

Honours Project Final Report

'The Development of a Webmail system for Older adults
using a User centred design methodology to investigate
positive usage of webmail '

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"Except where explicitly stated all work in this report, including the appendices is my own"

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Abstract

Developers of internet products should be aware of the ever increasing age of the population. They are not just developing for the younger age group, there is a whole other age group's needs to consider. There is evidence to suggest that increasing numbers of this age group wish to be a part of this modern world which is surrounded by technology and where communication is done on a daily basis through the Internet. The older generation are learning to use the computer, they wish to make use of the web to communicate with others but their actions are hindered by the online barriers that prevent them from completing their task. These online barriers are the poorly designed websites and Internet products that are usable and accessible to some but not to others. These barriers affect those most with impairments and lack of experience of using the web. These are the characteristics that older users have. These impairments brought on by aging can have a great impact on how the older users can use the computer and web, poor eyesight, hearing, motor problems and memory loss are all examples of impairments which developers need to cater for. One of the ways in which the user's needs can be fully represented in a design product is if the older users themselves are involved in discussing their design ideas with the developers. All developers should adopt a user-centred design approach to developing their products, the only way in which the developers are going to find out about the older users needs is if they involve them in the process.

This project investigates the positive usage of webmail by older adults over the age of 55 by designing a webmail system that makes use of a user-centred design methodology. The development of an interactive prototype representing a usable webmail system will be used to investigate this and this will be evaluated with users; the project also makes use of questionnaires and focus group methods.

The results found that the older users enjoyed being involved in the project, the findings also indicate that the users felt that the inclusion of the users in the design process would make the internet products a lot easier to use. So these findings suggest that the adoption of a user-centred design methodology will be beneficial to the user as the ease of use of the system is much increased.

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1. Introduction

Developers of web applications do take into account the needs of the users the majority of the time but is that because the typical users of these web applications are of a younger generation? It is clear that developing for older people is very different from developing for the more ‘typical user’, their needs are completely different and they haven’t grown up with this technology around them. The population figures show that the older generation is increasing all the time and so this is a good time as any for developers to really start considering the needs of this older user group. The older users who have taken an interest in technology often find that they are hit with barriers – interface barriers, a result of not meeting with this older age group and designing the interface properly.

The aim of this project is to investigate whether the adoption of a user-centred design methodology will have a positive impact of the older user’s usage of webmail. The project will involve the development of an e-mail system prototype for people aged over 55.

This section will give a detailed discussion of the background of the project area followed by the project’s aims and objectives, the research question and hypotheses.

1.1 Background

1.1.1 Population Growth

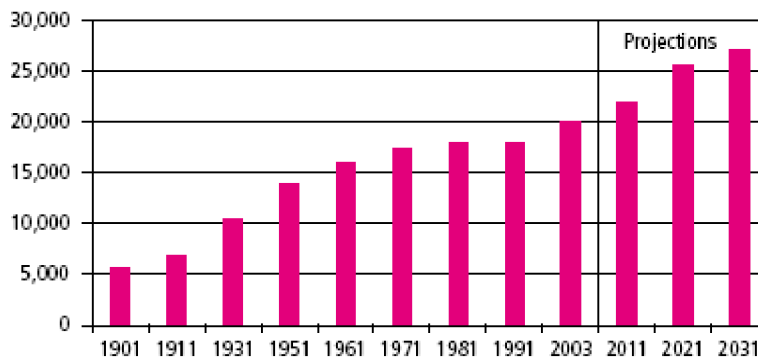
As several studies show, the population size is increasing with the numbers of people over the age of sixty increasing rapidly, “over the last 25 years the percentage of the population aged 65 and over increased from 15 per cent in 1983 to 16 per cent in 2008, an increase of 1.5 million people in this age group” (National Statistics Online, 2009).

It is also estimated that by the year 2033, 23 per cent of the population will be aged 65 and over, this is compared to 18 per cent of people aged 16 or younger (National Statistics Online, 2009).

Number of people aged 50 and over

United Kingdom

Thousands



Source: Office for National Statistics; Government Actuary's Department

Figure 1 - Number of People aged 50 and over in UK

As we are entering ever further into a world surrounded by digital technology, developers of such technology need to be aware that it is not just the younger age group that they should be developing technology for but for the growing older generation as well. Although it is thought that this older age group prefer to remain distanced from this new technology, there are figures that say something else entirely. According to a survey by Nielsen, there is evidence to show that in the last 5 years, the numbers of seniors aged 65 and over using the Internet grew from 11.3 million in 2004 to 17.5 million in 2009 (PRWeb, 2009).

1.1.2 Developing for the Older User

This clearly shows that technology should be made accessible to this age group to cater for their needs, but it is evident that developers are not aware of this and continue to design for the more typical user.

Developers who are aware of this may not fully understand that the needs of younger users are entirely different from those of the older users. As stated in Eisma (2004), “young developers may find it difficult to fully understand the day-to-day impact of age-related impairments”.

Developers need to consider the characteristics of the older user in order to be able to design an interface which is completely usable by them. Studies have found that older adults have two main characteristics which developers would need to consider – impairments caused as a result of aging and lack of experience with computers. Such impairments include visual, auditory, cognitive and motor difficulties. With these impairments acting as a barrier and being one of the main reasons why this older generation will not use computers, developers need to ensure that appropriate measures are taken to gather the requirements of this specific user group in such a way that their needs are properly represented.

As quoted by Newell (2006), “physical, sensory and cognitive characteristics of aging can be significant barriers to the use of the Internet and other computer systems in their present form”.

There needs to be special ways of using older users in order to gain information from them about their characteristics, developers cannot use typical younger users characteristics as a basis for design as the needs differ greatly between the two age groups. Also in older adults, their needs are dynamic not static – they change over time and they vary from individual to individual.

This finding indicates that there is a need to involve those users in the design process of the systems for which will be used by them to find out directly what adaptations will need to be made to satisfy their requirements. There is some evidence that some developers do not involve the users at all in the design process, these developers will therefore be unaware of the factors which will limit the older adults use of the computer and will develop a piece of software that the user can't and will not want to use.

These people may be interested to use such technologies but when they are faced with an interface that they find to be unusable and not suited to their specific requirements then they are discouraged to continue using it. This indicates that the internet needs to be completely usable and accessible for this older group of users. In order to achieve this, developers need to design the web applications to meet the users' characteristics.

As a result of aging, many people over the age of sixty suffer from impairments that can have a negative effect on their use of the computer (Arnott *et al*, 2004).

However on a positive note, according to Juznic (2006) there are several reasons why people of an older age group should learn how to use the internet. One of the reasons is that older adults want to stay in touch with their family and friends but there are physical geographical barriers that may prevent them from staying in contact – the family may stay in another country and so communicating by e-mail may be the easiest way. As stated by Juznic (2006) “One of the most appealing things for senior citizens is being able to e-mail their grandchildren”.

Another reason for internet use is that it gives older adults the chance to connect with the outside world (Selwyn *et al*. 2003).

As well as the online barriers that result from poor requirements gathering and developers not considering users needs, there are also physical barriers that can prevent older people from going out of their homes. Age-related impairments can cause these physical barriers to occur so the only way for older people to communicate with others is to use the internet.

This older age group can benefit greatly from learning to use email and similar technologies.

The use of the internet has been found to have positive psychological effects on the user and the use of the internet by older adults also allows them to keep their brains active as they are continually learning new things when using the internet (Juznic, 2006).

So to enable older users to use the web and other communication technologies such as email, e-mail and web interfaces need to be designed so that older users perhaps who have age-related impairments can access them with ease and feel confident enough to use them.

There are many types of impairments that may affect the older users' ability to access the internet and developers should try to design their web application with these impairments in mind but developers sometimes forget that the people they are developing for not only have

impairments to take into consideration but they may not have experience at all with the web and it's their lack of experience with the internet that can also act as a barrier. (Dickinson et al., 2005)

So it is clear that to make sure that interfaces are accessible to everyone whether they have impairments or not, developers need to find out exactly what features the users require to make the interface more comfortable to use. This can be done by using a user-centred approach to the development process.

Developers need to involve the targeted user group in the design of the product to ensure that the user's requirements are met and that the email system contains features that the user would like in the system. Every user is different and has different accessibility needs so a system with an interface that each individual can customise will need to be looked at.

This project aims to use a user-centred design methodology to develop the e-mail system as it is clear that many developers when developing software for the older age group that they forget to take into account that these users may be inexperienced with computers and they have no idea how to use them. Developers need to consider that there are many changes that occur to people as they get older and it is these age-related changes that can act as a barrier to the user if the software is not accessible.

1.2 Project Aims and Methodology

This project is a Develop and Test project which will use various HCI tools and techniques to create a webmail system that is to be used by older adults over the age of 55, (throughout this project, an older adult is defined as someone over the age of 55). The system will be designed using a user centred design methodology to ensure that the users' requirements are fully taken into account and their views on the design are represented in the final system.

A literature review was conducted to find out in more detail the uses of the Internet by older adults and the characteristics that older adults have that would have an impact on the design of an e-mail system.

Commencing after the literature review, requirements gathering activities would be carried out to collect the user's requirements for the system to be developed. The requirements gathered from these methods conducted will be used to create a final design interface prototype of the system with limited functionality. The prototype will be evaluated with the participants of the project where the prototype will be presented to them and they will be asked to complete a series of tasks using the system.

In total there are ten participants taking part in the project who are all over the age of 55. These participants were sourced through family and friends. The computer course at the local library was originally the first targeted source as those taking the course were less experienced computer users and it was thought that the participants obtained from the computer course would all have a wide variety of skills and experience in using the computer and Internet. These users would have been very valuable to the project, however due to further ethical and data protection issues that were brought up by the council concerned about the use of the computer course attendees; there would have needed to be more time spent by the council in researching these issues in order for permission to be granted. As a result, further participants were obtained from family and friend connections.

The views of the participants will be very useful to the project, as the project will be able to incorporate their opinions into the design of the e-mail interface. It is very important to consider the needs of each individual user who is going to be using the system as they are the people who are going to be using it and it needs to be usable. It is clear however from the literature search that not all developers take into account the needs of the users when they are designing an application for that targeted user group. This project will aim to collect all the views of the participating users so that the system will be representative of their participation in the development of the system and so it will be based on their realistic views.

It has become clear as indicated above that the needs of the users need to be identified by the developers to ensure that a system is designed that is suitable for them. So in relation to this, it has been thought that the most obvious way to do this is to involve the users themselves in the development process where their opinions will be used as input to the various design stages. As quoted by Sharp (2007), "developers can gain a better understanding of the users' goals, leading to a more appropriate, more usable product." When the user's requirements are fully understood then this will result in a product that they will be happy to use. Therefore the method used in this project will be the User-Centred Design methodology which completely centres on the needs of the users and they are involved throughout the process.

Through conducting the methods and carrying out user evaluation on the designed interface, the project will aim to answer the following research question.

‘Can a webmail system developed for adults over the age of fifty five and designed using a user-centred design methodology have a positive impact on the user’s usage of webmail?’

The main aim of the project is to investigate whether using a user-centred design methodology to develop a webmail system will have a positive impact on the older adult’s use of the internet and computers in general. The project will determine whether after being part of the design process of developing the system, the older adults will be more likely to use a similar system in the future.

There are several sub-questions that need to be addressed as well as the overall research question.

- § **Can the participation of users within the design process have a positive impact on their uptake of webmail?**
- § **What are the factors that motivate older adults over 55 to use webmail?**
- § **What are the reasons why older adults may be discouraged from using webmail?**
- § **How does the use of a User-centred design method to design a webmail interface compare with other possible design models that could be used?**

1.2.1 Objectives

To fulfil this overall aim, the project will involve completing the following objectives:

Objectives met within the literature review

§ **Find out the characteristics of older adults**

The literature search will identify the characteristics of an older adult over the age of 55. These characteristics will need to be clear as to ensure that the design of the webmail interface will meet these characteristics and that the webmail interface will be usable to them. The methods carried out with the users will also aim to meet this objective.

§ **Find out what problems they currently face whilst using an email system**

It is essential to investigate through the literature search what common problems older users meet when they use webmail as to ensure that the design of the webmail interface will not incorporate any of these features. The methods as conducted with the users will also hope to identify problems which relate to those found in the literature.

§ **Find out what features the users would like in the email system**

The literature search carried out on previous studies will identify specific features that users of this older age group would like in an email system. The methods conducted with the participants in this project will aim to gather this information and fulfil this objective. In order to design a webmail system suitable for adults over the age of 55, it is appropriate to gather the requirements for this age group through searching previous

literature and through the project's own research methods. It is when this objective has been fulfilled that the design of the webmail system can begin.

§ Investigate the motivational factors that can encourage the participants to learn to use the computer

It is important to find out what exactly motivates users to learn to use the computer. Different users of various ages will have different reasons for learning so it is essential that these are discovered.

Objectives met within the methods section of the report and through the webmail system developed

§ Hold focus groups to create a discussion about the use of email

The focus groups will be one of the main methods conducted to find out in detail the participant's opinions of e-mail systems. For the focus groups to be carried out successfully, previous literature will be sourced during the literature review to find out how to conduct focus groups properly in order to obtain enough suitable requirements from the participants.

§ Create paper prototypes of the envisaged system

This objective will be met through a literature review which would be carried out to find out how to create paper prototypes. It is important to find out how they can be created properly and how they can be used to represent the initial design ideas of the webmail system. It is therefore essential to find out from previous studies what problems users of this age group had with the design of the interface and what design features are essential for them to have in the interface based on design guidelines.

§ Evaluate the paper prototypes with the participants

The objective will be met during the project methods conducted and it is intended that this objective can be met through the literature review carried out to find out the ways of evaluating the paper prototypes with users over the age of 55 and whether these ways were successful or not. This objective is important as it is essential to find out the users opinions of the several designs of the email system so that the eventual design is completely suitable for the target group.

§ Develop an interactive prototype of the system

An interactive prototype of the email system would be created after carrying out methods to gather the user's requirements. The intention is to meet this objective by carrying out a literature search to find out how interactive prototypes are developed and refined from paper prototypes and to find out how they can be evaluated successfully with users to meet the overall research question. This objective will be met during the project methods.

§ Carry out further evaluation of the webmail system with the older adult participants by using usability tests

The literature search carried out will identify the ways of evaluating an interactive prototype with users. It will also find out how to create the tasks to be completed with the users and how these tasks could be analysed. It is important that these tasks are designed properly as to ensure that the webmail system interface is being tested for its suitability and appropriateness for this age group. The objective will be met during the project methods conducted.

The aim of the project is to evaluate the following hypotheses:

- § **The users will find the webmail system easy to use and they will feel more comfortable using it if they are involved in the design process.**
- § **The users will feel more positive towards future webmail systems after being involved in the design process of the webmail system.**

The first hypotheses was outlined as it was clear from previous research carried out that people of the over 55 age group are not confident about using the computer or email but they express an interest in using it. People of this age group also have diverse requirements unlike those of a typical computer user and from research carried out, requirements can be gained properly only through the involvement of these users in the development process. This project will therefore aim to test this hypothesis to find out if the users feel more at ease using an email system if they were involved in its design by involving the participants in focus groups and allowing them to input their opinions into the prototypes which will be created. This project will also try to find out whether the participation of these users in the design process will make the system easier to use for them. This hypothesis will be tested through the interactive prototype which will be used to evaluate the webmail system with the participants. The participants will be asked to complete some tasks while using the system, these tasks will test to find out whether the system is easy to use for this age group and takes into consideration their characteristics. A final evaluation questionnaire could also gather the participants' views of the system and how they feel that their participation in the project has affected their views of email systems.

The second hypotheses was defined as from research carried out, there have been some indication that people of this age group have shown an interest in using computers and the Internet, especially email but these email systems haven't been designed as to take into account the users changing characteristics that occur as a result of aging. As a result, the users find it difficult to use the system and so they start to adopt a more negative attitude towards computers. This project will test to find out whether this hypothesis is true through the use of the final evaluation questionnaire which will be distributed to participants after the interactive prototype and will aim to find out if the user's opinions of email have changed.

1.3 Structure of the rest of the report

The structure of the report is outlined as follows:

Literature Review

The literature review will be discussed in chapter 2 of this report. It will discuss the specific areas that arose from the result of the literature search that was conducted, these that relate to the project.

Methods

The methods section which will be explained in chapter 3 of this report will discuss the overall project methodology used in this project where it will be justified and its appropriateness for the objective of the project discussed.

Design

This section will discuss the various aspects involved in the design of the webmail system prototype that was evaluated with the participants.

Results

The results chapter will discuss the findings of the methods conducted with the research participants.

Discussion & Conclusions

This final chapter will conclude the overall project by discussing the work completed during the project and will give a summary of how the project went as a whole. There will be a final discussion of the findings outlined in the results chapter and a discussion of how they allow the overall research question to be answered. Finally there will be a short discussion of the future research work that could be undertaken as a result from these research findings.

2. Literature Review

This section will give a discussion of several areas which are relevant to the objectives of this project. This section will aim to fulfil the objectives defined in. The areas discussed include characteristics of older users, motivational factors, common problems found with e-mail, design guidelines, user-centred design process. There will also be a discussion of the various methods available which include questionnaires, focus groups and prototypes.

2.1 *Characteristics of Older Users*

It has been identified from the research conducted that characteristics of users need to be identified in order to build an application which is suitable for them. In the development of an application for the older age group, it is important that developers take these characteristics into account and not just assume that their needs are the same as every other user because it is clear that they are not. However, it is somewhat suggested by research that some developers do just that and forget to consider the needs of this age group of users. They develop systems that they think the older age group will like but these systems are completely unusable to them. Their individual characteristics act as a barrier to those trying to use the system, as a consequence this often results in people who are wary of going near computers. Characteristics have been divided into two sub-sections: age-related changes and experience or more appropriately the lack of experience. These both act as physical barriers to the user. Arnott et al (2004) conducted a study with the goal to understand the older user's requirements in relation to email. The various data gathering activities established a set of requirements which allowed prototype designs of an email to be created. Arnott et al identified that older adults encounter two main barriers with computer use, age-related impairments and inexperience with modern technology. The paper consisted of a discussion of older users requirements.

2.1.1 Age-Related Changes

As adults age, their bodies suffer many changes; these changes include declines in their visual, aural, cognitive and motor abilities. All of these declines can have a negative impact on the users' use of the computer but visual impairment is the most obvious factor that can limit the use of the computer by the user (Hanson, 2004). A study conducted by Hawthorn (2000) reviewed findings on how various age-related changes affected the users' computer ability and also discussed how these affected the design of an interface by a designer. The author suggested that certain design adaption's can be incorporated to make the user interface more user friendly, for example increasing the font size, have a clear, simple layout and avoid flashing text amongst others.

As stated by Becker (2004) "The normal aging process and physical impairments, has an impact on web usability when designs are not senior friendly".

There have been several comparisons of the usability of computers and the Internet by younger users and older users. Chadwick-Dias et al (2003) identified from a study that older users have more difficulty using the web than younger users. This was found to be due to the various physical aging factors that affect users as they get older. The author is also quoted as saying that modifications made to the design of the interface could often help younger users as well, so that it would be useful that an interface was designed that could be used by younger users in addition to the older user.

Gregor et al (2002) discusses how interfaces are designed for the typical younger user. The author also discusses that older people can be divided into three distinct groups. The paper described the three groups as - “fit older people who don’t appear to have a disability but whose needs have changed since they were younger”, “frail older people who have one or more disabilities and a general reduction in their other functionalities” and “disabled people who grow older and whose long-term disabilities have affected the aging process and whose ability to function depends upon their other faculties”.

It is therefore suggestive from the evidence that older people have a wide range of characteristics which need to be taken into account and that their specific requirements vary greatly from a younger user.

As quoted by Eisma et al (2004) “Older people may have significantly different needs priorities and expectations than young people”.

There are various impairments which have been identified by many studies to have come about as a result of ageing in the older user. These types of impairment will be discussed with a reference to how these impairments impact upon the older user’s ability to use webmail.

Visual Impairments

It has been stated by Hawthorn (2000) that people with visual impairments suffer considerably when using the web and that there is a clear decline in their performance. This can be due to the web and related interfaces being highly visual and designers not taking various visual impairments into consideration when designing an interface.

There are many different types of visual impairments which can impact upon a user’s ability to use webmail and the computer in general. The World Wide Web Consortium (2009) identifies some different types of visual impairment; these are blindness, low-vision and colour blindness.

Older users can be affected by these impairments as they age.

Becker (2004) discussed the various factors in relation to aging that can affect web use. The author states that the users change in their vision can affect their use of a web site in terms of the legibility, the speed at which they can read the text on the screen, their understanding of the information on the screen and the navigation between screens.

Arnott et al (2004) states “text and buttons in industry standard software are difficult to see clearly, partly because of the small size of the letters, this is also influenced by the font size, low contrast between text and background colours”. These authors also stated that the user’s ability to scan a page would be degraded, “user’s ability to scan a page in search of a particular target will be degraded by the difficulty of distinguishing what is on the screen as by screen complexity and the users own inexperience”.

The findings from the prototypes found that the participants preferred to have the toolbar along the top of the window and to have graphical icons on the buttons to reinforce what they meant.

Action buttons such as delete and reply to message were preferred at the bottom of the screen.

The participants liked bold, clear design, important features stand out, made it clear where the user should click.

The participants liked the large up, down, back, forward arrow buttons rather than scrollbars. They didn't like menus.

Hanson (2009) "reduced acuity, colour perception and contrast discrimination. These declines leads to difficulties in reading small text, text that is closely surrounded by other visual elements, and text that has complex font styles or lowered contrast due to poor colour choices on pages."

Cognitive Impairments

There are several cognitive impairments, one which include decline in memory. Arnott et al (2004) states that "Short term memory decline makes it harder to remember the steps in computer tasks and the unfamiliar nature of these tasks will increase the difficulty of remembering steps". It is essential therefore that there are a limited number of steps in menus as not reduce the number of steps to remember.

Motor Impairments

As adults age, their bodies suffer many changes; these changes include declines in their visual, aural, cognitive and motor abilities. All of these declines can have a negative impact on the users' use of the computer but visual impairment is the most obvious factor that can limit the use of the computer by the user (Hanson, 2004). A study conducted by Hawthorn (2000) reviewed findings on how various age-related changes affected the users' computer ability and also discussed how these affected the design of an interface by a designer. The author suggested that certain design adaption's can be incorporated to make the user interface more user friendly, for example increasing the font size, have a clear, simple layout and avoid flashing text amongst others.

"Short term memory decline makes it harder to remember the steps in computer tasks and the unfamiliar nature of these tasks will increase the difficulty of remembering steps." (Arnott et al, 2004)

"The normal aging process and physical impairments, has an impact on web usability when designs are not senior friendly". (Becker, 2004)

There have been several comparisons of the usability of computers and the Internet by younger users and older users. Chadwick-Dias et al (2003) identified from a study that older users have more difficulty using the web than younger users. This was found to be due to the various physical aging factors that affect users as they get older. The author is also quoted as saying that modifications made to the design of the interface could often help younger users as well, so that it would be useful that an interface was designed that could be used by younger users in addition to the older user.

"Older people may have significantly different needs priorities and expectations than young people" (Eisma et al, 2004).

2.1.2 Experience

Dickinson et al (2005) carried out a study that involved creating an email system for older people with no experience of Internet use. This study found that this system was preferred by the inexperienced older adults in comparison to the commercially available email system.

The author quotes that “most older users are inexperienced computer users. These users are likely to encounter difficulty with terminology and with a range of interface conventions”

Inexperienced users with no experience at all of computers or the Internet will have no idea of the typical conventions used. An interface would be completely confusing to them, so a lot of effort has to go into making sure that these types of users feel comfortable and happy using the system.

The author found that one of the barriers that inexperienced users encountered was multiple windows, as the users thought that when they clicked on a background window that they had lost all their work when the window they were working in had now become hidden behind other windows.

Arnott et al (2004) quotes that “older adults generally have much less computer experience than younger people do and they are less likely to use computers”.

“as a group, they find it harder to learn how to use a computer and are likely to make many more errors, from which they will find it harder to recover”.

Aula (2005) states that “computer experience should not be measured simply by the number of years a person has used computers, experience is not the same as expertise.”

Dickinson et al (2007a) discusses that “older users may face some barriers for which the reasons are that many older adults are inexperienced web users and they are less likely to be aware of access options or assistive technologies.”

Dickinson et al (2007b) quotes that “most people over 65 are likely to have had direct experience of computers and no experience with the Internet.”

Hanson (2009) quotes “there is reason to believe that the type of experience that older users have will affect their ability to use the Web.”

The author also states that “Collaborative experiences such as workplace environments or learning as part of a class may improve web expertise.”

Hawthorn (2000) “discusses that a previous study by Czaja and Sharit found that the level of prior computer experience outweighed the effects of age when considering performance on training to use an application. ”

Juznic et al (2006) states that “seniors lack confidence, feel that they are too old to learn such things and can experience computer-related anxiety.”

Kubeck et al (1999) discusses that “computer inexperience may be an obstacle for older adults. Current research shows that older adults take more time to learn computer applications such as word processing and spreadsheet software.”

Results from the survey conducted by Morrell indicates that there were two primary reasons for not using the Web: lack of computer access and lack of knowledge about using the Web.

2.2 Motivational Factors

A study by Juznic et al (2006) investigated the use of the Internet by seniors; the paper discussed the reasons why seniors should use the Internet. The study found that there were several reasons why seniors use computers, one of the most common reasons was that they

wanted to stay in touch with their relatives. Staying in contact with people and continuing to communicate with them is a very important aspect to an older person, especially those that are housebound due to physical impairments. Computers and the Internet can allow them to remain communicative with others. As stated by Juznic et al, “the Internet removes the barriers of time, place and physical limitation and helps seniors to gain a positive attitude ageing and life”.

Results from the study conducted by Juznic also indicated that there were several reasons why the participants of the study did not use the Internet, the reasons are stated as follows: they don't know how to use the computer, do not know how to use the Internet, do not have an Internet connection and they have a problem with their eyes. This brings up the thought that older users with visual impairments feel that they can't use the computer or the Internet, they are not aware that adaptations can be made to existing systems to incorporate their limitations or that various technologies are available to help them to use the computer and Internet more easily.

There are multiple reasons why older adults don't use the web and there are many papers that discuss this. Hanson (2009) revealed that one of the reasons for non-use is that they don't feel the need to use it. Older users who enjoy the face-to-face communication and the personal contact with people don't see what computers can offer that can't be done via the traditional method of going out and meeting people.

There have been several studies conducted that discuss the reasons why people want to use computers and what aspect motivates them to use them. There are some people that don't have any experience in using computers but they have expressed an interest to learn how to use them. Dickinson et al (2007) however stated that these users that have an interest to use computers face multiple accessibility barriers as a result of characteristics. When faced with these barriers, users as a result can become discouraged from learning to use the computer. The paper also stated that this lack of experience that users have can prevent them from knowing what help and support is available to them and so they don't see any way of solving the problems that they have with the computer.

The Internet can offer various benefits to the user. Jaeger and Xie (2009) stated that online communities such as discussion sites for seniors can help the disabled and older users to overcome physical, cognitive and geographical barriers that can often prevent them from interacting with other people.

A study by Aula (2005) discussed findings that after undertaking a training period and using the Web for two hours, the attitudes were much more positive than before. This shows that involvement could have a positive impact, however there is other evidence to show that people are just not interested as they don't see it as being relevant to them. (Dickinson et al, 2007)

There are other users that may be interested in learning how to use computers but the accessibility barriers that they face as a result of characteristics might discourage them from using it. The inexperience barrier may prevent them from knowing what help or support is available for them. (Dickinson et al, 2007)

Kurniawan and Zaphiris (2005) gives one of the reasons that older users don't use the web is the lack of understanding from the developers that older users have different needs from the younger users, both in the way in which older people use the web and also in the way in which older users interact with the web.

Melenhorst et al (2006) carried out a study that examined the older adults' motivation to adopt new technology; the study included the use of older e-mail users and non-users. The results found that the older users were not interested in using the computer if there was no benefit to them, only if they thought that the computer would be helpful to them and help them achieve their goals then they would be interested in using it. As a consequence, the author states that these results contradict the thought that it is usability barriers that determine whether older users use technology.

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2.3 E-mail systems: Common Problems

Arnott et al (2004) carried out a study in an aim to understand the e-mail needs of older people. Prototypes of an e-mail system were designed after carrying out various requirements gathering methods and these prototypes were evaluated with participants. The evaluation revealed that older users had a problem with the use of menus, especially drop down menus which they found were confusing to use and navigate.

These menus would be a severe barrier to those with motor impairments, so it would be more preferable to use buttons instead.

The results also revealed that the users did not like scrollbars; up and down buttons could be used instead as they would be easier to understand than how to use scrollbars.

2.4 Design Guidelines

There have been various studies discussing sets of design guidelines that could be used to create a more usable system for older adults that take their characteristics into account.

A survey conducted by Ivory & Megraw (2005) in 2002 revealed that only 36% of web practitioners always use guidelines when designing sites.

It is perhaps clear that due to guidelines not being followed that it results in an unusable system for everyone, but especially for older adults with impairments.

World Wide Web Consortium (2009) has produced Web Content Accessibility Guidelines for developing websites. The guidelines come under a set of four principles which are as follows: perceivable, operable, understandable and robust. Principle 1 (perceivable) states that interface and user interface components must be presentable to users in ways that they can perceive. Principle 2 (operable) states that user interface components and navigation must be operable. Principle 3 (understandable) states that Information and operation of user interface must be understandable and Principle 4 (robust) states that content must be robust enough that it can be interpreted reliably by a wide variety of user agents including assistive technologies. These guidelines should be followed by developers but they may be too confusing and complex to understand.

There have been several studies which discuss the use of design guidelines in relation to the use of the web by older users. A study conducted by Dickinson et al (2005) described the design and development of an email system for older users. Before the commencement of the design, Dickinson et al (2005) identified other studies that discussed the barriers relating to impairments suffered by older users and subsequently the author agreed a set of guidelines which the designed e-mail system would aim to follow (see Appendix). These guidelines include reference to font size, where Dickinson et al (2005) states that font sizes should be 14 point minimum. The author also states that scroll bars should be avoided.

A study by Ellis and Kurniawan (2000) describes the use of participatory design techniques to increase the usability of online information for older users. Through trial and error approaches and reference to literature, design guidelines for older users using the web were created (see Appendix). These authors stated that a sans-serif font such as Arial be used as the users found them easier to read. One guideline also refers to the use of dark text on a light background.

A study by Kurniawan and Zaphiris (2005) developed a set of age-centred guidelines based on research carried out. The study describes the evaluation of guidelines with users to test their usefulness. A refined set of guidelines was then developed (see Appendix). These guidelines include use of colours and layout of items on the screen.

2.5 User-Centred Design Process

The diagram below shows the ISO13407 process model. This model represents the user-centred-design process which involves the user in the process to enable the developers to gather information on the needs of the user. The users could be involved in various activities such as focus groups and prototyping sessions to discuss their ideas for the design.

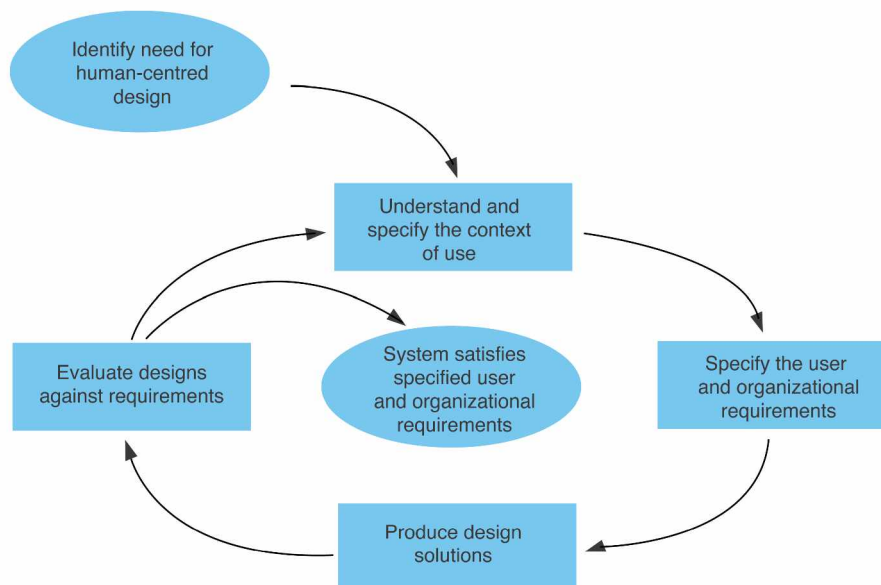


Figure 2 - ISO13407 process model

2.6 Methods

2.5.1 Questionnaires

As discussed by O'Brien (2007), questionnaires are quite flexible in what they can measure, they can be designed to gather either quantitative or qualitative data.

The use of surveys has many benefits and also some costs. Lazar et al (2010) discusses the benefits of surveys, there are many benefits of using surveys. They can be used easily to collect data from a large number of people at a relatively low cost. The authors also discuss that surveys can be created using e-mail or web pages but paper surveys do not require any special tools or equipment like the above survey types do. Denscombe(2007) discussed that questionnaires can provide a sufficient amount of research data for a relatively low cost in terms of materials, money and time. This author also describes that the answers supplied by questionnaires are all very standardized, as all the participants receive the same set of questions which they are required to answer. The data collected therefore is very reliable. Denscombe (2007) also discussed that questionnaires allow the data to be quickly analysed by the researcher. One of the main advantages is that questionnaires can give feedback from the point of view of the user (Human Factors Research Group, 2000). It allows the developer to get specific feedback on the various areas that were asked. The feedback that is received in response depends on whether the questionnaire was developed using proper types of questions and the type of responses/data that the developer wishes to receive back will only be obtained through the correct use of questions to get qualitative or quantitative data.

Questionnaires and surveys also present some costs with the benefits. Lazar et al (2010) discussed costs of using questionnaires. The authors of this source stated that questionnaires are not good for getting deep detailed data from participants' while they are good at obtaining some limited information. This would be a disadvantage to be aware of as it is necessary that detailed data is gathered from the participants to gain an insight into their use of email and their opinions of it. Lazar et al also gave another drawback as it being impossible to go back and ask the participant for more detailed information if the data received needs questioned. In some cases this would occur if the use of certain types of questions does not gather the complete response hoped for. However this method will be used in conjunction with a focus group within this project which will allow for the further investigation of any key points that arise from the questionnaire. Denscombe (2007) stated that there is the possibility of getting a poor response rate from questionnaires as they can be easily ignored by participants.

There are three types of questionnaire, closed-ended, open-ended or a combination of both. (Dawson, 2002) Closed-ended questions are those which allow the user to answer only within the set of answers which have been provided in the question. In addition, there are two types of closed-ended questions – one type has ordered response categories and the other has unordered categories. An example of an ordered response is the use of a Likert scale which often takes the form of a 1-5 scale or one which asks users to respond on a scale of 'strongly agree' to 'strongly disagree' Unordered response categories allow for choices that don't have a logical order. (Lazar et al, 2010). An advantage of closed-ended questions is that the respondents are more likely to answer all the questions if it just requires them to tick boxes (Dawson, 2002). Another advantage is that the answers provide pre-coded data which can be easily analysed. (Denscombe, 2007). However there are also some disadvantages to using these forms of questions. Dawson (2002) identifies that respondents can only answer using a set of responses, but they might become somewhat annoyed as the set answers may not represent their own opinions. Open-ended are those questions that don't have a set of pre-determined responses and the respondent can answer the question however they want (O'Brien, 2007). Denscombe (2007) describes one of the advantages of open-ended questions, the responses gained from these type of questions fully represent the respondents views, something which cannot be shown through pre-determined responses. However there are disadvantages of this type, the responses are much more difficult to code as it is in fact qualitative data that is being gathered, another disadvantage is that respondents often leave the question blank as they don't wish to write a long answer (Dawson, 2002).

2.5.2 Focus Group

Focus groups are small groups which have been brought together specifically to focus on certain issues (Wisker, 2001). These group discussions provide a reasonably effective and inexpensive tool for easily gathering a wide range of opinions (Lazar et al, 2010). The size of the focus groups can vary but it is suggested that they should contain between six and nine people as this is a suitable number to gain a range of opinions from (Denscombe, 2007). The person who is responsible for organising the focus group session is called the moderator, this role requires the moderator to ask the suitable questions and to then step back to allow the group members to start discussing the topic. From time to time, the moderator will be required to encourage all participants to contribute to the discussion and to make sure that the focus group stays on track (Denscombe, 2007). The benefits of focus groups have been identified by several sources, Barrett and Kirk (2000) discuss that they are a suitable technique to use for preliminary data gathering in order to obtain an insight into the research

topic and the needs of a specific group of people. Dawson (2002) outlines several benefits, one of which being that the researcher can gain a wide range of responses during the one evening. This results in the production of more data for the researcher to work with and use. Another advantage is the focus group can help people to overcome their inhibitions; this is especially true if they know other people in the group. It also allows individuals to come together and express views on the topic, this is useful for the participants to learn from each other about their various computing experiences (UsabilityNet,2006). Another important benefit is the use of an audio recording device to record what is said during the focus group. The audio recording device offers a permanent record, which can be referred to later (Denscombe, 2007). On the other hand, there are several disadvantages that can arise when running focus groups. Lazar et al (2010) says that focus groups can become limited to a small number of questions as conversation between group members can take time. The authors also identified another disadvantage where it can become the case when one group member may dominate the discussion thus reducing the opinions gathered from other members. Dawson (2002) outlines a disadvantage where some group members may refuse to take part in the discussion. The author also identified the disadvantage where the venue of a focus group session and the equipment used can be expensive.

2.5.3 Prototypes

Prototypes allow you to test your ideas before investing any time and money on the development (Usability.gov). According to Nielsen (2003), it is much cheaper to spend time making changes before any code is written than waiting until after the implementation stage when it might be too costly to make changes. There are several types of prototypes, they can range from low-fidelity to high-fidelity prototypes. Low-fidelity prototypes which are also known as paper prototypes are very useful as they can be quickly presented and evaluated by the users (Lazar et al, 2010). Paper prototypes also allow potential usability problems to be detected at a very early stage in the design process before any code has been written (UsabilityNet,2006). As little time is spent developing them, the design can be changed multiple times. As stated by Sharp(2007), they are for exploration of ideas only. Ideas for designs can be drawn on paper and then they can be thrown away if the design needs to be changed. It is easy to discard this prototype and start again. The advantages of paper prototypes are that only minimal resources and materials are required to produce them (UsabilityNet, 2006). You would only need a paper and pen to create these types of prototypes. They are also very useful for identifying the layout of items on the screen (Sharp, 2007). High-fidelity prototyping produces a prototype that looks like the final design (Sharp, 2007). They are developed in a piece of software and can take you as close as possible to the final design (Usability.gov). High-fidelity prototypes are fully interactive and they are completely user-driven (Sharp, 2007). However these types of prototypes are more expensive and time-consuming to create. There are also medium-fidelity prototypes which contain aspects of both low and high fidelity prototypes. They contain some visual design and a level of detail between low and high-fidelity prototypes (Farnum, 2002).

3. Methods

This section will describe the primary research method which will be used to investigate the project's research question. It will also describe the various methods that will be conducted in addition to the primary method. There will be a discussion of the various methods in detail and a justification of their use.

3.1 Overview of Primary Research Method

The goal of this project is to investigate whether using a user-centred design methodology to develop a webmail system will have a positive impact on the older adult's use of the internet and computers in general. To investigate this, an interface of a webmail system would be developed in the form of an interactive prototype which would be evaluated with the participants. Data would be gathered about their use of the prototype through the creation of a task evaluation sheet which would be distributed. This webmail system interface will be designed based on the data gathered from the questionnaires distributed to the participants and the focus group conducted.

3.1.1 Participants

This project required the involvement of several participants who were aged over 55 to take part in the various requirement gathering activities and evaluations. This project's aim was to investigate the older adults' use of webmail and to design a webmail interface which would take into consideration the various needs that this age group has. It was therefore essential that suitable recruitment strategies were undertaken to obtain the required number of participants.

It was intended that to gain a suitable number of participants that those persons attending computer classes should be targeted. Several efforts were made to first of all find out what computer classes were held in the local area. This search found that there were computer classes being held at the local library which were run by the council. Enquiries were made to the leader of the classes to gain participants over the age of 55, however before any contact could be made with the participants, it was essential that several ethical checks by the council needed to be carried out. This process was going to be time consuming and there was no guarantee that any participants spoken to would be willing to take part in the project. So it was decided that to minimise the time spent on recruiting participants, to go with the backup plan and recruit participants through speaking to my grandparents who are over the age of 55. By word of mouth, other participants over the age of 55 were recruited and they agreed to contribute to the project.

Through this process 10 participants were recruited to participate in this project. It was thought that this be a suitable number of people to successfully evaluate the prototypes and draw conclusions from.

The table below outlines the participants taking part in the project. All participants' identities will be kept anonymous and will be given an identification number which will be used throughout this report.

Table 1 – Participants

Participant	Age	Gender
Participant 1	78	Male
Participant 2	76	Female
Participant 3	65	Female
Participant 4	64	Male
Participant 5	69	Male
Participant 6	69	Female
Participant 7	65	Male
Participant 8	58	Female
Participant 9	70	Male
Participant 10	62	Male

In this project, an older adult is defined as someone over the age of 55. Therefore any further mention of older adults will refer to the people over the age of 55.

The participant's opinions will be gathered through the use of an initial questionnaire that will gather information on their experience etc. Some of the participants taking part in the overall project will take part in the focus group. There will be a final evaluation session which will involve the distribution of the final prototype on a disk.

3.1.2 Selection of software/apparatus

It was decided that the design of the e-mail interface would be implemented in the Macromedia Director MX software. It is especially useful software to use as it allows creation of applications which can contain multimedia elements and some functionality. It is very easy to use and seemed appropriate due to the student's familiarity with it.

The screenshot of the Director software is shown below.

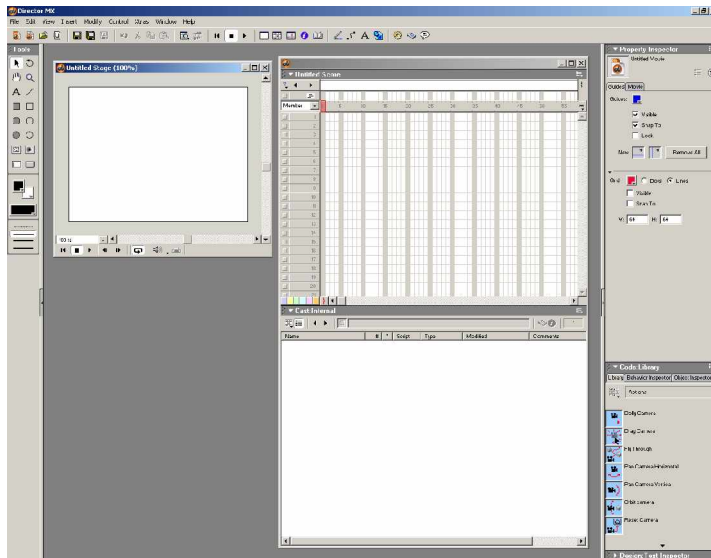


Figure 3 - Screenshot of Director

3.2 Outline Specific Nature of Methods

The methodology of the project is comprised of several different methods. These methods are described in detail as follows.

3.2.1 Questionnaire Design

Two questionnaires were created in order to gain useful information about the participants at different stages of the project. An initial questionnaire (see Appendix A) was distributed to participants at the start of the project and an evaluation questionnaire (see Appendix B) was distributed to participants' after the other project activities had been completed.

All ten participants who are all over 55 years of age received an initial questionnaire, nine of the participants received the questionnaire through physical distribution, and one participant received their questionnaire by post.

The purpose of the initial questionnaire was to gain background information about them and their use of the computer and email. The questions asked included asking their age, their length of computer use, use of the computer (what do they use it for?), how they learnt, the type of email system they use (Email client such as Outlook or a Web based email) and questions regarding the problems (if any) they have with their current email and there was a final question asking what was their main reason for learning to use the computer.

These questions hoped to identify the individual's personal thoughts on their email use. The question asking the main reason why they learnt was particularly important to investigate whether these participants' reasons echoed those found in literature.

The questionnaire aimed to collect both quantitative and qualitative data from the participants and so it used a combination of both closed-ended and open-ended questions. As previously discussed by Denscombe (2007), the use of closed-ended questions allows for easily analysis of data. This type of question was suitable in this project as there was a limited amount of

time available to spend on data analysis and quantitative data can be analysed quickly unlike qualitative data which can become time consuming to analyse. Open-ended questions were also used within this questionnaire as they a good way of gathering the participants exact opinions.

When the participants completed the questionnaires, the data was then analysed and the preparation was begun for the focus group which then followed.

3.2.2 Focus Group

All participants were contacted by email and they were asked if they would like to come to the focus group which was arranged to be held on 29th March at 7.30pm. The focus group was held at the home of two of the participant's as it was very local to most of the participants and they would not have far to travel. This was also a very cost-effective method as Dawson (2002) states that disadvantages of running some focus groups are that the cost of the venue would be expensive. This was not a problem in this case. The focus group lasted for a couple of hours. Six participants attended the focus group. This was a good number of members as it was not too large a number that the discussion was difficult to control but not too small a group that the data gathered from the discussion was not sufficient or detailed enough. As described by Denscombe(2007), a suitable size of focus group has between six and nine members.

The aim of the focus group was to gather additional information on the views of email. The questions asked aimed to gather deeper data into some of the answers in the initial questionnaire and clarify the opinions of the participants. It was also to ask some questions that had not been asked in the questionnaire but was felt to be relevant and whose answers would be useful. Its purpose was also to gather the participants initial views on the paper prototypes.

The focus group was set quite informally as refreshments were provided and the questions were semi-structured. The focus group was recorded using a sound recorder program which was on the laptop which was brought by the moderator. The moderator took notes during the focus group but it was essential to try to record the session as it allows the opportunity to go back and listen to the recording again once the focus group has ended to clarify points made in the notes.

The first part of the focus group involved the moderator asking a series to questions to the group (about six in total). There was a discussion which followed each question and multiple people contributed so there were a variety of different viewpoints.

The second part involved the moderator showing some paper prototypes to the group to gather their views on the look of the interface design. The prototypes were transferred into Microsoft PowerPoint from initial drawings on paper. The prototypes were printed off in a large size to ensure that all participants were able to see the designs. These paper prototype designs were based on findings from literature.

The moderator asked some questions to the group. The group members were asked for their opinions of a selection of prototypes for some of the intended screens within the system. There were a variety of opinions but the main consensus was that they were very clear to see. The members contributed to this discussion by giving their thoughts on what changes could

be made to the system. The answers given and opinions of the prototypes were very important as they would help to influence the final interactive prototype which would be developed further on.

3.2.3 Interactive Prototype

An interactive prototype was developed in Macromedia/Adobe Director. This type of prototype would be classed as a medium-fidelity prototype as it contains aspects of both low-fidelity and high-fidelity (Farnum, 2002). There was visual design present across the whole prototype and there was also the inclusion of some functionality although this functionality was limited to show the navigation between different screens. The views of the participants in the focus group helped to influence some design decisions and so changes were made to the initial prototype designs accordingly. The interactive prototype was then distributed on a CD to the participants and used along with a Task List sheet to evaluate the ease of use. This was used in conjunction with the task list sheet as part of the user based evaluation stage.

3.4.5 User Based Evaluation

This stage of the project allowed the users to evaluate the prototype by completing a task list sheet (see Appendix C). The interactive prototype was distributed on a CD in the form of a projector which is an executable file which can be easily run by the users without the need for them to have the Director software installed on their machine. The CD and task sheet were distributed to them physically in person by the researcher. The participants were asked to load the prototype (exe file) into their computer themselves; however appropriate instructions were given on how to locate the file on the disk. The participants were given about a week to complete the series of tasks using the disk. The purpose of this stage was to evaluate the ease of use of the designed interface and to find out if the participants would be willing to use it permanently if it were an alternative. Thus it was essential that the data gathered at this stage would be mainly quantitative.

3.4.6 Final Evaluation Questionnaire

This questionnaire was distributed to the participants; the participants completed this questionnaire after carrying out the evaluation of the system. The aim of this questionnaire was to find out whether the users enjoyed participating in the research project overall and whether they found it to be a positive experience. The data gathered from this questionnaire would give the researcher a clear idea of how the users felt about taking part. The data gathered was mainly qualitative data as it was the aim to get opinions from the users about their feelings on their participation in the research and to ensure that the research question was answered. The questions included asking the users whether they felt more positive towards using email in the future since taking part in the research project, to rate on a scale how much they enjoyed taking part in the research project and whether they felt it was a good idea for developers to include potential users in the development of such email systems and similar products. The data collected from this questionnaire was then analysed.

4 Design and Implementation

This section will give a discussion of how the design and implementation activities were undertaken. This includes a discussion of how the various prototypes were designed and subsequently evaluated.

4.1 Prototype 1

A low-fidelity prototype was designed based on the previous literature. Investigation into the design elements which older users had problems with was important as not to include these in this prototype (See Appendix D)

4.2 Prototype 2

This second prototype (see Appendix E) was designed after the information gathered from the initial questionnaire, it is a refinement of prototype 1. It was created using Microsoft Powerpoint. These prototypes were shown during the focus group in order to evaluate them with the users.

The welcome screen is displayed below.

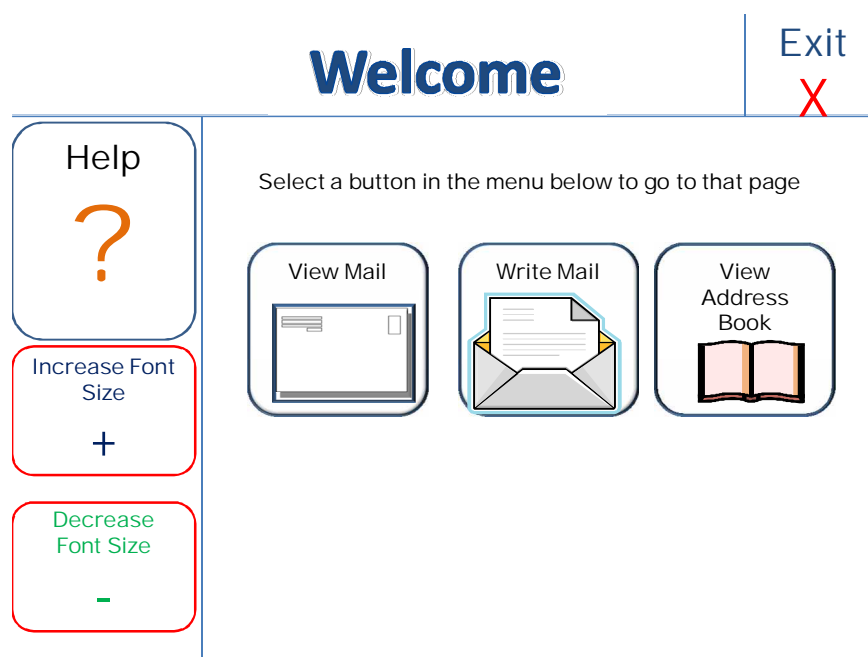


Figure 4 - Prototype 2 Welcome screen

4.3 Prototype 3

Welcome screen

This is the main page of the email system. Selecting a menu item by clicking on one of the three buttons in the centre of the screen will take the user to that page. A help page can be accessed by clicking on the clear help button on the top left of the screen. Users can exit from email at any time by selecting the red cross at the top of the screen. As all users eyesight can vary, there is an option to increase or decrease the font size on the screen.

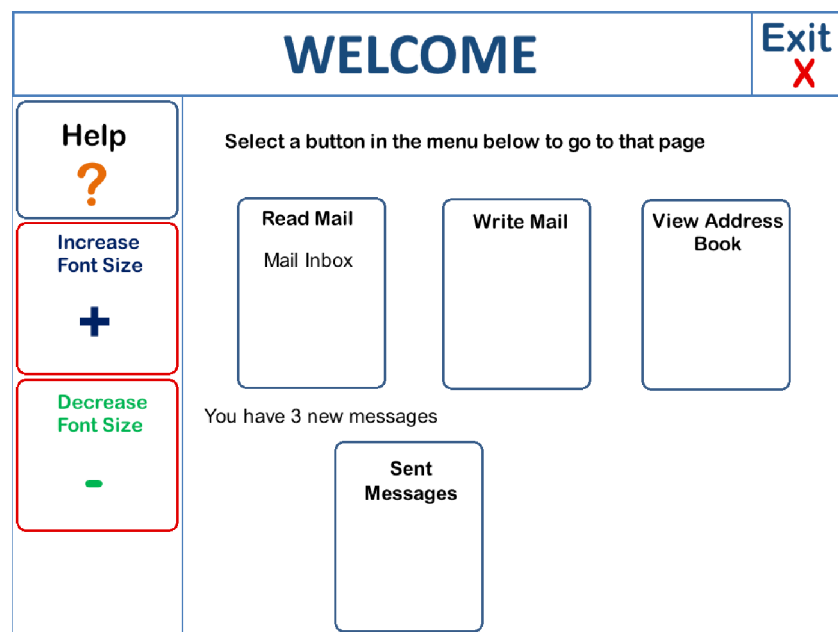


Figure 5 - Welcome screen Screenshot

It was found during the literature search that several studies identified the text and button size in commonly used software is too small and difficult to see clearly. Arnott et al (2004) investigated the older user's requirements and characteristics and used these findings to develop an email system suitable for the older adult.

Arnott et al (2004) states "text and buttons in industry standard software are difficult to see clearly, partly because of the small size of the letters, this is also influenced by the font size, low contrast between text and background colours".

It was as a result of this evidence and results from other similar studies that the buttons and text should be a suitable size for ease of readability by the older user. The discussion of the prototypes during the focus group indicated that the design of the text and buttons on the screen was very clear and easy to see. It was decided that there should be black text on a plain white background to increase readability especially appropriate for users with visual impairments.

Arnott et al (2004) also found that the participants preferred to have the toolbar along the top of the window and to have graphical icons on the buttons to reinforce what they meant. The choice was therefore to include graphical icons on the buttons on the welcome/home screen

to make it easy for the user to understand what would happen when they clicked the buttons; it was also thought that this screen would be easily recognisable to users.

The red cross below the exit button was used as in most standard applications; the user can exit by clicking on a cross in the right hand corner of the screen. The cross was the appropriate design choice to allow it to be recognisable to users familiar with this way of exiting from the applications they use.

The discussion during the focus group that was held brought some interesting facts about the use of certain terminology. It was clear that the use of some text was not correctly understood by the users, for some buttons I had used the terms 'view mail' to indicate that they would click this button and they would view their mail inbox. However the participants had preferred that it would be changed to 'read mail' instead as one person had said this particular age group is familiar with the terms 'read and write'.

Hawthorn (2000) reviewed findings on how various age-related changes affected the users' computer ability and also discussed how these affected the design of an interface by a designer. These findings echo those made by Arnott et al (2004). The author suggested that certain design adaptations can be incorporated to make the user interface more user friendly, for example increasing the font size, have a clear, simple layout and avoid flashing text amongst others.

Mail Inbox screen

This shows the users inbox, showing the new mail. The user clicks on the read button to open the message. Menu options are shown at the top of the screen, the menu is at the same place on every screen to ensure consistency across screens. The menu in this interface takes the form of buttons as users with motor impairments may find it difficult to navigate through a drop down menu. Arnott et al (2004) found that the participants in their study did not like drop down menus. Participants with a poor memory may also find it difficult to remember where to find the option they were looking for in the menu, so the 'menu' has now been replaced with several appropriate sized buttons placed near the top of the screen. The problem with drop down menus was discussed during the focus group, one such participant was quoted as saying that one way to remember where to find what they are looking for in the drop down menu is to go through the hierarchy of the drop down menu then take a screen shot of the menu when it is fully extended, that way if they print it off they would have a physical visual representation of the drop down menu that could refer to in the future.

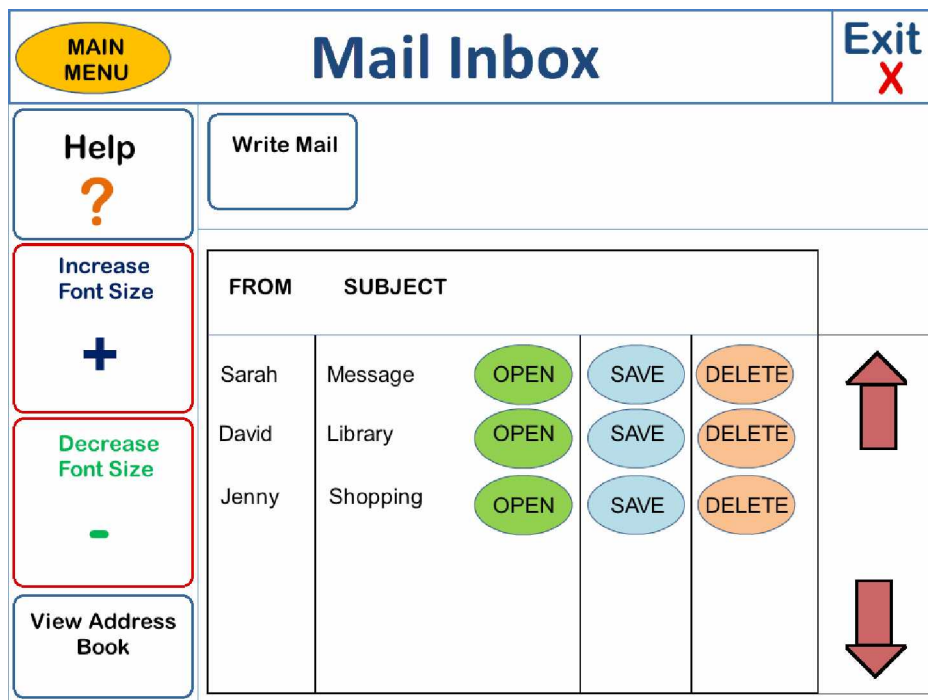


Figure 6 - Mail Inbox screen Screenshot

Arrows buttons are used instead of scrollbars, taking into account that most older users find it difficult to use scrollbars. This was found through several literature sources.

There is a clear button at the top which links back to the main menu. This minimises the chances of the user becoming lost within the system.

During the focus group, the participants indicated that they wished that the 'view address book' button be moved from the top toolbar to underneath the decrease font size button. The reason for this is that they wanted this button to be in the same place so they would know where to find it. It was also indicated that the green open button next to the message subject which was formally called 'Read' was changed to Open instead as the participants thought that the button meant that they had already read the message instead of it being the function for which the users click to open and read their mail. The participants were keen on having a save and delete button before the message was open so that they could immediately discard of any emails which they did not want to keep. They are in different colours so that they can be easily distinguished from one another as due to motor impairments that some people may have difficulty using the mouse and accidentally select an option they did not want.

Read Message screen

This is a page showing an open message. There are clear links in the menu bar to allow the user to reply to the message or delete it. There is the presence of arrow buttons instead of a scrollbar to move the message up or down to read it.

The most relevant buttons were kept nearer to the left side of the top of the screen so that they can be easily found by the user.

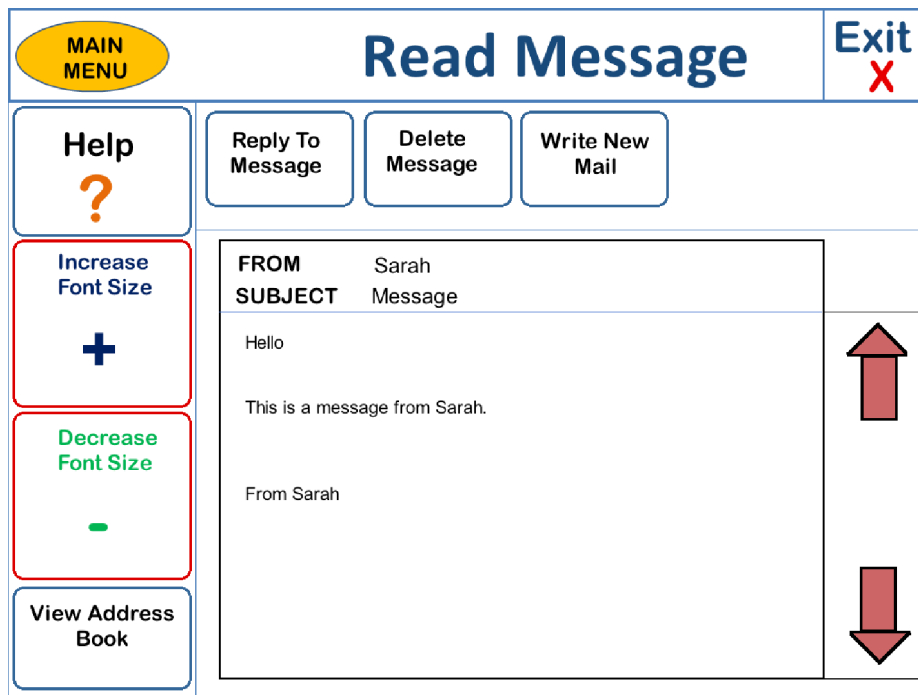


Figure 7 - Read Message screen Screenshot

Add Attachment screen

There is text to indicate the various steps involved in adding an attachment to an email. The questionnaire and focus group indicated that some participants have difficulty in understanding the concept of doing this so the steps will aim to make it easier for them to understand. Extra text information is given to describe what will happen when the user clicks on each of the buttons.

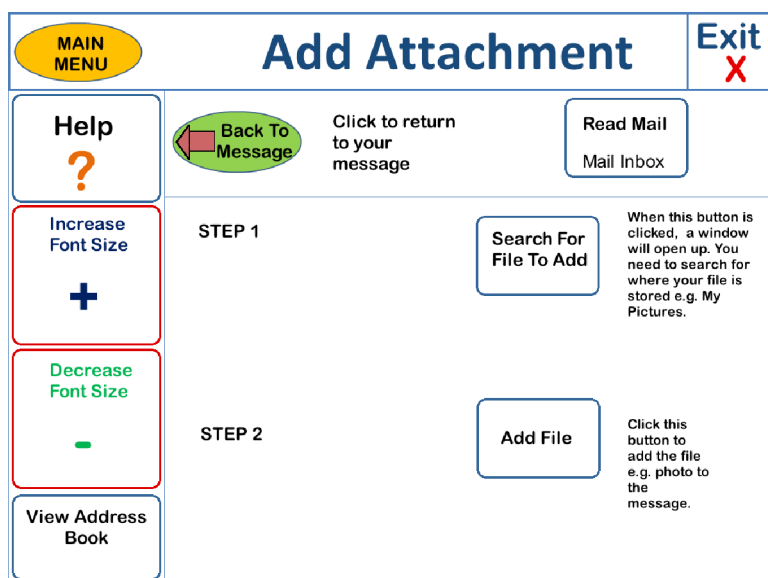


Figure 8 - Add attachment screen Screenshot

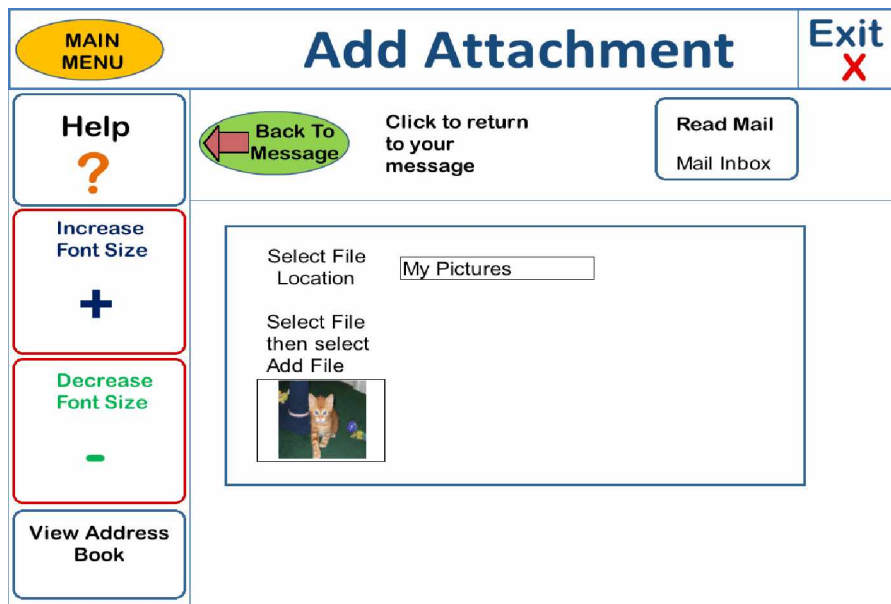


Figure 9 - Add attachment 2 screen Screenshot

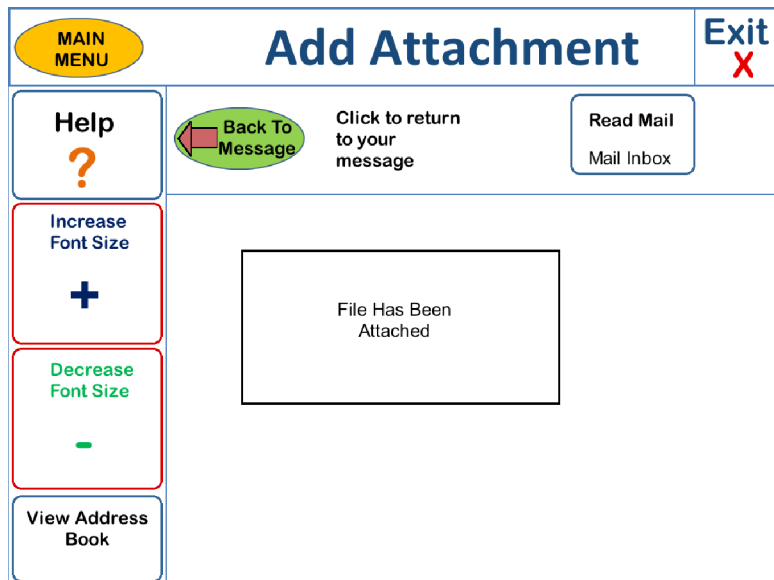


Figure 10 - Add attachment 3 screen Screenshot

Write Message

MAIN MENU Exit X

Help ?

Add Attachment Delete Message Read Mail Mail Inbox

SEND

TO Sarah Insert contact to send to

SUBJECT

Your message will appear here

Figure 11 - Write message 2 screen Screenshot

Address Book

MAIN MENU Exit X

Help ?

New Address Delete Address Write Mail Read Mail Mail Inbox

NAME	ADDRESS	
Anne	Anne@email.com	EDIT
David	david123@mail.com	EDIT
Jenny	j54@mail.com	EDIT
Sarah	sarah@email.com	EDIT

Figure 12 - Address book screen Screenshot

MAIN MENU		Write Message		Exit X
Help ?	Add Attachment	Delete Message	Read Mail Mail Inbox	
	SEND			
	TO Sarah			
	SUBJECT <input type="text"/>			
<div></div>				

Figure 13 - Reply to message screen Screenshot

MAIN MENU		Write Message		Exit X
Help ?	Add Attachment	Delete Message	Read Mail Mail Inbox	
	SEND			
	TO Sarah Insert contact to send to			
	SUBJECT <input type="text"/>			
<div></div>				

Figure 14 - Write message screen screenshot

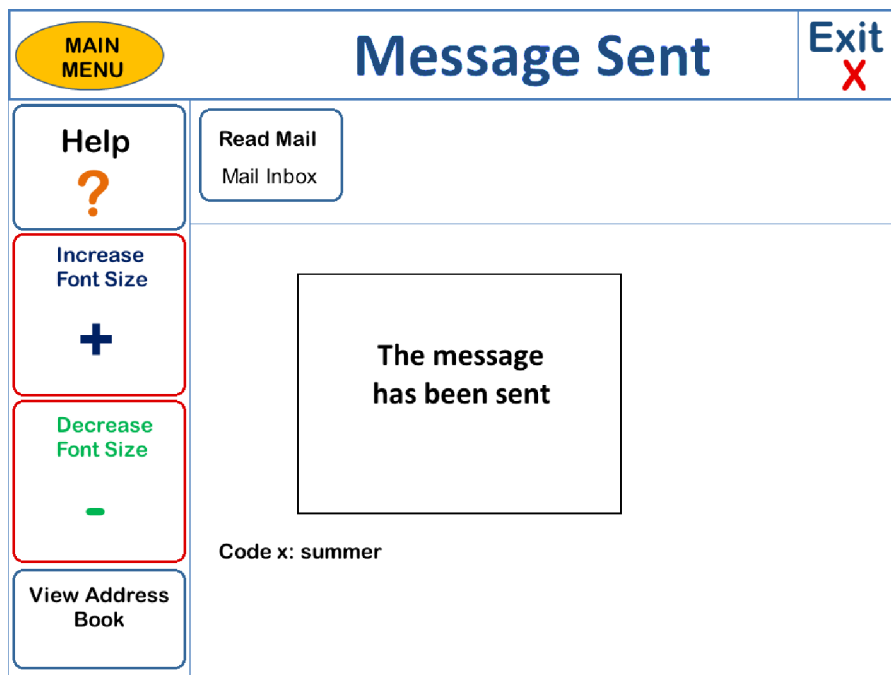


Figure 15 - Message sent screen Screenshot

4. Results and Evaluation

This section will discuss the results from the methods undertaken to test the hypotheses and meet the research question. The results of the initial questionnaire distributed to the participants, focus group conducted, interactive prototype and task lists evaluated and the final evaluation questionnaire distributed will all be discussed within this section.

4.1 Results of Initial Questionnaire

The purpose of this method was to gain an understanding of the participants background, this included finding out their experience of using computers and the type of system which they currently use to access their e-mails and its ease of use. The results from the different questions asked in the questionnaire are described below.

4.1.1 Age of Participants

This question was in the form of an open-ended question to allow for the participants to enter in their age so that all the exact ages could be analysed.

The bar graph below gives a representation of the ages of the all ten participants. This graph shows the participant against their age.

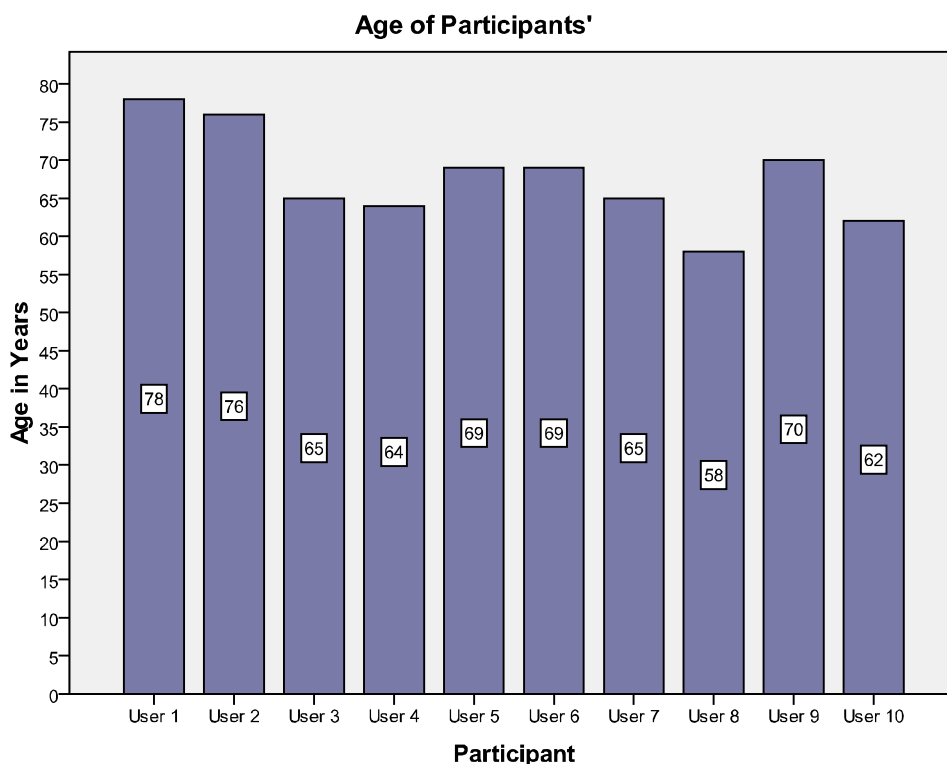


Figure 16 - Graph showing age of participants

The table given below shows the descriptive statistics that was carried out. The mean age was calculated as 67.60. The minimum age is shown as 58 and the maximum age is calculated as 78, which results in a 20 year range between the youngest and the oldest participant. Thus, it could be expected that there would be a variety of views regarding the use of e-mail as the youngest participant may feel differently from the oldest participant.

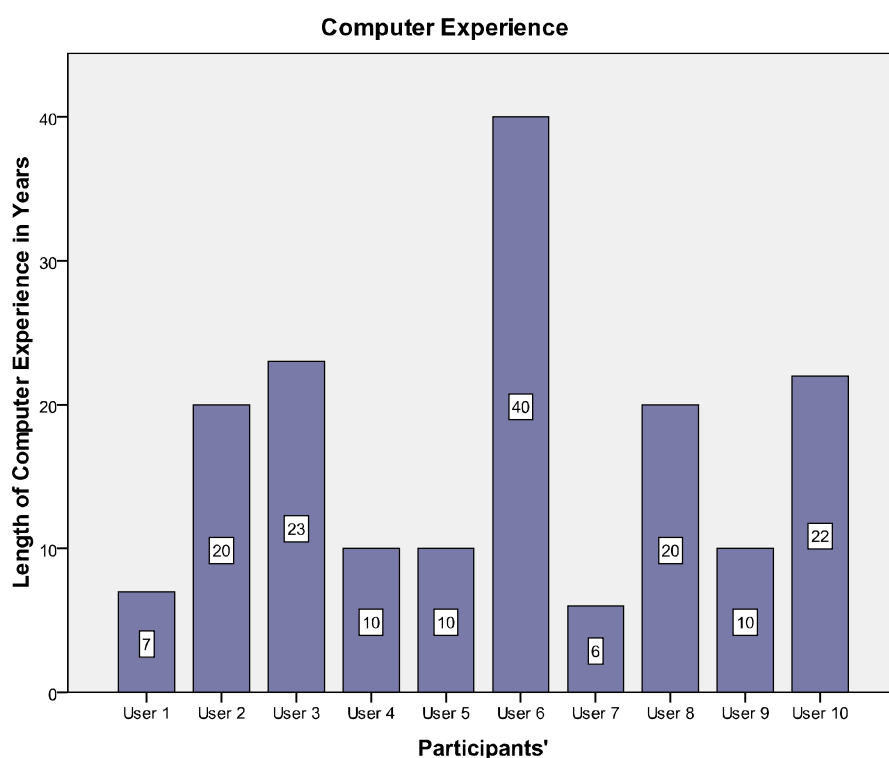
Table 2 - Participants age's

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
Age	10	20	58	78	67.60	6.132
Valid N (listwise)	10					

4.1.2 Experience

This question asked how long approximately the users has used computers for, the aim was to find out the length of experience that each participant has had regarding the use of computers. This question was also open-ended format.

The bar graph below shows the participants associated years of experience with using the computer. The graph shows that the figures are very varied with the minimum years of experience being six years and the maximum being 40 years.

**Figure 17 - Graph showing participants' length of computer experience**

The table below shows the descriptive statistics which have been calculated for this data, they include the mean, minimum, maximum and standard deviation. The mean has been calculated as 16.80, this shows that the participants have an average computer experience which is less

than 20 years. The minimum value is shown as 6 years and the maximum is 40 years with the difference being 34 years. The variation in the years of experience is very useful as there has been data taken from those participants with a lot of experience and from those with very limited experience. Thus, there is a variety of opinions to consider.

Table 3 - Length of computer experience

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
Length of computer use in years	10	34	6	40	16.80	10.412
Valid N (listwise)	10					

4.1.3 Computer Use

The graph shown below describes the different types of computer uses (shown in questionnaire with use of categories) by the participants' against the frequency of the choices. This graph shows that the Email use is the most popular activity with all ten users selecting this option, this is closely followed by Internet searching with nine out of ten respondents choosing this activity, use of the computer for word processing follows behind with six out of ten users choosing this option and other activities which have been outlined by four of the participants. The comments given by the respondents who indicated that they use the computer for 'other' activities are detailed below.

One participant gave the following response: "Desktop Publishing, Access database, excel spreadsheet". Another participant indicated that they use the computer for the following: "Internet banking, Photos, Internet shopping, spreadsheets, watching tv catch up through i-players", a third participant gave the following comment: "Selected programmes e.g. audio, photographic". The final participant who indicated that they use the computer for another purpose gave the comment: "Photographic enhancement". These comments suggest that there are some users that make use of the additional programs provided on their computer as shown by the users that use the Microsoft Office programs e.g. the Access database and spreadsheets. The second comment which describes that they use the Internet for banking and using I-Players was given by the youngest participant, this person is also one of the most experienced in using the computer. This indicates that this person is very comfortable with using the Internet for these services.

This graph perhaps suggests that only the most experienced users use the computer for activities besides those identified in the set responses.

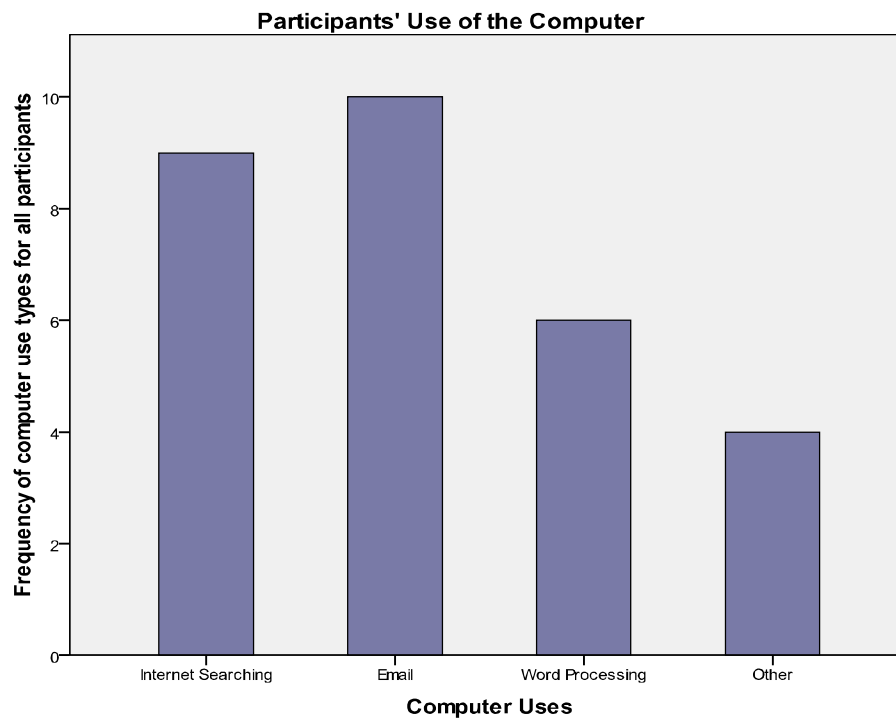


Figure 18 - Graph showing what participants use the computer for

The table below summarises the data shown in the graph above. It has to be indicated that this question was a multiple choice question which allowed the participants to select as many options as they thought applied to themselves. So in total there were 29 responses to this question.

Table 4 - Participants Use of computer

Participants' use of computers				
		Responses		Percent of Cases
		N	Percent	
Computer Uses	Internet Searching	9	31.0%	90.0%
	Email	10	34.5%	100.0%
	Word Processing	6	20.7%	60.0%
	Other	4	13.8%	40.0%
Total		29	100.0%	290.0%

4.1.4 Types of Learning – Question 6

The aim of this question was to gather information on how the users learnt to use the computer. The question used closed-ended questions which were unordered as they have no logical order. This question was also multiple response which allowed the users to select as many categories as applied to them.

The table below shows the responses for the question asking the users how they learnt to use the computer whether it being by attending a computer class, helped by a friend or a relative, if they were self-taught or if there was another way in which they learnt. Similarly to the above question, as this question also allowed for multiple responses, in total there were 20 responses to this question by the ten participants. The responses show that each category is more or less equal with the others, with helped by friend or relative receiving a maximum number of responses of six, attending a computer class and other are both equal with 5 responses. Self-taught has the minimum number of responses with 4 responses. This category receiving the fewest responses shows that more of these users are more likely to learn how to use the computer or attend a computer class than trying to teach themselves how to use the computer. However as mentioned previously, users were allowed to select more than one category which as a result could show that multiple users would attend a computer class as well as trying to learn themselves.

The ‘other’ category option included a comment box to allow for qualitative data to gathered, as it was possible that the users could have learn in another way that was not defined by the categories listed. Some of the comments from the users are detailed below. One participant said that they learnt “Through work”, another participant echoed this comment by saying “Through employment and quite a bit of self learning especially desktop publishing”, the three other participants that gave comments also repeated this. This suggests that the inclusion of ‘through employment’ as a category would have been appropriate as the results would have given different responses.

Table 5 - How participants' learnt to use the computer

How did participants' learn?				
		Responses		Percent of Cases
		N	Percent	
How did participants learn?	Attending a computer class	5	25.0%	50.0%
	Helped by friend/relative	6	30.0%	60.0%
	Self-taught	4	20.0%	40.0%
	Other	5	25.0%	50.0%
Total		20	100.0%	200.0%

4.1.5 Current E-Mail System

The following results refer to questions 7a to question 10. They are all questions which relate to the current e-mail system used by the participants. The questions below use a combination of open-ended and closed-ended questions to gain quantitative and qualitative data from the users.

Current E-mail System Used – Question 7a

The aim of the question was to identify from the users which type of e-mail system they currently used. These results would assist in finding out whether one of the systems is easier to use than the other. This question used closed-ended unordered response categories, an Other box was also provided which was an open-ended question in the case that the participants made use of another e-mail system which was not present in the categories provided.

The pie chart below shows the percentages of the users using either Outlook or an Internet based email system. This question was answered by all ten participants and it shows that the majority of these users use an Internet based email system (60%) as opposed to Outlook (40%). The use of these e-mail systems was discussed further in the focus group conducted and these results will be discussed later (see Section).

Pie chart showing percentage of E-Mail Systems used

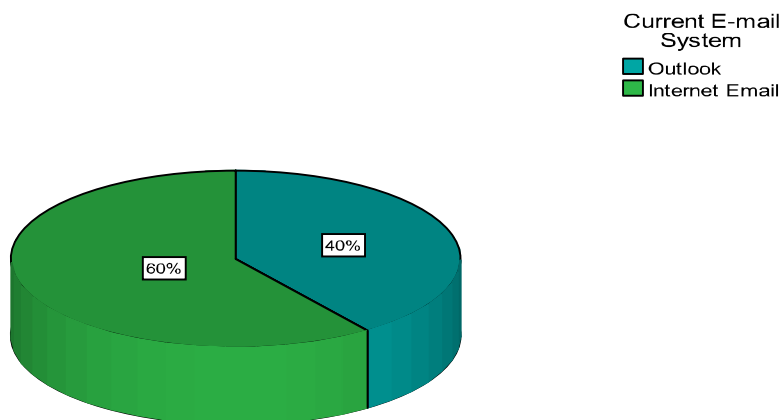


Figure 19 - Current Email Systems

Problems with Current E-Mail System – Question 7b

This question hoped to identify whether the users had any problems with the e-mail system that they were using. There were two boxes provided, 'yes' and 'no'. If the users had indicated that they did have problems then they were asked to describe the problems in the open response box provided.

The cross tabulation table below compares the e-mail system categories (Outlook and Internet e-mail) with the number of 'yes' and 'no' responses to the question asking if they have any problems with using the e-mail system. This table shows that there are a total of nine responses to this question (1 missing value), it shows that the number of 'no' responses in total was 8 and there was 1 response indicating that they had a problem. This table shows that this respondent uses Outlook Express. There were no people that used Internet e-mail that selected the 'yes' response.

Table 6 - Crosstabulation of Current E-mail System with Problems

Current e-mail system * Problems with current e-mail Crosstabulation					
			Problems with current e-mail		Total
			No	Yes	
Current e-mail system	Outlook	Count	3	1	4
		% within Current e-mail system	75.0%	25.0%	100.0%
	Internet Email	Count	5	0	5
		% within Current e-mail system	100.0%	.0%	100.0%
Total		Count	8	1	9
		% within Current e-mail system	88.9%	11.1%	100.0%

The second cross tabulation table below compares the responses to this 'problems' question with the length of computer experience that each participant has had. This is to identify whether there is any connection between the length of experience that a user has had and the problems faced.

These results indicate that the one respondent who answered 'yes' to the question has had the second lowest number of years of computer experience, this value being '7'. This does in fact suggest that the problems occurred may be linked to the number of years that a person has used the computer for.

Table 7 - Crosstabulation

Length of computer experience *Problems with current e-mail Crosstabulation			Problems with current e-mail		Total
			No	Yes	
Length of computer experience in years	6	Count	1	0	1
		% within length of computer experience in years	100.0%	.0%	100.0%
	7	Count	0	1	1
		% within length of computer experience in years	.0%	100.0%	100.0%
	10	Count	2	0	2
		% within length of computer experience in years	100.0%	.0%	100.0%
	20	Count	2	0	2
		% within length of computer experience in years	100.0%	.0%	100.0%
	22	Count	1	0	1
		% within length of computer experience in years	100.0%	.0%	100.0%
	23	Count	1	0	1
		% within length of computer experience in years	100.0%	.0%	100.0%
	40	Count	1	0	1
		% within length of computer experience in years	100.0%	.0%	100.0%
Total			8	1	9
			88.9%	11.1%	100.0%

The comment given by the respondent who answered ‘yes’ to this question is given below:

“I find it difficult to add attachments e.g. photos, notes from other sources”.

This comment suggests that the process of adding attachments in Outlook is difficult and not clear. Therefore this problem is discussed further in the focus group to find out why this is difficult and what can be done to make it easier.

Changes that could be made to current E-Mail System – Question 7c

This question identifies if there are any changes which the respondents would like to make to the e-mail system that they use. The question involves the use of two ‘yes’ and ‘no’ boxes for the user to select which one most applies. A cross tabulation was performed to compare the results of this question with the type of e-mail system that was used. The result of this cross tabulation is displayed in the table below.

The table shows that 8 respondents said that there are no changes they would make to their e-mail system, 2 respondents selected ‘yes’ to indicate that there are changes that they would like to make. Of the two respondents that indicated ‘yes’, one uses Outlook and the other uses an Internet based e-mail system. The comments given by the respondents who selected ‘yes’ are discussed here. The respondent who uses Outlook said “I would like better clarification that a message has been sent”, the second respondent who uses an Internet based e-mail gave the comment “I particularly object to advertisement on the site”. This suggests that Outlook does not display a clear message indicating that the message has been sent. The second comment suggests that the Internet-based e-mail contain a lot of adverts that appear on the screen. These issues will be discussed further in the focus group.

Table 8 – Cross tabulation comparing changes with e-mail system used

Current e-mail system * Any changes that you would make to your current e-mail system? Crosstabulation

Count

		Any changes that you would make to your current e-mail system?		Total
		No	Yes	
Current e-mail system	Outlook	3	1	4
	Internet Email	5	1	6
Total		8	2	10

Particular Features to add to current E-Mail System – Question 7d

The purpose of this question was to ask the participants if there were any features that they would like to have in the e-mail system.

The question indicated that the user select either ‘yes’ or ‘no’ to identify their choice and to give a comment if they answered ‘yes’.

The cross tabulation table below compares the responses to this question with the type of e-mail system that is used. The results indicate that there were a total of 9 responses (1 missing value) with 8 respondents selecting ‘no’ and the 1 person indicating that there is a feature that they would like to add. This table also indicates that the respondent selecting ‘yes’ uses an Internet-based e-mail system.

The comment made by this respondent is identified as “would like a webcam connection with my family”. This comment is slightly irrelevant to the aspect of e-mail system but this suggests that this participant is aware of the additional features that can be added. This comment could also suggest that an e-mail system has a feature incorporated into it which allows a connection with a webcam to be made.

Table 9 - Crosstabulation

Current e-mail system * Any particular features you would like to have in the e-mail system? Crosstabulation

Count

		Any particular features you would like to have in the e-mail system?		Total
		No	Yes	
Current e-mail system	Outlook	4	0	4
	Internet Email	4	1	5
Total		8	1	9

Ease of navigating in current E-Mail system – Question 8

The aim of this question is to identify how easy the participants find it is to move from page to page within their e-mail system. The question uses a likert scale from values 1-5 where 1 is very difficult and 5 is very easy. The results are displayed in the stacked bar graph below. The graph below shows the scale values on the x-axis with the percentage of participants’ that chose each category shown on the y-axis.

The data in the graph shows that approximately 110% of participants chose ‘Neither difficult or easy’ with about 35% of them using an Internet-based e-mail system and the remaining 75% of them using Outlook. The second bar shows that about 40% in total chose ‘Easy’ with about 20% each of them using Outlook and Internet-based e-mail. The third bar shows that 50% of participants in total would classify their e-mail system as being ‘Very easy’ to navigate from page to page. All of these participants use Internet-based e-mail. This suggests that it may be slightly easier to move through different pages in an Internet-based email than Outlook as a high proportion of participants did not say that it was easy to navigate through pages in their e-mail system.

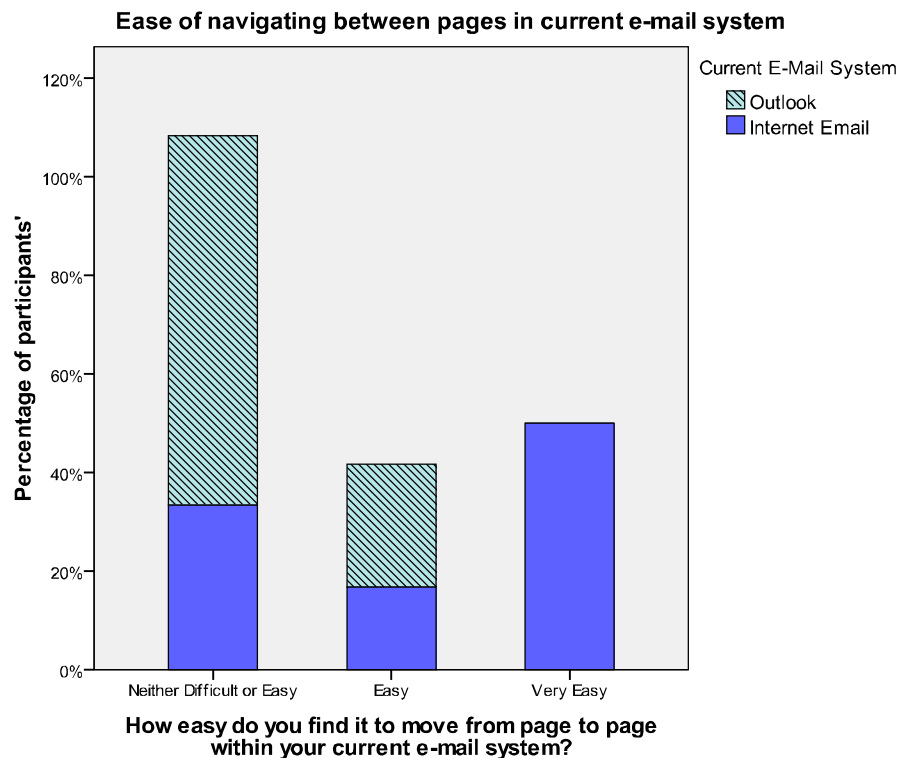


Figure 20 - Stacked Bar Graph showing ease of navigating in current e-mail system

Ease of adding a new contact to address book – Question 9

This question aimed to find out how easy participants found it to add a new contact into their address book. This question also made use of a likert to gather data on a scale.

The stacked bar chart below shows the results of this question. The chart shows that about 110% of participants said that it was 'Neither difficult or easy' to add a new contact into their address book. 30% of these use an Internet-based e-mail system and about 80% use Outlook. The percentage of participants' that chose 'Easy' was in total about 60% with those using Outlook being around 25% and about 35% using Internet e-mail. The percentage of participants choosing to select 'Very easy' was 30% with all these participants using Internet e-mail. These results suggest that the majority of participants using Outlook chose to say that it is 'neither difficult or easy' to add a new contact to their address book while the majority of participants using Internet e-mail class their system as being 'easy' or 'very easy' to add a new contact. This suggests that it may be easier to carry out this task in an Internet-based e-mail system.

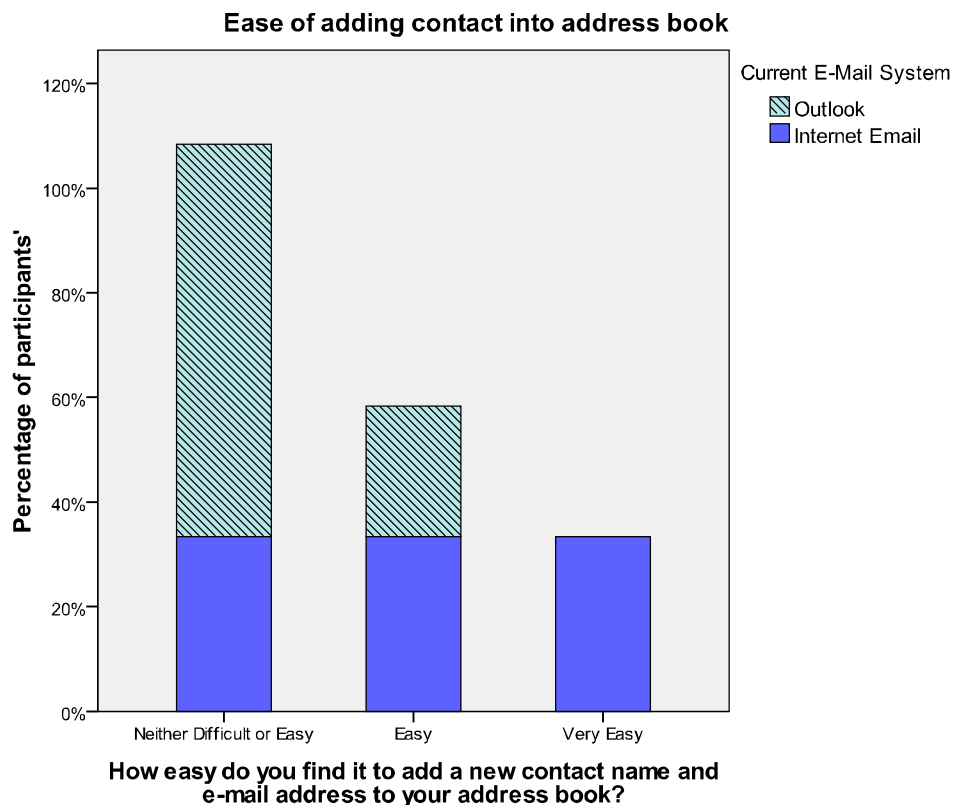


Figure 21 - Stacked bar graph showing ease of adding contact into address book

How comfortable you are with Current E-Mail system – Question 10

The purpose of this question was to find out how comfortable users were with their current e-mail system. This question gathered users responses on a likert scale ranging from 1-3 where 1 is Uncomfortable and 3 is Comfortable.

The stacked bar chart below shows the percentage's of the users' responses for the categories. Around 110% of participants said that they were 'Neither uncomfortable or comfortable' with their e-mail system, 30% of these use Internet e-mail whilst the remaining 80% use Outlook. About 90% in total indicated that they were 'Comfortable' with their current e-mail system, 65% using Internet e-mail and 25% using Outlook. There were no percentages of participants' that indicated that they feel 'Uncomfortable' with their e-mail system. These results suggest that the majority of participants' using Internet e-mail feel 'Comfortable' compared to a lower percentage that were 'neither'.

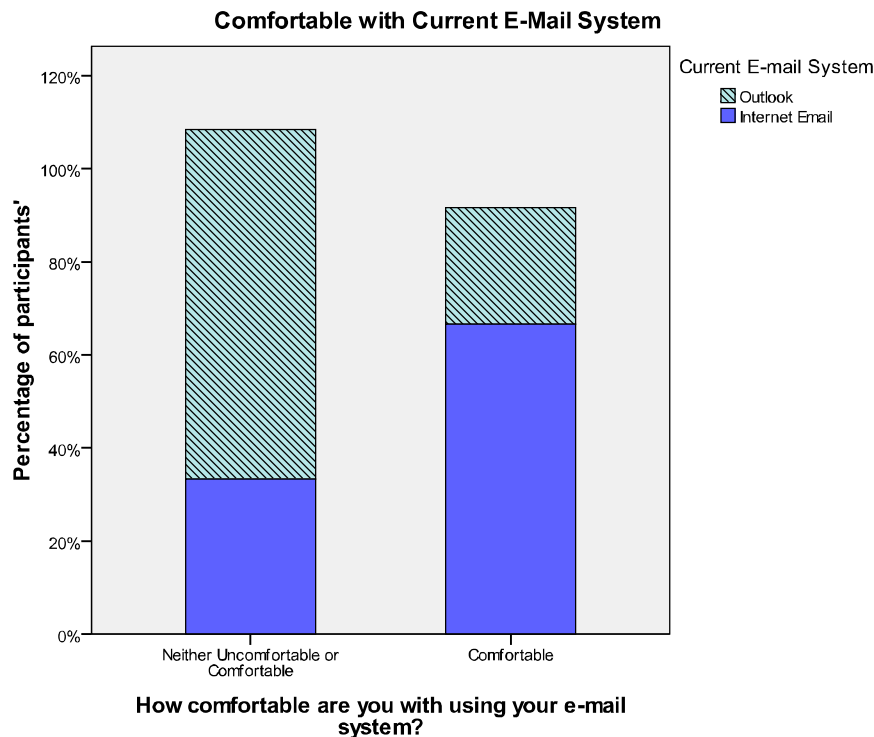


Figure 22 - Stacked bar graph showing users' comfort of e-mail system

4.1.6 Problems affecting use of computer – Question 11

This question aimed to find out whether users had any physical problems in relation to their health that affected their use of the computer. It has been identified previously in the literature that there are several types of problems which can affect use of the computer. The problems identified are given as a list of unordered categories for the users to select if any apply to them. There is also an 'Other' option which allows the participants to include a comment indicating any problem which they may have which might impact upon their computer use.

The table below shows the categories and the corresponding frequency of participants' that selected this option. Only the categories for which there were responses were included. This table shows that in total 6 out of a possible 10 participants did not select any of the options which indicate that they don't have any problems that impact upon their use. So the 4 participants that did answer, 1 indicated that they have a problem with eyesight and the other 3 indicated that there was another problem. The comments given by those participants with another problem are detailed here: One participant gave the comment "I find it difficult to reach a proficient typing speed on the keyboard", another indicated that they could have problems in the future "Memory could be a problem with advancing years!!!" and the third responded with a comment which related to the computer rather than their own health "I do not have broadband but my system via telephone is adequate-though slower than those with broadband".

Table 10 – Frequency table showing problems affecting use of computer

Do you have any particular problems that affect your use of the computer?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Eyesight	1	10.0	10.0	10.0
	Other	3	30.0	30.0	40.0
	None	6	60.0	60.0	100.0
	Total	10	100.0	100.0	

4.1.7 Main reason for learning to use the computer – Question 12

The aim of this question was to find out what was the participants' main reason for using the computer, it was important to find out what exactly motivated them to learn. It was appropriate that qualitative data be gathered from this question so an open-ended question was asked and a comments box provided.

There were ten responses from this question from all ten participants. The exact responses from the participants are given below.

“To be able to learn something new and keep up to date with modern technology and communication systems”

“To keep up to date with modern technology”

“Storage of information and the availability of information from the internet”

“Spreadsheet (Lotus), email & internet access”

“Obtaining information (saving money & getting ideas), correspondence”

“I worked with IT from the first computers in the UK in the late 50s-they worked very slowly and took a whole room space. Very much improved today. Basically I used the computer for both work and pleasure.”

“Work communication”

“I used computers at work, both as a classroom teacher and as a senior manager. Being able to use a computer with confidence is a prerequisite of living in the 21st century and the technological age”

“To successfully make use of modern communication systems to facilitate participation in my interests & to receive and send correspondence”

“Sourcing information, booking holidays, online banking”

These responses suggest that there are variety of reasons for using the computer but some comments which were echoed by several of the participants is that they would like to keep up to date with modern technology. Another comment which was repeated was the availability

of information from the Internet. Some of the participants are aware of the information that can be gained from using the Internet. These results suggest that these users wished to learn to use the computer as they felt that they should be part of the advancing technology.

4.2 Results of Focus Group

The aim of the focus group was to gather data from the users that extended the answers given in the initial questionnaire. It was to gain a deeper understanding of the participants' opinions of e-mail and the use of it. There were several questions that were asked to the group. These questions included asking the users what their expectations of e-mail were before they used it, the things which they find difficult to do in their e-mail system and questions about computer classes.

The second paper prototypes were also evaluated with the users, the users were shown the prototypes and then they were asked what they thought of their design. The results of the data gathered are detailed here. The qualitative data gathered was analysed and then coded into categories. A selection of the discussion is displayed below.

Inexperience

Participant 1-"I didn't use it a lot when I first started, I think we first started using email/getting email because people started saying I'll send something to you in an email and we didn't know what it was about and they started appearing and then you've got to find a way of responding to that and they were coming in first and you feel as though you've got to learn a bit about it to respond to it and that's when the difficulties start coming up and you don't quite know how to do it"

Participant 8-"If you're really scared then you just delete everything and you don't want to open anything. "

Participant 1-"When we first got a computer, I didn't know what a keyboard was! I didn't know the keyboard shortcuts. When we first got the computer, we took it out the box and wondered why it wasn't working – we'd left the screen in the box."

Learning

Participant 8-"what we need is the younger people that are saying it is so easy to show you how to do it"

Participant 3-"if you haven't used email before then you need to learn how to use word processing and these things first"

Participant 2-"when I worked, I worked with computers all these years ago but I wanted to learn word processing and things like that so we were quite keen and we went to the class together"

Problems

Participant 1 -“I find it hard, its not easy cause I’m quite good at reading them but I’ve got a fundamental problem-my typing is hopeless, that’s why I’m not so keen in sending emails -I’m not very good at typing ”

Participant 1 -“One thing I find irritating is that when I send an email, I’m not sure if it has gone”

Participant 1 -“I would like to see something where I press the button and it to come up quite positively saying it has been sent, being sent or going to be sent, if it doesn’t happen then the only way you find it is going back later to items you’ve sent, so if it comes up under sent items, but there’s sometimes a long delay to get to that stage.”

Participant 1 -“When it comes to sending an attachment, I can’t do it, I can’t do the right bits to press the button, I think fundamentally I don’t understand the process, if I don’t understand the process of what I’m trying to do, I can’t do it.”

Functionality in current email system

Participant 1 -“Mine does everything I want it to, I think”

Participant 3 -“You are offered so much and you only use a small amount of it, there’s usually far too many options, somebody must use them, why offer them.”

Participant 8 -“there are so many different ways of closing the screen, for somebody learning, but the fact that there’s different ways of closing the screen – its confuses somebody that’s older cause they think which is the right way to do it.”

4.2.1 Prototype discussion

Welcome screen

“Very clear”

“Like help at top, it is easy to see”

“Like that it says ‘Welcome’ – so you know where you are”

“You should change ‘view mail’ to ‘read mail’ as older users are more used to ‘read & write terms rather than view”

“Underneath the read mail button, have another button (or make this button larger) to include text ‘mail inbox’, they might think they have clicked the wrong button”

“On this screen, have a text box that states how many new messages you have got”

Mail Inbox

“Like arrows”

“Move ‘view address book’ to bottom left, below font size buttons.”

Include buttons to delete and save the message (in two columns)

“Change the name of the read button to something more understandable, like ‘open’”

They thought it had meant that they had already opened the message and read it

Change it to ‘Open’

Read Message

“Change the order of the buttons - Reply, delete, and save?”

“List should start with most likely option”

The participants were unsure about the down & up arrow buttons – thought that they moved to the next message instead of moving the page down to read the whole message (if it’s a long message)

Write message

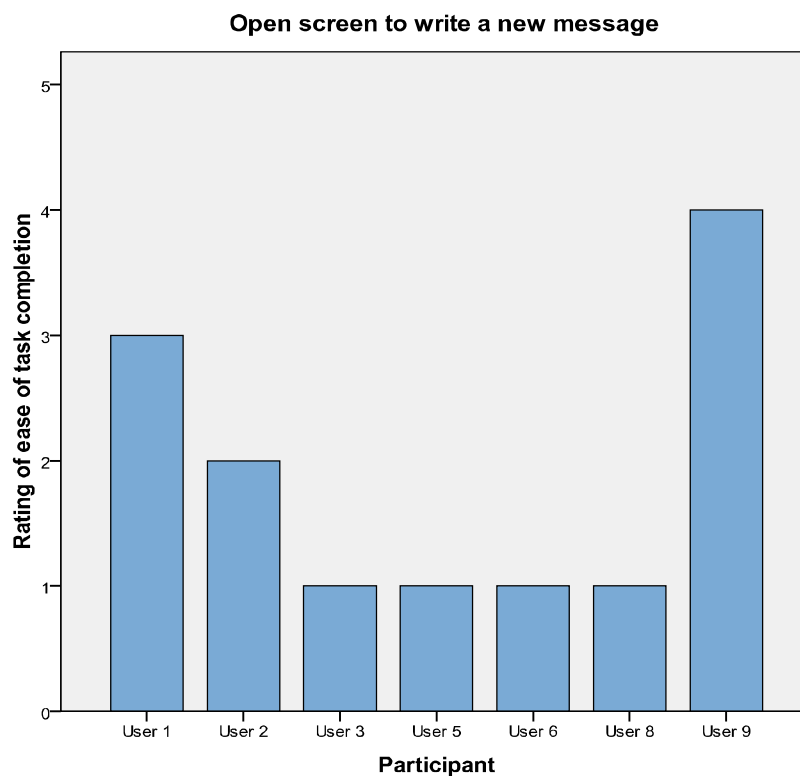
The participants suggested that there needs to be confirmation that message has been sent

4.4 Results of User Based Evaluation (Task Sheet)

These results describe the responses from the task list sheet that identify the tasks that were carried out using the interactive prototype. The aim of these tasks was to find out how easy the users found each of the tasks to complete. The task list sheet also includes a set of questions which refer to the interface design. It was suitable that quantitative data was gathered so a likert scale ranging from 1-5 where 1 was 'Very Easy' and 5 was 'Very Difficult' was used to rate the participants' responses.

4.4.1 Task 1 – Open screen to write a new message

This first task asked the users to open the appropriate screen in order to write a new message. The bar graph below shows users on a scale against the rating they gave for how easy they felt the task was to complete. 4 of the users indicated that they felt that task 1 was very easy to complete. User 2 rated this task as a '2' which suggests that they found the task 'easy' to carry out. User 1 selected '3' on the scale which suggests that they were undecided. User 9 selected '4' on the scale this suggesting that they found this task difficult to complete. This task required the users to select the 'Write Mail' button to access the screen where they could write a message. As one of the users found this task difficult to complete, this suggests that the terminology used on this button could be changed to allow it to be better understood.

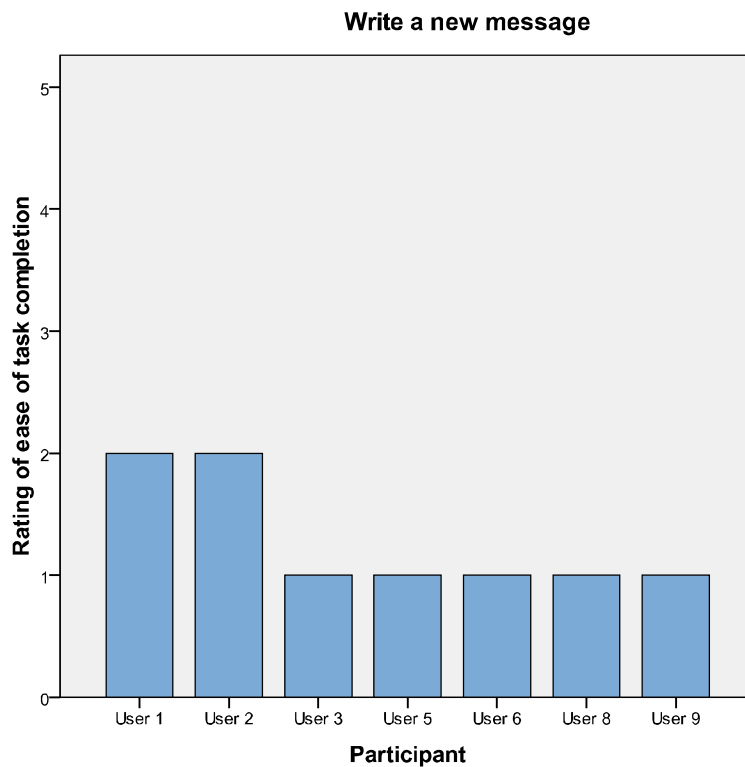


Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 23 - Bar graph showing task 1 results

4.4.2 Task 2 – Write a new message

This second task asked the users to write out a message, the users should now all have accessed this screen as it follows on from task 1. The majority of the participants' (5 in total) found this task 'Very easy' to carry out by selecting '1' on the scale. Users 1 and 2 both found it 'easy' to complete by selecting '2' on the rating scale. These results suggest that these users found this task much easier to complete than task 1.

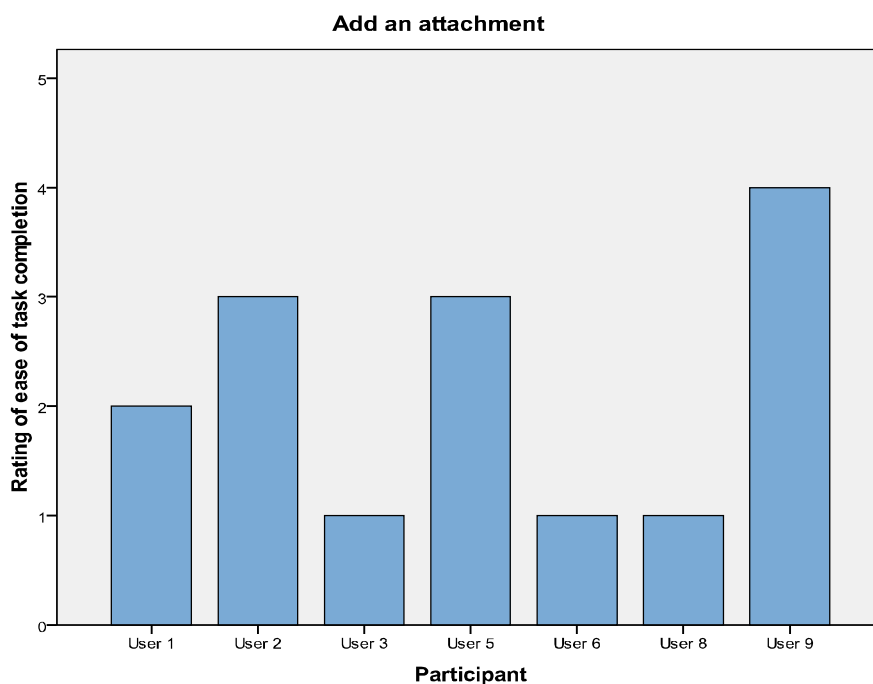


Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 24 - Bar graph for Task 2 results

4.4.3 Task 3 – Add an Attachment

This third task required users to carry out various steps in order to add an attachment to their message. The bar chart below shows that the ratings given in response to this task completed are a lot more varied than the previous tasks. Three of the participants' found this task 'very easy' to complete by selecting '1' on the scale, user 1 selected '2' on the scale and found this task 'easy' to complete, users 2 and 5 both selected '3' and they were undecided about this task as they found this task neither easy nor difficult. User 9 selected '4' showing that they felt that the task was 'Difficult' to complete. These results show that adding an attachment is a process which is found difficult.

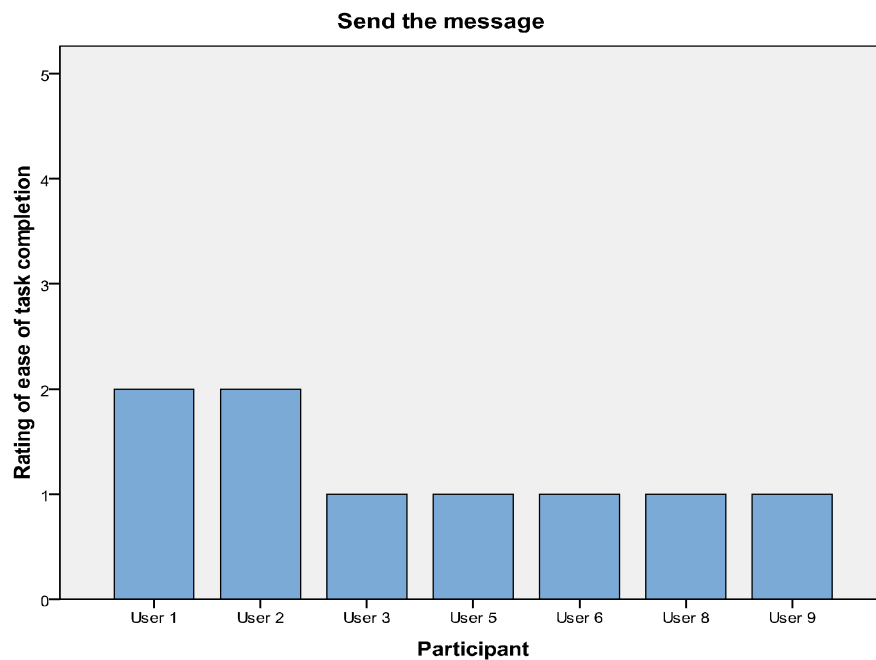


Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 25 - Bar graph showing task 3 results

4.4.4 Task 4 – Send the message

This fourth task required the participants' to send the message. The correct action was selecting the 'send' button. The bar graph below shows the users and the rating which they gave the task for its ease of completion. 5 of the participants found the task 'very easy' to complete by selecting '1' on the scale, 2 of the participants' (Users 1 and 2) found this task 'easy' to complete. This shows that this task was easy to carry out.

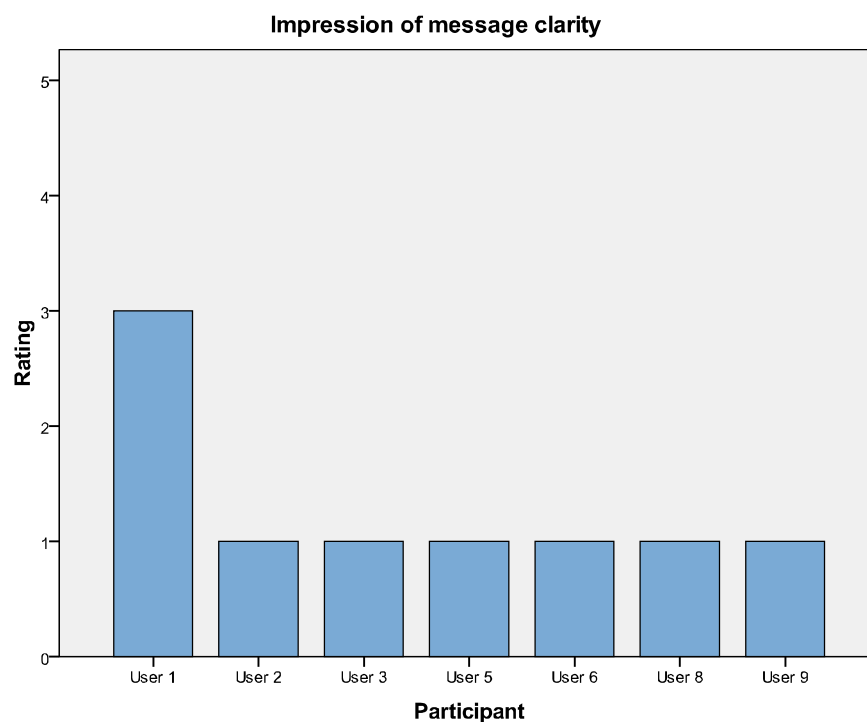


Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 26 - Bar graph showing Task 4 results

Clarity of Screen – Question 4b

This question was related to the design of this screen. The question aimed to find out the users impression of the clarity of the message that appeared on the screen once the user had selected the 'send' button. As it was indicated previously in the initial questionnaire results that one of the participants were unsure if a message had been sent, it was clear that the design of the interactive prototype should attempt to design this message sent text more clearly so that it could be understood. The bar graph below indicates that 6 users selected '1' on the scale thus indicating that the clarity of the message sent text was 'Very satisfactory'. User 1 selected '3' on the scale indicating that they were undecided about the clarity. These results suggest that for the majority of users, the text font and size used was appropriate.



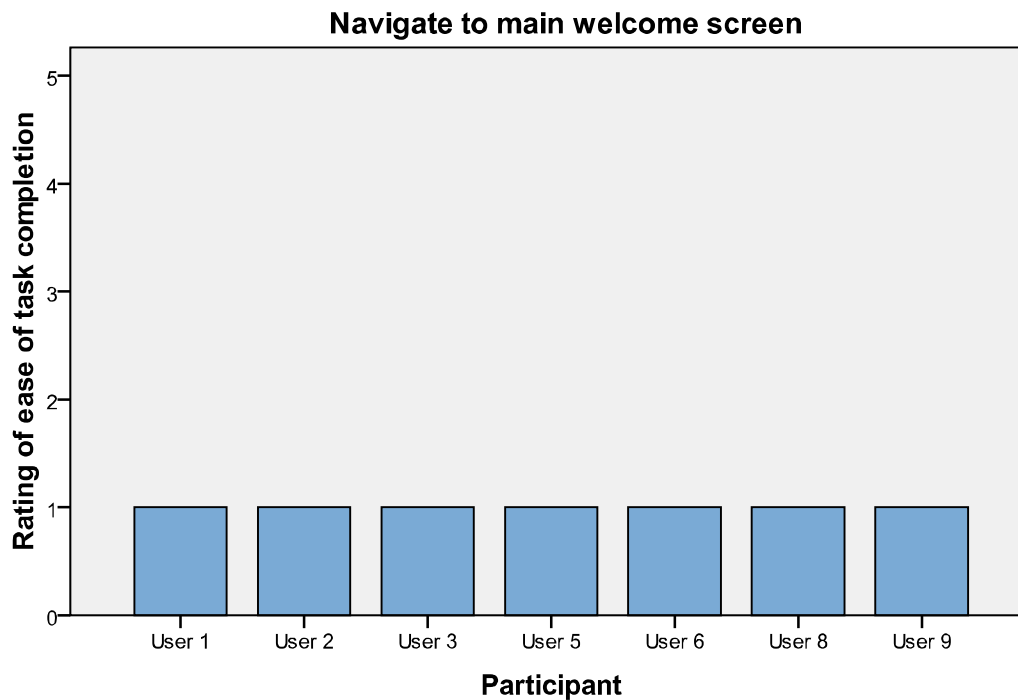
Rating scale 1-Very Satisfactory 2-Satisfactory 3-Undecided 4-Unsatisfactory 5-Very Unsatisfactory

Figure 27 - Bar graph showing results of message clarity question

4.4.5 Task 5 – Navigate to the main welcome screen

This fifth task asked the users to navigate back to the main welcome screen from the ‘message sent text’ screen. The correct action for this task to be carried out was to select the yellow Main Menu button in the top left corner of the screen.

The bar graph below shows that all users found this task ‘very easy’ to complete as they all selected ‘1’ on the rating scale. This suggests that the button is very visible and the colours used are clear for the users to see.



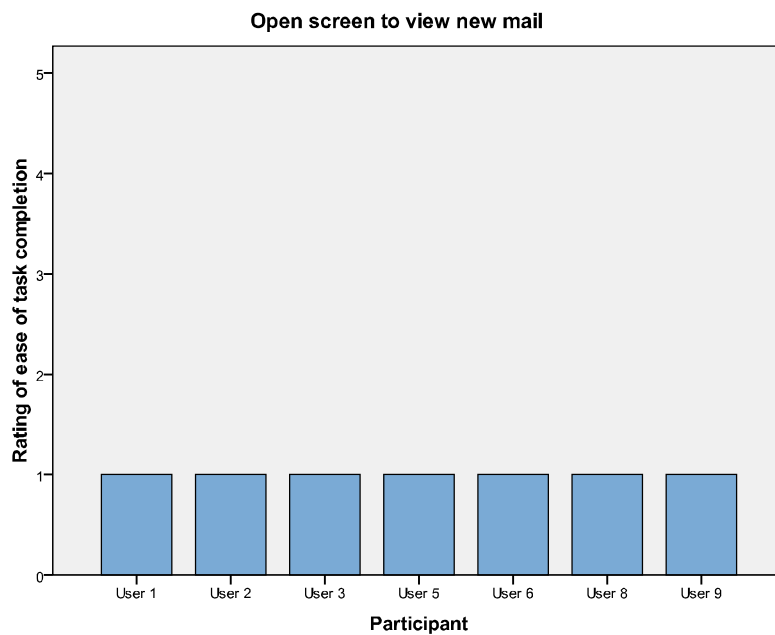
Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 28 - Bar graph showing task 5 results

4.4.6 Task 6 – Open screen to view new mail

This task asks the users to select from the buttons on the main menu which button would take them to a screen which would allow them to view their new mail.

The bar graph below shows that all the users found this task ‘very easy’ to complete as they all selected ‘1’ on the rating scale. This suggests that the button is very clear and easily understood.



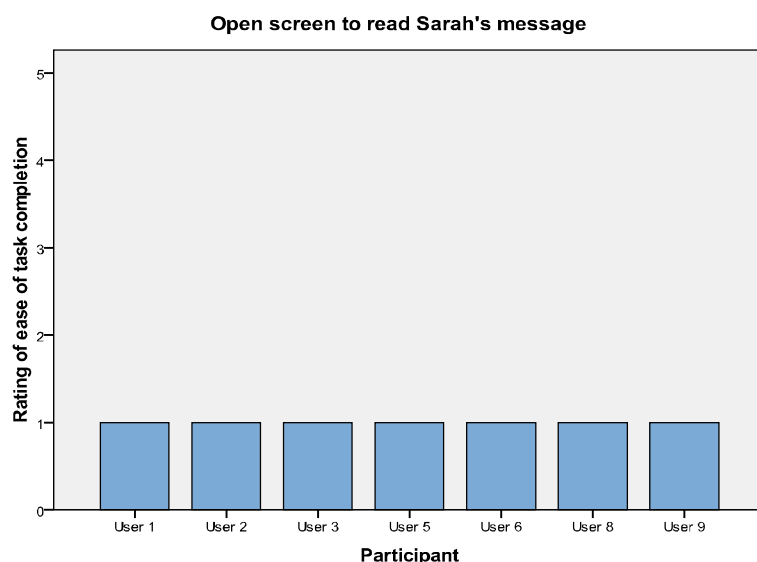
Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 29 - Bar graph showing task 6 results

4.4.7 Task 7 – Open screen to read Sarah’s message

This final task asked the users to open Sarah’s message. This task required the users to select the open button which is next to Sarah’s message.

The bar graph shows that this task was easily completed by all the users as they all selected ‘1’ on the rating scale, this indicating that the task was ‘Very easy’ to complete. This suggests that this button is easy to see and it is easy to understand.



Rating scale 1-Very Easy 2-Easy 3-Undecided 4-Difficult 5-Very Difficult

Figure 30 - Bar graph showing task 7 results

4.4.8 Questions relating to Interactive prototype

These following results refer to the questions asked as part of the user task evaluation. These questions were related to the tasks which were completed using the interactive prototype. They ask the users about the design of the prototype interface. The aim of these questions was to find out what the users thought about the design choices and whether they thought it was easy to use. Questions 1 to 8 used a likert scale which asked the users to rate on the 1-5 scale where they think their response lies. The likert scale was used as it was easy to gather quantitative data from the participants. Questions 9 and 10 gather a combination of quantitative and qualitative data by using closed-ended questions with unordered response categories and an open-ended question which asks the users to specify their choices.

Language Used – Question 1

The aim of the following question was to find out whether the language used in the design was easy to understand. The users were asked to rate on the 1-5 scale whether they strongly agreed (1) with the statement or strongly disagreed (5) with the statement. The table below gives the categories for which there were responses and gives the frequency of responses for each of these choices. The results show that the majority of users strongly agreed with this statement, the number of users selecting ‘1’ on the scale being 4 users. The remaining 3 users each selected ‘2’, ‘3’ and ‘4’ on the scale - these responses being ‘agree’, ‘neither’ and ‘disagree’. This shows that with the percentage of users choosing ‘strongly agree’ being 57.1%, a high majority of users understood the language that was used throughout the prototype.

Table 11 - Frequency table showing understanding of language used

The language used in the design was easy to understand					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	33.3	57.1	57.1
	Agree	1	8.3	14.3	71.4
	Neither	1	8.3	14.3	85.7
	Disagree	1	8.3	14.3	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

Button Size – Question 2

The purpose of this question was to find out if the users thought that the button size being large was suitable. The users were asked to rate on the 1-5 scale whether they strongly agreed (1) with the statement or strongly disagreed (5) with the statement. The table below gives the categories for which there were responses and gives the frequency of responses for each of these choices. The table shows that 5 users selected ‘strongly agree’ on the scale, this being a

percentage of 71.4%. One user chose to agree with the statement and another decided it was 'neither'. These both have a percentage of 14.3% each. This shows the majority of users thought that the large button size was suitable for them.

Table 12 – Frequency table showing button size results

		The large button size was suitable			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	41.7	71.4	71.4
	Agree	1	8.3	14.3	85.7
	Neither	1	8.3	14.3	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

Cluttered Screens – Question 3

The purpose of this question was to identify from the users whether they thought the screen was cluttered. The question made use of a likert scale which ranged from 1 being strongly agree to 5 being strongly disagree. The frequencies of these responses and the chosen categories are displayed in the table below. The results indicate that 3 users chose 'strongly disagree', 3 chose 'disagree' and 1 user chose to select 'neither'. With 42.9% each for the strongly disagree and disagree categories compared to 14.3% for neither response, this indicates that the users feel that the screen is not too cluttered.

Table 13 - Frequency table showing results of question on screens

		The screens were cluttered			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neither	1	8.3	14.3	14.3
	Disagree	3	25.0	42.9	57.1
	Strongly Disagree	3	25.0	42.9	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

Navigation – Question 4

The purpose of this question was to find out if the users agreed with the statement that they found it difficult to navigate through the screens in the system. The question used a likert scale to gather their responses on a scale of 1-5 where 1 was strongly agree and 5 was strongly disagree. The table below shows the results of the questions by showing the frequencies and percentages of users that chose the various categories. 4 users chose to say that they disagreed with the statement while 3 chose to say that they strongly disagreed with the statement, this suggests that some people may have had some difficulty with navigating through the screens in the prototype.

Table 14 - Frequency table showing ease of navigation

I found it difficult to navigate through screens					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	33.3	57.1	57.1
	Strongly Disagree	3	25.0	42.9	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

Understanding of Tasks – Question 5

The aim of this question was to find out whether the users understood what the various tasks were asking. It was important to find out these results as it may have been a case that the users misunderstood what a task was asking them to do and so this may have had an effect on the user's ability to complete the task. The question used a likert scale with values ranging from 'strongly agree' - shown on scale as '1' to 'strongly disagree' which was shown on the scale as '5'. The table below displays the frequency and percent of users selecting values on the scale. The table shows that 4 users (57.1%) selected 'strongly agree' on the scale. 2 users (28.6%) selected that they 'agree' with the statement and 1 user (14.3%) indicated that they didn't agree with the statement by selecting 'disagree'. This shows that although the majority of the participants understood what the tasks were asking of them, there was one participant that did not understand the task questions. This indicates that the tasks could have been more carefully worded to make sure that all the users understood what the task was asking them to do.

Table 15 - Frequency table showing understanding of tasks

I understood what the tasks were asking of me		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	33.3	57.1	57.1
	Agree	2	16.7	28.6	85.7
	Disagree	1	8.3	14.3	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

Comfortable using System – Question 6

The purpose of the question was to find out how much they agreed with the statement that they felt comfortable using the system. A likert scale ranging from 1-5 was used to gather responses from the participants. The table below shows the frequency and percent of these participants choosing the responses on the scale. 2 users (28.6%) strongly agreed with the statement, 3 users (42.9%) agreed with the statement and 2 users neither agreed or disagreed that they felt comfortable using the system.

Table 16 - Frequency table showing comfort of using system

I feel comfortable using this system		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	16.7	28.6	28.6
	Agree	3	25.0	42.9	71.4
	Neither	2	16.7	28.6	100.0
	Total	7	58.3	100.0	
Missing	System	5	41.7		
Total		12	100.0		

System Meets Needs – Question 7

The question aimed to find out whether the users agreed with the statement that the system met their needs. The question used a likert scale ranging from 1-5 to gather the responses from the users. The table below displays the results of the question with the frequency and percent of users selecting each category. 2 users strongly agreed with the statement that the system met their needs, this is 33.3% of the users that responded to this question. 3 users selected '2' on the scale thus indicating that they agreed with the statement. 1 user indicated that they disagreed with the statement and this indicates that they didn't think that the system met their needs.

Table 17 - Frequency table showing results of agreement of question

		The system meets my needs			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	16.7	33.3	33.3
	Agree	3	25.0	50.0	83.3
	Disagree	1	8.3	16.7	100.0
	Total	6	50.0	100.0	
Missing	System	6	50.0		
Total		12	100.0		

Ease of Use of Overall System – Question 8

The aim of this question was to identify how easy the users thought the whole system was to use. The question uses a likert scale ranging from 1-5 where 1 is very easy and 5 is very difficult. The table shows the frequencies and percentages of users choosing each response. The table shows that a frequency of 4 users thought that the overall system was very easy to use, this is 66.7% of the users. 2 of the users thought that the system was easy to use, 33.3% of users. This is positive as there were no users that were undecided or who thought that the system was difficult to use.

Table 18 - How easy is the overall system?

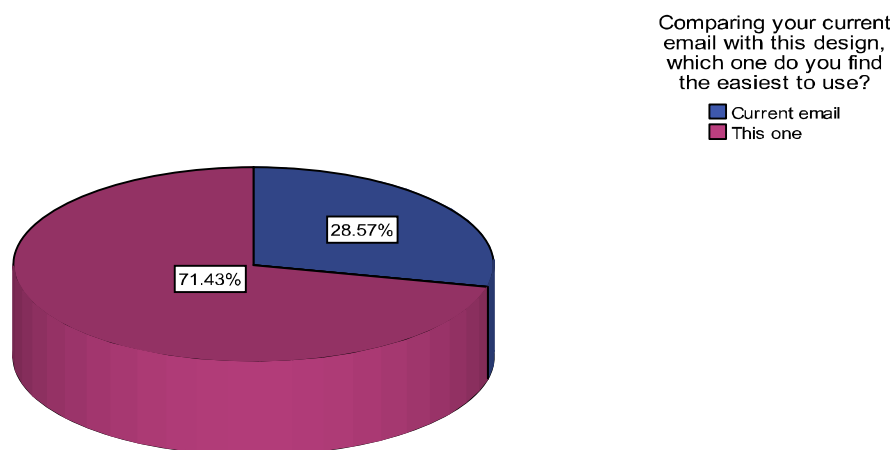
How easy you found the overall system to use					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Easy	4	40.0	66.7	66.7
	Easy	2	20.0	33.3	100.0
	Total	6	60.0	100.0	
Missing	System	4	40.0		
Total		10	100.0		

Ease of Use – Current E-mail Compared with This design – Question 9

The aim of this question was to find out whether the users thought that their current e-mail system was easier to use or if this designed interface was easier. The question aimed to gather both quantitative and qualitative data from the responses, so it used unordered responses categories for the users to select from. There was an open-ended question that asked the users to specify their choice.

The pie chart below displays the results of this question. The chart shows that 71.43% of users felt that this design was easier compared to 28.57% of users that thought that their current e-mail system was easier to use. This indicates that a higher number of participants found the designed interface easier to use than the system which they currently use.

Percentage of participants' opting to use the interface design compared with their current e-mail

**Figure 31 - Pie chart showing ease of use comparison**

The user's comments discussing the reasons for their choice are given below.

These comments are from users that found the designed interface easier to use

“I found it easy to use”

“As a new user of e-mail this system would be very good but as I am used to Outlook Express I find it personally rather simplistic”

“Yours is more simple”

“It appears to be idiot-proof, whereas my current system could confuse a novice IT user”

“Far less cluttered, and easier to navigate”

These comments are from users that found their current email easier to use

“I wrongly tried to operate this as my current outlook express system, but after following the instructions I found it easy to operate”

“I am accustomed to it and understand precisely what is being asked”

There are a variety of different opinions about the designed interface although the majority of the comments indicate that the designed interface is simple and easy to use.

Consider Use if Commercially Available – Question 10

This question aimed to find out whether the users would use the designed interface if it were available commercially on the market to purchase. The question aimed to gather both quantitative and qualitative data from the responses, so it used unordered responses categories for the users to select from. There was an open-ended question that asked the users to specify their choice. The pie chart below displays the results. This chart indicates that the majority of the users asked would use the email system if it were available commercially; this is 66.67% of users. This value compares with 33.33% of users that would not be willing to use it if commercially available.

Percentage of participants' considering use of designed interface if commercially available

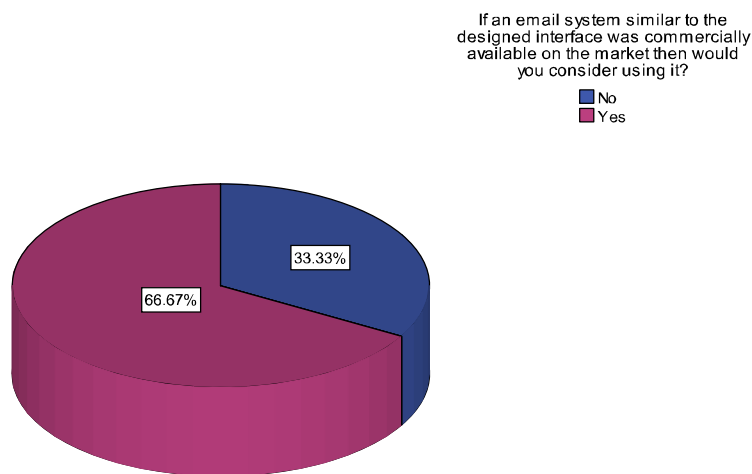


Figure 32 - Pie chart showing percentages of users considering its use

The comments from the users are detailed below.

Comments from users that responded 'Yes'

"Yes if my reply to the message reappeared after my typing/sending it"

"The boxes were big and easy to follow"

"Needs some more refinements say sending to a group of people or replying to more than one person at the same time"

"Simple to operate but still offers full range of tasks required"

Comments from users that responded 'No'

"I think for a first time user of a computer and of e-mail it would be excellent but not for me. It does not have enough of the options I am used to. "

"The designed interface screens are clear. I found it difficult to follow some of the instructions which I have referred to. It would take me some time to become acquainted with a new system."

A comment from a user that indicated both 'yes' and 'no' answers. (This user's results were not included in the pie chart results shown above).

"Personally I am happy with my current system at the moment but I would seriously consider purchasing a package like this for others who are less confident about using email!"

4.5 Results of Final Questionnaire

The aim of the final questionnaire was to ask the users questions relating to their participation in the research project. It was useful to evaluate how the users felt about taking part and how the involvement of users in the design of a piece of software particularly one which would be aimed at users of a particular age group or who have health issues which would affect their use of the computer. The results of this questionnaire would be useful to test the hypotheses and meet the research question. The questions used a combination of both open-ended and closed-ended questions which were necessary to gather qualitative and quantitative data from the participants.

4.5.1 Participants' involvement in research project

This question asked the user's to state on a likert scale which ranged from 1-5 where 1 was 'Enjoyed very much' and 5 was 'Did not enjoy at all' how much they enjoyed taking part in the research project. This question enabled the users to declare how much they enjoyed participating and to give reasons for their answer. These results would be useful to a future developer as it would give an indication of the reasons that users enjoy taking part in research projects and would hopefully encourage developers to involve users in the future.

The bar graph shown below describes the percentage of users who selected the different values on the scale. About 60% of the participants indicated by selecting 1 on the scale that they enjoyed taking part in the research project very much. About 30% of the participants stated that they enjoyed taking part in the research project by selecting value 2 on the scale. The remaining 10% of the participants were undecided. These results indicate that the majority of the participants enjoyed taking part in the research project very much.

The comments gathered from the participants are discussed below.

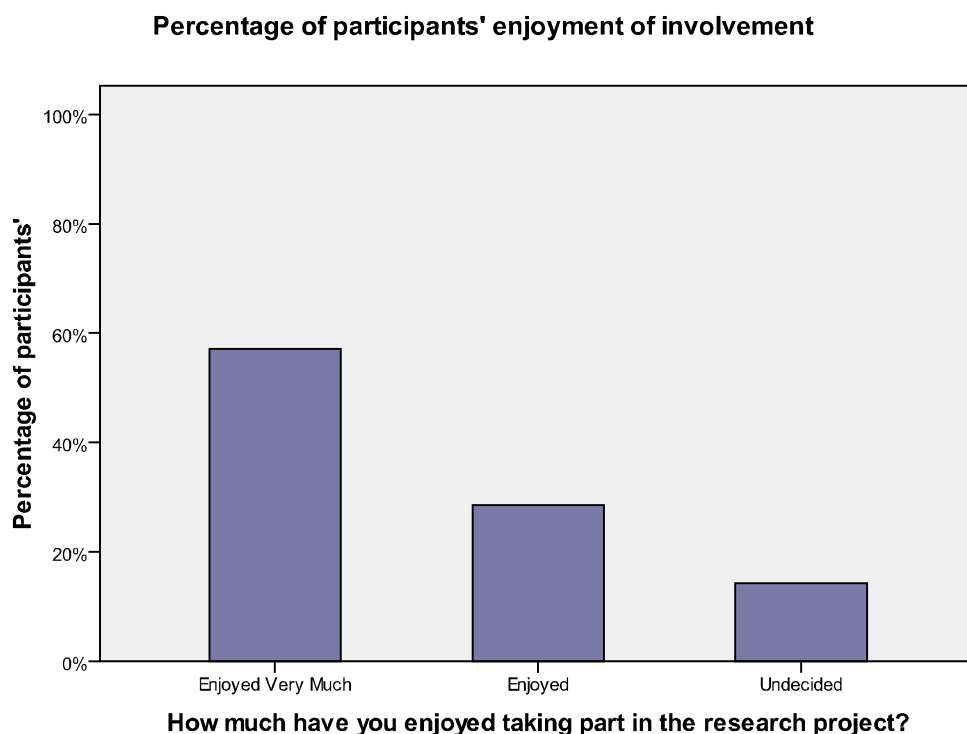


Figure 33 - Bar graph showing participants' enjoyment of involvement

The following comments refer to the users who selected 'Enjoyed Very Much' on the scale.

"Something useful and a good idea to keep it simple for 'newcomers'"

"I have always loved computers and IT and thoroughly enjoyed participating"

"Interesting to see someone else's ideas about simplifying a system. Enjoyed taking part as a learner this time!"

The first comment is important to consider as this user indicated that they enjoyed it very much but they also found it to be useful. Part of the reason which they may have enjoyed it may be a result of getting something useful out of it.

The following comments refer to the users who selected 'Enjoyed' on the scale.

"It made me think differently and I enjoyed helping a student"

"It offered new experiences with email systems"

The following comment was made by one user who selected 'Undecided' on the scale

"I enjoyed being involved"

4.5.2 Participants' positivity towards e-mail use

This question gathered quantitative data alone from the users. A likert scale with values on the scale ranging from 1 being 'strongly agree' and 5 being 'strongly disagree' was used to find out how much the users agreed with the statement 'I feel more positive towards using e-mail in the future since taking part in this research'. These responses are also important as they enabled the hypotheses to be tested.

The bar graph below indicates the percentage of participants who selected the values on the scale. These results are quite varied as around 30% of users said that they agreed with the statement that they do feel more positive, however about 45% said that they were undecided by choosing 3 on the scale. Around 15% disagreed with the statement, thus indicating that they don't feel more confident about using e-mail in the future. The remaining 15% of participants indicated that they strongly disagreed with the statement; therefore this shows that they don't feel any more positive about using e-mail in the future since taking part in the research project. These results could have depended on how the users interpreted the word 'more' in the statement, it is possible that the users feel really positive anyway about using e-mail in the future and they don't feel that they can be any more positive than they already are.

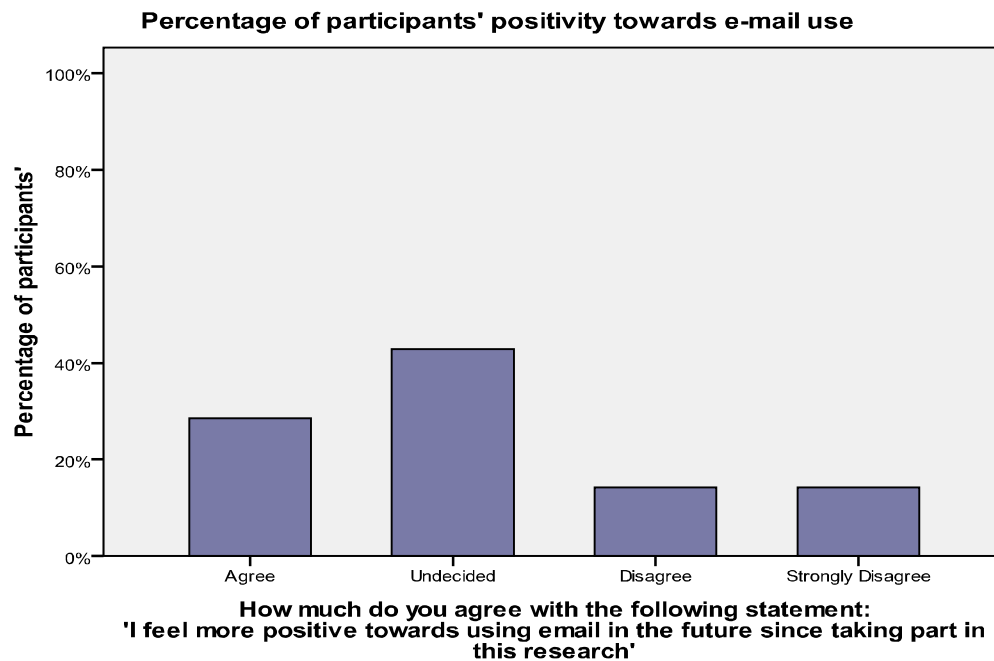


Figure 34 - Bar graph showing participants' positivity towards e-mail

4.5.3 Participants' changing thoughts

This question asked the users whether their thoughts on using e-mail had changed since taking part in the research project. This question collected both quantitative data and qualitative data from the users by using a closed-ended question with two unordered response categories which were 'yes' and 'no'. The qualitative data was gathered by including a question which asked users to give reasons for their choice.

The pie chart below displays the results of this question.

The chart shows that 57.14% of users answered 'yes', that their thoughts had changed since taking part in the research. This is compared with the 42.86% of users that had answered 'no' that their thoughts had not changed. These results indicate that there is not much of a difference between the different responses but the qualitative data gathered from the users are presented below which would give an insight into the reasons why the participants gave those answers.

Participants' thoughts on using e-mail

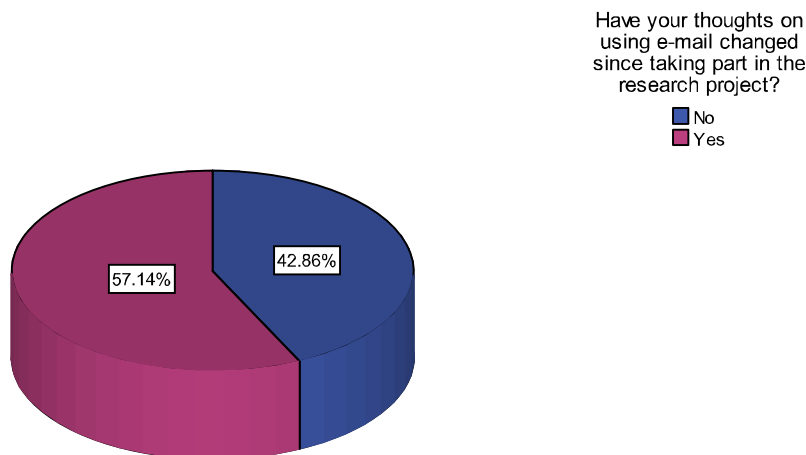


Figure 35 - Pie chart showing participants' thoughts of e-mail

Some of the comments from the users that answered 'yes' are given below.

"I see how sending email can be made easier"

"learned more about attachments"

"seems straight forward, but do I have time to read all future emails and respond to them?"

Some of the comments from the users that answered 'no' are given below.

"Outlook Express satisfies my needs"

"I have always (for the last 20 years) communicated by email to everyone I know with a computer and I will continue to do so"

"I'm pretty confident about using email anyway!"

4.5.4 Developers involving users

The aim of this question was to find out what the users thought of developers involving users in the design of an internet product by including them in activities such as focus groups. This question made use of a likert scale where the scale ranged from 1-5 where 1 was 'Like it a lot' and 5 was 'Dislike it a lot'. The question also included an open-ended question which asked users to give reasons for their choice. Quantitative data was therefore collected through the use of the likert scale and qualitative data was collected through the inclusion of the comments box.

The bar graph displayed below gives the percentages of the participants that chose the categories on the scale. These results show that the responses for the categories are not varied as 30% of participants chose rating 1 on the scale indicating that they like this idea a lot. 30%

of participants also chose rating 2 on the scale 'Like it' and 30% were undecided. 10% of the participants indicated that they disliked the idea a lot.

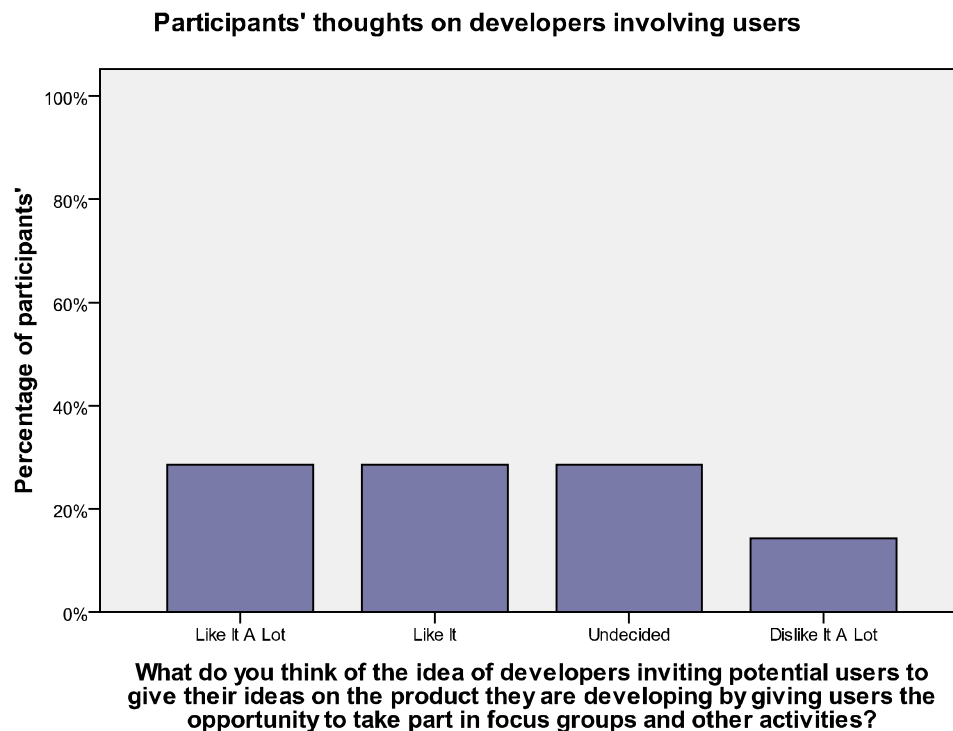


Figure 36 - Bar graph showing participants' thoughts on developers involving users

The comments gathered from the participants that indicated 'Like it alot' on the scale are presented below.

"All products can benefit from market research"

"If one is included in the development, then any tweaks to make it more user-friendly for oneself can be included."

The comments gathered from the participants who indicated 'Like' on the scale are presented below.

"It should make new ideas more user friendly"

"Give the user a chance to give ideas or opinions"

The comment gathered from the participant who indicated that they were 'undecided' is presented below.

"I tend not to take part in surveys etc but it is probably a good idea"

The comment gathered from the participant who indicated that they 'disliked the idea a lot' is presented below.

“I have little input into IT problems and this problem would find me unable to contribute”

4.5.5 Developer design ideas

The purpose of this question was to find out whether the users thought that the internet products available, for example websites would be easier to use if the developers included ideas from the users into their design. The question used unordered response categories to find out if the users thought they would be easier to use or if they thought that they would not be easier to use.

The bar graph below gives the percentage of users that answered ‘yes’ and those who answered ‘no’. The results show that approximately 80% of users thought that these products would be easier to use if the developers included the users design ideas into the design. This is compared with around 20% of users that thought that they would not be any easier. This high value of participants answering ‘yes’ indicate that they believe that with the users input, internet products e.g. websites could be made a lot easier than they already are.

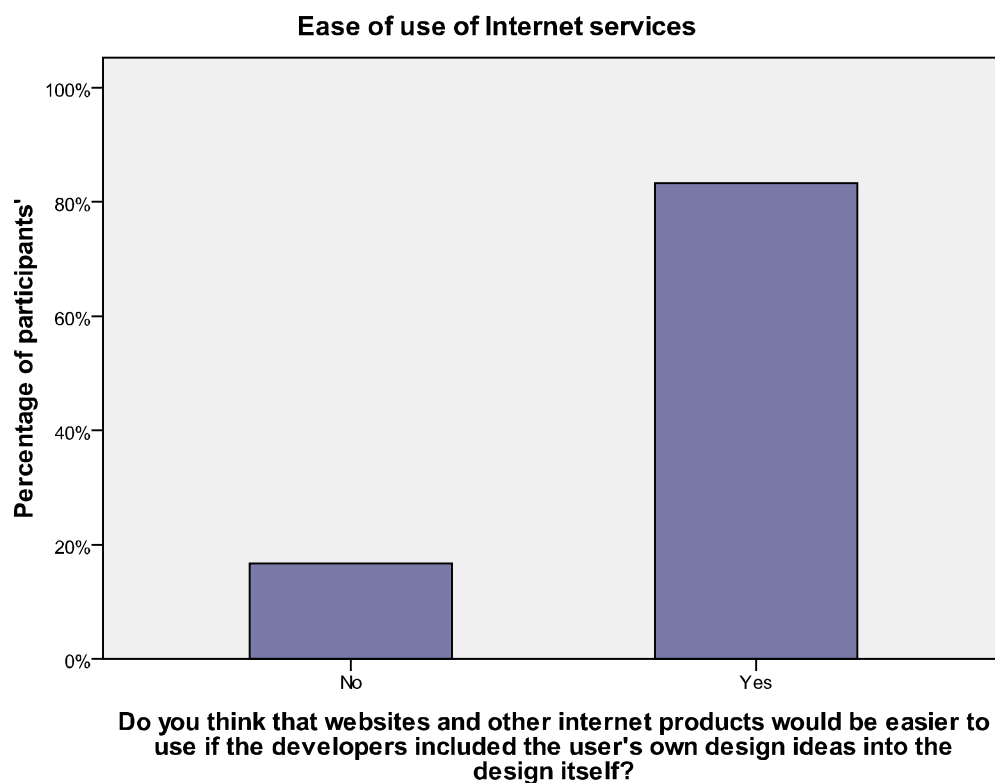


Figure 37 - Bar graph showing participants' thoughts on ease of use of Internet Products

The comments gathered from the users that answered ‘Yes’ are given below.

“But it needs to be a two-way process”

“It would be a benefit if it drastically improved the operation of the product”

“Only if the user is aware of what is the aim of the system or project”

“It is always good to have one’s own designs incorporated, it somehow personalises a very impersonal process”

The comment gathered from the user that answered ‘No’ is given below.

“I assume developers pay quite a lot of money for advice on design – and I suspect that it could be the case of ‘too many cooks spoil the broth’”

5. Discussion and Conclusions

This section will aim to first of all discuss the purpose of the research that was being carried out. It will also discuss the results in greater detail. There will also be a discussion of the things learnt through the whole research process, this will include an identification of whether the project aims were achieved and what problems arose during the course of the project. This section will also discuss the research that could be carried out in the future. There will be a final conclusion section which will indicate the successfulness of the project.

5.1 Final Discussion of Results

The purpose of this project was to investigate whether the development of a webmail system for older adults which adopted a user-centred design methodology had a positive impact on the users' use of webmail. It was to find out if the involvement of the users in the design process would encourage them to feel more comfortable about using webmail.

The developed webmail system was an interactive prototype that was designed to evaluate the system and the users through a set of tasks which were completed by the users. This aimed to find out whether the users felt that this system was easier to use than the e-mail system that they currently use. It is also to show that their involvement had an impact on the ease of use of the system. The results from this interaction prototype and the other methods show that the hypotheses were supported as the first hypothesis was as stated below

The users will find the webmail system easy to use and they will feel more comfortable using it if they are involved in the design process.

The data does show that the users found the webmail system easy to use as the results indicated that the majority of the participants found the overall system easy to use.

The users will feel more positive towards future webmail systems after being involved in the design process of the webmail system.

5.2 Project Critique

The project identified many sub-questions which required to be answered; these sub-questions were as follows-

Can the participation of users within the design process have a positive impact on their uptake of webmail?

What are the factors that motivate older adults over 55 to use webmail?

What are the reasons why older adults may be discouraged from using webmail?

What are the advantages to the designer that result from involving the older user in the design process?

How does the use of a User-centred design method to design a webmail interface compare with other possible design models that could be used?

The answers to these questions were found through the literature search carried out and through the conduct of the research methods i.e. questionnaires, focus group and user-based evaluation with the interactive prototype.

During the course of the project there were some problems that arose that had a negative impact on the research being carried out. The main problem was the failure to recruit older adults from the computer classes that were held at a local library. This failure was a result of additional ethical issues that the council needed to consider, due to this process becoming time consuming, the contingency plan was to instead ask grandparents and their friends. It would have been extremely useful to involve these users as they would not have had much or any experience using webmail and their use of the designed prototype would allow data to be gathered about how they felt about using this type of webmail system in the future and how positive they felt towards it given that they wouldn't have had much experience of using the computer or the Internet. Recruiting these users would also have increased the possibility that there would have been a larger number of participants involved and thus this would have increased the reliability of the results. The time spent on the additional ethics process was probably too much and as a result the various stages in the project were delayed. In the case of becoming involved in another research project, all the ethical issues relating to council run computer classes and the recruitment of these older adults will be looked at in detail to ensure awareness of the various ethical procedures.

5.3 Future Research

Future research could be carried out which would involve questioning the results gathered from this investigation and to explore the area of user centred design in more detail especially focussing on the involvement of older users.

A research project could involve the complete development of an e-mail system using html coding. This would create a more realistic looking system for the users to evaluate

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Appendices

Appendix A: Initial Questionnaire

Questionnaire

1. What is your age? Years

2. Do you own a computer? ☐ Yes ☐ No

3. Do you use the computer? ☐ Yes ☐ No

4. How long approximately have you used a computer for?

Enter values in the boxes

Years Months Weeks

5. What do you use the computer for? (Check all that apply)

Internet searching

☐

E-mail

☐

Word Processing

☐

Other

6. If you use the computer then how did you learn

Attending a computer
Class

☐

Helped by friend/relative

☐

Taught yourself

☐

Other

7. If you use the computer for E-mail then**a. What current E-mail system do you use?**Outlook ☐Internet email e.g. yahoo, hotmail, Google mail ☐

Other

I don't know

☐**b. Do you have any problems with it?**Yes ☐No ☐

If you answered 'yes' then use the box below to describe the problems you have with the E-mail system that you use

c. Are there any changes that you would make to the E-mail system that you use?Yes ☐No ☐

If yes then in the box below, describe what changes you would make.

d. Are there any particular features you would like to have in the e-mail system?

Yes ☐ No ☐

If yes then in the box below, describe what features you would have.

8. Circle on the scale below how easy you find it to move from page to page within your current e-mail system

1	2	3	4	5
Very Difficult	Difficult	Neither difficult or easy	Easy	Very Easy

9. Circle on the scale below how easy you find it to add a new contact name and e-mail address to your address book

1	2	3	4	5
Very Difficult	Difficult	Neither difficult or easy	Easy	Very Easy

10. Circle on the scale below how comfortable you are with using your e-mail system

1	2	3
Uncomfortable	Neither uncomfortable or comfortable	Comfortable

11. Do have any particular problems that affect your use of the computer? (Check all that apply)

Eyesight ☐ Hearing ☐ Memory ☐

Motor e.g. using the mouse ☐

Other

12. What is your main reason for learning to use the computer?

Thank you for your participation

--

4. What do you think of the idea of developers inviting potential users to give their ideas on the product they are developing (e.g. a website) by giving users the opportunity to take part in focus groups and other activities?

Please state on a scale of 1-5, 1 being like it a lot and 5 being dislike it a lot.

1 2 3 4 5

Like It A Lot

Dislike It A Lot

Please give reasons for your choice.

--

5. Do you think that websites and other internet products would be easier to use if the developers included the user's own design ideas into the design itself?

☐ Yes ☐ No

Please give reasons for your choice.

--

Section 2

1. Please indicate your age by ticking one of the options below.

☐ 55-59 ☐ 60-64 ☐ 65-69 ☐ 70-74 ☐ 75+

2. Please indicate your gender.

☐ Male ☐ Female

Any additional comments

--

Thank you for your time

Appendix C: Task List Sheet

Tasks

The main welcome screen should be open before you start task 1.

1). Open screen to write a new message

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

2). Write a new message

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

3). Add an attachment

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

4a). Send the message

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

4b). What is your impression of the clarity of the message that appears on the screen?

Please state on a scale of 1-5, 1 being very satisfactory and 5 being very unsatisfactory.

1 2 3 4 5

Very satisfactory

Very unsatisfactory

Enter code X

5). Navigate to the main welcome screen.

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

6). Open screen to view new mail

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

Enter the subject of Jenny's message

7). Open screen to read Sarah's message

Please state on a scale of 1-5, 1 being very easy and 5 being very difficult how easy it was to complete this task.

1 2 3 4 5

Very Easy

Very Difficult

End of Tasks

These following questions relate to the design of the interface and the tasks completed. Complete these questions before exiting from the system.

Questions

Please select on the scale of 1-5, 1 being strongly agree and 5 being strongly disagree, how much you agree with the following statements.

1). The language used in the design was easy to understand.

1	2	3	4	5
Strongly Agree				Strongly Disagree

2). The large button size was suitable.

1	2	3	4	5
Strongly Agree				Strongly Disagree

3). The screens were cluttered.

1	2	3	4	5
Strongly Agree				Strongly Disagree

4). I found it difficult to navigate through screens.

1	2	3	4	5
Strongly Agree				Strongly Disagree

5). I understood what the tasks were asking of me.

1	2	3	4	5
Strongly Agree				Strongly Disagree

6). I feel comfortable using this system.

1	2	3	4	5
Strongly Agree				Strongly Disagree

7). The system meets my needs

1	2	3	4	5
Strongly Agree				Strongly Disagree

8). Please indicate on the scale of 1-5, 1 being very easy and 5 being very difficult, how easy you found the overall system to use.

1	2	3	4	5
---	---	---	---	---

Very Easy

Very Difficult

9). Comparing your current email system with this design, which one do you find the easiest to use?

☐ Current email ☐ This One

Please give reasons for your choice.

10). If an email system similar to the designed interface was commercially available on the market then would you consider using it?

☐ Yes ☐ No

Please give reasons for your choice.

Thank you for your time

Appendix D: Prototype 1

WELCOME		EXIT X
HELP ? 0	MENU	
Increase Font Size +	VIEW MAIL	WRITE MAIL
Decrease Font Size -	VIEW ADDRESS BOOK	

Arrows indicate navigation: from VIEW ADDRESS BOOK to WRITE MAIL, and from WRITE MAIL to VIEW MAIL.

MAIN MENU	MAIL		EXIT X															
HELP ? 0	WRITE MAIL	VIEW ADDRESS BOOK																
Increase Font Size +	<table border="1"><thead><tr><th>FROM</th><th>SUBJECT</th><th></th></tr></thead><tbody><tr><td><input checked="" type="checkbox"/> Sarah</td><td>My new car</td><td>READ</td></tr><tr><td><input checked="" type="checkbox"/> David</td><td>Library</td><td>READ</td></tr><tr><td><input checked="" type="checkbox"/> Joan</td><td>Dinner Arrangements</td><td>READ</td></tr><tr><td><input type="checkbox"/> Maggie</td><td>- No subject -</td><td>READ</td></tr></tbody></table>			FROM	SUBJECT		<input checked="" type="checkbox"/> Sarah	My new car	READ	<input checked="" type="checkbox"/> David	Library	READ	<input checked="" type="checkbox"/> Joan	Dinner Arrangements	READ	<input type="checkbox"/> Maggie	- No subject -	READ
FROM	SUBJECT																	
<input checked="" type="checkbox"/> Sarah	My new car	READ																
<input checked="" type="checkbox"/> David	Library	READ																
<input checked="" type="checkbox"/> Joan	Dinner Arrangements	READ																
<input type="checkbox"/> Maggie	- No subject -	READ																
Decrease Font Size -																		

Arrows indicate navigation: from VIEW ADDRESS BOOK to WRITE MAIL, and from the bottom of the list to the next screen.

MAIN MENU	READ MAIL		EXIT X						
HELP ? 0	WRITE MAIL	VIEW ADDRESS BOOK	DELETE MESSAGE						
BACK TO READ MAIL	REPLY TO MESSAGE								
Increase Font Size +	<table border="1"><thead><tr><th>FROM</th><th>SENT</th><th>SUBJECT</th></tr></thead><tbody><tr><td>Sarah</td><td>Tuesday 10th March 09</td><td>My new car</td></tr></tbody></table>			FROM	SENT	SUBJECT	Sarah	Tuesday 10 th March 09	My new car
FROM	SENT	SUBJECT							
Sarah	Tuesday 10 th March 09	My new car							
Decrease Font Size -									

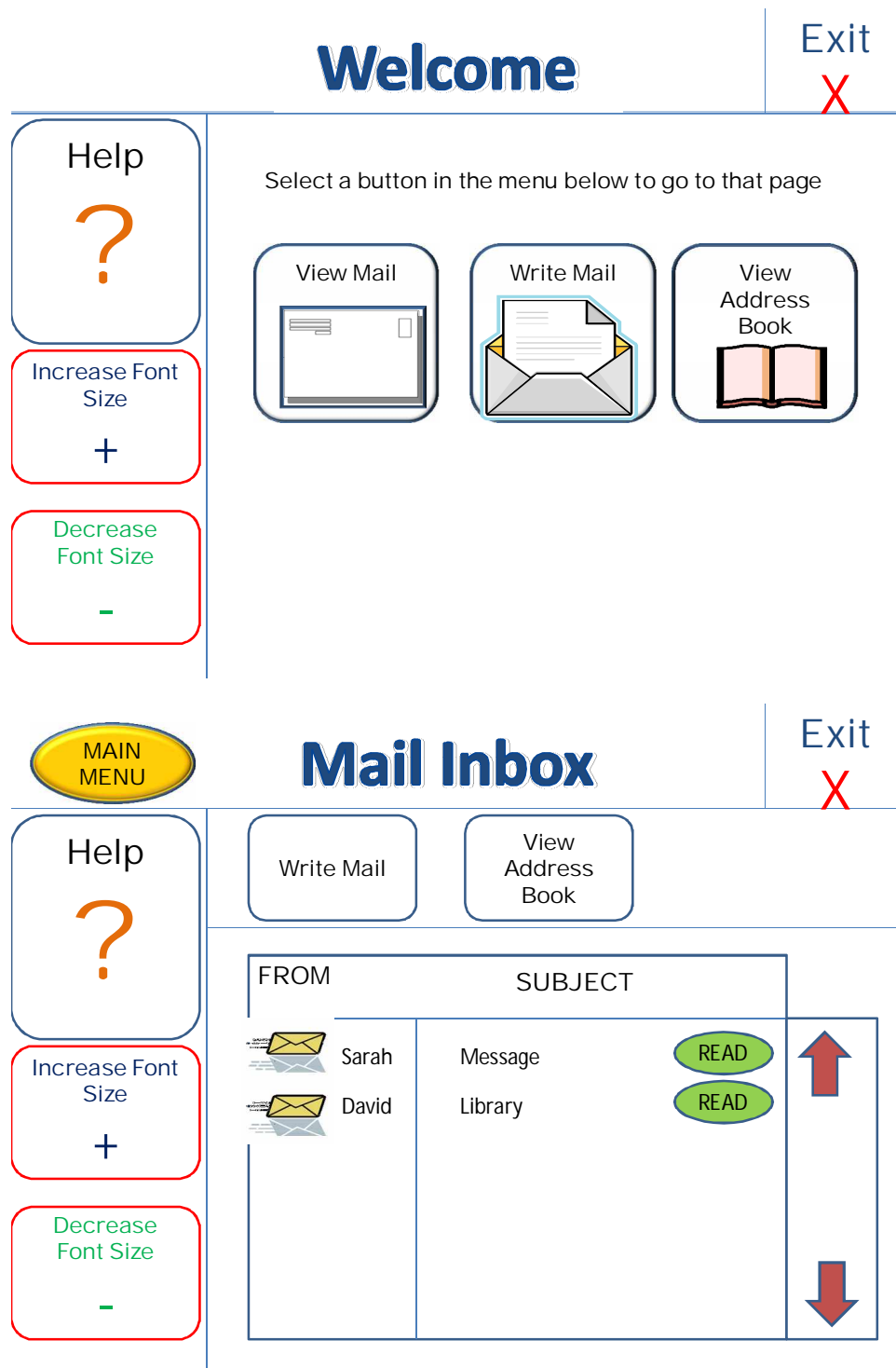
Arrows indicate navigation: from REPLY TO MESSAGE to DELETE MESSAGE, and from the bottom of the message details to the next screen.

MAIN MENU		WRITE MAIL		EXIT X
HELP ? 0	READ MAIL	VIEW ADDRESS BOOK	DELETE MESSAGE	ADD ATTACHMENT
SEND Increase Font Size + Decrease Font Size -		TO Kate Subject Meeting		

MAIN MENU		Add ATTACHMENT		EXIT X
HELP ? 0	READ MAIL	VIEW ADDRESS BOOK		
BACK TO MESSAGE Increase Font Size + Decrease Font Size -		Add Photo		
		Add Document		
		BROWSE FOR FILE TO ADD		

MAIN MENU		ADDRESS BOOK		EXIT X
HELP ? 0	WRITE MAIL	READ MAIL	NEW ADDRESS	DELETE ADDRESS
Increase Font Size + Decrease Font Size -		NAME ADDRESS		
		Anne		
		David		
		Joan		
		Maggie		
		Pauline		
		Peter		
		Sarah		

Appendix E: Prototype 2



MAIN MENU

Read Message

Exit
X

Help
?

Increase Font Size
+

Decrease Font Size
-

Write New Mail

View Contacts

Delete Message

Reply To Message

FROM Sarah
SUBJECT Message

Hello
This is a message from Sarah.
From Sarah

↑

↓

MAIN MENU

Write Message

Exit
X

Help
?

Increase Font Size
+

Decrease Font Size
-

Read Mail

View Address Book

Delete Message

Add Attachment

SEND

TO
SUBJECT

↑

↓

MAIN MENU

Add Attachment

Exit
X

Help
?

Back To Message

Read Mail

View Address Book

STEP 1

Search For File To Add

STEP 2

Add File

Increase Font Size
+

Decrease Font Size
-

MAIN MENU

Address Book

Exit
X

Help
?

Write Mail

Read Mail

New Address

Delete Address

NAME	ADDRESS	
Anne	Anne@email.com	VIEW
David	david123@mail.com	VIEW
Joan	j54@mail.com	VIEW
Sarah	sarah@email.com	VIEW


Increase Font Size
+



Decrease Font Size
-


Appendix F: Prototype 3

WELCOME		Exit X
Help ? Increase Font Size + Decrease Font Size -	Select a button in the menu below to go to that page	
	<div>Read Mail Mail Inbox</div> <div>Write Mail</div> <div>View Address Book</div>	
	You have 3 new messages <div>Sent Messages</div>	

MAIN MENU		Mail Inbox			Exit X																						
Help ? Increase Font Size + Decrease Font Size - View Address Book	Write Mail																										
	<table border="1"><thead><tr><th>FROM</th><th>SUBJECT</th><th></th><th></th><th></th><th></th></tr></thead><tbody><tr><td>Sarah</td><td>Message</td><td>OPEN</td><td>SAVE</td><td>DELETE</td><td rowspan="3">↑ ↓</td></tr><tr><td>David</td><td>Library</td><td>OPEN</td><td>SAVE</td><td>DELETE</td></tr><tr><td>Jenny</td><td>Shopping</td><td>OPEN</td><td>SAVE</td><td>DELETE</td></tr></tbody></table>					FROM	SUBJECT					Sarah	Message	OPEN	SAVE	DELETE	↑ ↓	David	Library	OPEN	SAVE	DELETE	Jenny	Shopping	OPEN	SAVE	DELETE
	FROM	SUBJECT																									
	Sarah	Message	OPEN	SAVE	DELETE	↑ ↓																					
David	Library	OPEN	SAVE	DELETE																							
Jenny	Shopping	OPEN	SAVE	DELETE																							

MAIN MENU		Add Attachment		Exit X
Help ?	 Back To Message	Click to return to your message	<div>Read Mail Mail Inbox</div>	
Increase Font Size +	STEP 1	<div>Search For File To Add</div>	When this button is clicked, a window will open up. You need to search for where your file is stored e.g. My Pictures.	
Decrease Font Size -	STEP 2	<div>Add File</div>	Click this button to add the file e.g. photo to the message.	
View Address Book				

MAIN MENU		Add Attachment		Exit X
Help ?	 Back To Message	Click to return to your message	<div>Read Mail Mail Inbox</div>	
Increase Font Size +	<div>Select File Location <input type="text" value="My Pictures"/></div> <div>Select File then select Add File</div> <div></div>			
Decrease Font Size -				
View Address Book				

MAIN MENU		Add Attachment		Exit X
Help ?		Click to return to your message	<div>Read Mail Mail Inbox</div>	
	<div>File Has Been Attached</div>			
Increase Font Size +				
Decrease Font Size -				
View Address Book				

MAIN MENU		Write Message		Exit X
Help ?	<div>Add Attachment</div>	<div>Delete Message</div>	<div>Read Mail Mail Inbox</div>	
	<div>SEND</div>			
	<div>TO Sarah <div>Insert contact to send to</div></div>			
	<div>SUBJECT <input type="text"/></div>			
Increase Font Size +	<div>Your message will appear here</div>			
Decrease Font Size -				
View Address Book				

Appendix G: Design Guidelines

Guidelines created by Dickinson et al(2005)

Level of functionality:

- § Only essential functionality for a working email system to be included.
- § Each screen to have a very clear primary function.
- § The number of actions / buttons per screen kept to a minimum (fewer than 10)

Accessibility:

- § Larger than average clickable targets (32 and 26 pt size recommended).
- § Larger than average fonts (14 point as a minimum).
- § High contrast choice of colours for text and background.
- § Accessibility features compatible with the W3C guidelines.

User interface paradigms:

- § Simple and very consistent select and operate paradigms.
- § Clear conventions for the positions of buttons and information.
- § No new or poorly established interface paradigms which were unlikely to be understood by the user group.
- § Avoid scroll bars if possible, and definitely do not use nested scroll bars.

Terminology:

- § Terminology which was understandable by the user group.

Personalisation:

- § Some personalization to allow for people with poor eye sight or dexterity, for example the ability to easily increase text size.

Guidelines created by Ellis (2000)

- Use a sans serif font, such as Arial or Helvetica. The literature generally supports the contention that older users perform better with these fonts, and our users found them to be both more appealing and subjectively easier to read than the serif font (TimesNewRoman) that was present in the original design.
- Use dark type on a light background (commonly referred to as “negative contrast” or “positive image”), emphasizing high contrast. We make this recommendation based on our experience with this group of users, despite the fact that the literature is mixed with regard to the positive–negative contrast issue
- Make sure that links (a) are placed where they are easy to see, (b) are fairly large and (c) have plenty of dead space around them to prevent accidental selection.
- Plan screen sizes to fit in lower resolution display settings, at least 800×600 and perhaps even 640×480 for monitors up to a 17-in. screen size. Plan for users to browse with a single maximized (full-screen) window, and minimize the use of links and references to new browser windows. These findings have not been explicitly mentioned in the literature to date.

38 Guidelines identified by Kurniawan and Zaphiris(2005)

H1. Target Design

H1.1. Provide larger targets

H1.2. There should be clear confirmation of target capture, which should be visible to older adults who should not be expected to detect small changes

H1.3. Older adult should not be expected to double click

H2. Use of Graphics

H2.1. Graphics should be relevant and not for decoration. No animation should be present

H2.2. Images should have alt tags

H2.3. Icons should be simple and meaningful

H3. Navigation

H3.1. Extra and bolder navigation cues should be provided

H3.2. Clear navigation should be provided

H3.3. Provide location of the current page

H3.4. Avoid pull down menus

H3.5. Do not use a deep hierarchy and group information into meaningful categories

H4. Browser Window Features

H4.1. Avoid scroll bars

H4.2. Provide only one open window e.g., pop-up/ animated advertisements or multiple overlapping windows should be avoided

H5. Content Layout Design

H5.1. Language should be simple and clear

H5.2. Avoid irrelevant information on the screen

H5.3. Important information should be highlighted

H5.4. Information should be concentrated mainly in the centre

H5.5. Screen layout, navigation and terminology used should be simple, clear and consistent

H6. Links

H6.1. There should be differentiation between visited and unvisited links

H6.2. Links should be clearly named and no link with the same name should go to a different page

H6.3. Links should be in a bulleted list and not tightly clustered

H7. User Cognitive Design

H7.1. Provide ample time to read information

H7.2. Reduce the demand on working memory by supporting recognition rather than recall and provide fewer choices to the user

H8. Use of Colour and Background

H8.1. Colours should be used conservatively

H8.2. Blue and green tones should be avoided

H8.3. Background screens should not be pure white or change rapidly in brightness between screens. Also, a high contrast between the foreground and background should exist, for example, coloured text on coloured backgrounds should be avoided.

H8.4. Content should not all be in colour alone (colour here is denoted by all colours other than black and white)

H9. Text Design

H9.1. Avoid moving text

H9.2. Text should be left justified and text lines should be short in length

H9.3. There should be spacing between the lines

H9.4. Main body of the text should be in sentence case and not all capital letters

H9.5. Text should have clear large headings

H9.6. Use sans serif type font i.e., Helvetica, Arial of 12-14 point size. Avoid other fancy font types.

H10. Search Engine

H10.1. Search engines should cater for spelling errors

H11. User Feedback & Support

H11.1. Provide a site map

H11.2. An online help tutorial should be provided

H11.3. Support user control and freedom

H11.4. Error messages should be simple and easy to follow

Appendix H: Consent Form

Consent Form

Name: _____

Telephone No: _____

E-Mail Address (optional): _____

I agree to participate in the project

Signed: _____

Date: _____

Appendix I: Participants' Rights

By consenting to take part in the research project, you understand that as a participant in the research project, you would have the following rights:

1. Right not to participate
2. Right to withdraw

3. Right to give informed consent
4. Right to anonymity
5. Right to confidentiality

Right not to participate

By consenting to take part in the study, you understand that you don't need to take part in the study if you don't want to.

Right to withdraw

If you change your mind about participating in the study at any time, then you can withdraw from this study without giving any reasons for doing so.

Right to give informed consent

You as participants have the right to give consent to take part in the study only when you are informed about what is involved in the study.

Right to anonymity

Your identity will be protected by using pseudonyms throughout the study.

Right to confidentiality

Any data kept about the participant's will be stored securely and will not be disclosed to any unauthorised people. Any information you give will be used for research purposes only and will not be used for any other purpose.