



FACULTY OF SCIENCE & TECHNOLOGY

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An awareness package for combatting fraud amongst the
elderly using Eduweb

by

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Abstract

This project explores the gap in knowledge amongst the elderly and technology. For the majority of elderly people's lives technology did not exist and many have not adapted to the newly connected world, leaving them digitally illiterate. Current technology is evolving rapidly in a way that many day to day activities are becoming solely online signifying that getting online is crucial. However, although elderly people are starting to successfully use the internet, they do not have any knowledge of the dangers associated. Elderly people are classed as a vulnerable demographic and therefore exposing them to the dangers of being online increases their vulnerability. There are few pedagogies available for the education of elderly peoples online safety, and those that are available do not get utilised. This paper is examining the current solutions for this problem area and proposing a new pedagogy in which young, educated individuals teach the elderly about their online safety. Research will be done into the best learning techniques for elderly people and content will be created incorporating computer security knowledge in a fun and interactive way that will allow the young to successfully teach the old. This content will then be deployed on an EU funded educational website, EduWeb, to gain coverage and incorporate their use of gamification as a tool to motivate elderly people. This will provide a safe and creative space for the young to become educators and the old to learn.

Keywords: elderly, social engineering, pedagogy, fraud, learning techniques, digital community, gamification, vulnerabilities

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1.0 Chapter 1 - Introduction

1.1 Introduction

Digital exclusion has become a problem in society due to the dependence of ICT increasing (EUBIA, 2010), causing a digital divide between generations. In 1988, the Education Reform Act (1988) was implemented within all schools in England and Wales with technology becoming a compulsory subject. However, this begins the isolation for generations who did not get any access to such education. Newer generations have had the fortune of being able to learn and adapt with technology. Generations that just missed out on this education are more influenced to use it in society and their work lives, however, the older demographic are in a technological world with no education and no one to teach them. Unless they actively seek guidance, it is unlikely that they will experience any form of training in the usage or risks of technology.

1.1.1 Background of the Problem

People over the age of 75 have been consistently the lowest internet users since 2011. An Age UK study has shown that this could be due to fear (Green et al, 2013) of 'breaking' an expensive device or accidentally paying for something. However, internet use between the ages 65 and 74 has increased by 26% between 2011 and 2017 (ONS, 2017). This indicates that the older demographic are starting to bridge the gap between themselves and the digital generations. This is crucial as everyday tasks are becoming based online. For instance, banks are closing and 'online banking' is becoming the most common way to access your bank account, meaning elderly people that are not online will be excluded further and may face an even higher level of discrimination (EUBIA, 2010). Technology has the ability to improve the lives of the elderly by reducing loneliness and integrating them into the community (Iancu, 2017). Therefore, it is becoming a necessity to teach them to stay safe online. ICT can enhance the independence of the elderly (Sixsmith & Gutman 2013) and create the safest environment for them to develop in.

1.1.2 Statement of the Problem

Lack of computer and internet skills are contributing factors to elderly peoples vulnerability online (Arfi et al, 2013). This creates a community of online users that

are susceptible to cybercrime and more likely to be targeted due to societies perception of them having more money (George et al, 2015). In addition, elderly people who are more socially isolated are more vulnerable to attack. An Age UK (George et al, 2015) study shows that victims older than 55 experienced twice the financial loss than younger people due to a scam online. This indicates a need in the elderly community to have accessible information that can help protect them online.

1.1.3 Purpose of the Study

Personally identifiable information is the data that can identify or distinguish a specific individual (Rouse, 2014). The Data Protection Act (1998), contains laws that protect people from the consequences of leaked data due to mishandling by an organisation. The repercussions an organisation can face if not abided by can ruin them financially and socially. Therefore, organisations are coming out with measures that prevent them from being liable for any parts of the act not being followed. This means that consumers hold some responsibility for their own data. Good cybersecurity needs people to participate correctly and not just rely on technological defences (Wong, 2016) yet elderly people have no education on this to protect themselves. This indicates the problem area and need for awareness around online safety.

1.1.4 Research Questions and Objectives

	Key Research Questions
1.	What learning techniques can be used to educate the elderly on identity theft and keeping their personally identifiable information protected?
2.	What pedagogy can be successfully used for young people educating the elderly for staying safe when conducting their online tasks?
3.	What design packages can be tested, used and deployed anywhere to create a digital community for the elderly?

Table 1 Key Research Questions

	Objectives
1.	Identify the top best learning techniques to integrate elderly people into the digital age and the best teaching techniques for digital citizens using fun and interactive features and technologies.
2.	Design packages to advance computer security knowledge and develop the packages in a way that they can be deployed anywhere
3.	Create and deploy content for the European funded project, Eduweb (EduWeb, 2017), to reach and expand the digital community and gain as much coverage as possible.

Table 2 Objectives

1.1.5 Significance of the Study

Current day education focuses on preventing children from falling victim to cybercrime. The more digitally literate children become, the safer they are (Livingstone et al, 2010), and approaches should be equally important for the elderly. This study aims to apply new techniques of equal importance for a successful pedagogy for the elderly as well as allow young adults to use their knowledge to educate the old. Using gamification and incorporating listening, getting advice from teachers or videos and using computers themselves (Kordy, 2015) can result in awareness around online safety. Elderly people respond well to these techniques and can play independently (McCallum, 2012), therefore, being significant in the success of this project.

1.1.6 Assumptions and Limitations

The assumption of this project is that elderly people are vulnerable when using technology due to it not being in existence when they were in education. A definition of terms is provided in Appendix A to clarify any assumptions in the words used.

A limitation of this project will be time. The project time frame is 15 weeks whereby an artefact and a dissertation have to be produced. Research, methods, requirements, design and implementation and an evaluation have to be completed in this time. This means that any issues that might occur have to be factored in so that the deadline can be still be met.

An issue that could limit this project is accessing people in the correct target audience. Requirements will have to be elicited from the target audience to gather evidence and their perspective on this project. However, finding willing candidates may cause problems and this could affect the time frame of the project.

Another limitation for this project is access to necessary resources. Software will be required to complete certain aspects of the artefact and cost of this software could limit the functions available. Also, resources to elicit requirements, such as online survey websites may not be easily accessed by the target audience and therefore alternative methods will need to be practiced.

1.1.7 Conclusion

The proposed solution for this is to give young people the incentive to teach the old. Similar existing materials involve the “Mentor Up” program where senior management are paired with young employees (Proctor & Gamble, 2008). Young people that have recently learned the safe use of technology can contribute to the proposed pedagogy by transferring their knowledge. By allowing the young to teach the old, resources can be used to their full potential. Young people can increase their self-confidence whilst both the young and the old can learn how to understand ideas from other people’s perspectives (Ashton, 2010). This framework can continue to enforce the issues of cybercrime for young people, whilst also highlighting the issues to the elderly.

This project aims to create security packages that can be deployed anywhere by recycling the information that is already circulating to minimise the risks of the elderly using the internet. The packages will initially be uploaded onto Eduweb, an EU funded website designed as a way for children to educate the digitally illiterate in online safety (Eduweb, 2017). Eduweb will be used to help reach a larger target audience and show how the packages can be used by others. This will demonstrate how different social media platforms can use it to create communities of learning and can be the beginning of combatting online vulnerability for elderly people.

2.0 Chapter 2 – Literature Review

2.1 Systematic Literature Review

2.1.1 Search Description

A systematic literature review was conducted using the objectives and research questions a guide into relevant material. This was then formatted into a table to clearly identify which parts of the literature were being used and what ideas were being taken from it. Each paper was listed with a description of the topic, a method for each was then put into the table to clarify what the material would be used for within this paper and an example of what artefacts could be produced from this.

Objective 1	Identify the top best learning techniques to integrate elderly people into the digital age and the best teaching techniques for digital citizens using fun and interactive features and technologies.
Research Question	What learning techniques can be used to educate the elderly on identity theft and keeping their personally identifiable information protected?

Table 3 Systematic Literature Review Objective 1

Papers	Description	Method	Example
Digital Inclusion Evidence Review (Green & Rossall, 2013)	What elderly use the internet for? Emails, social media (phishing and social engineering)	Gather examples of risks associated with emails, social media and transactions List preventions of these risks	Step by step guide or video – follow along, feel involved, interactive

	<p>Transactions (online shopping, banking)</p> <p>Keeping in contact with people</p>		<p>(social engineering, password strength, phishing)</p>
<p>Pedagogical Proposal to Increase Senior Citizens' Quality of Life (Escuder-Mollon et al, 2013)</p>	<p>Appropriate Pedagogies</p> <p>Group activities, conversations and discussions</p> <p>Active learning</p> <p>Not based on memory capacity</p> <p>No exams but progress based evidence/reaching a goal</p> <p>Way to keep up to date in society</p>	<p>Groups of similar ages/abilities/likeminded people learning together</p> <p>No lectures</p> <p>Opportunities benefitting the group as motivation</p> <p>Interactive</p>	<p>Gamification (reward is given for getting correct answer)</p> <p>Solving a puzzle</p>
<p>Older People, Technology and Community (Independent Age, 2010)</p>	<p>Barriers</p> <p>Technology is not marketed in a way that reflects elderly's needs and interests</p> <p>Lack of interest from the designer to get attention of elderly</p>	<p>Create ways to market technology and the importance of staying safe specifically targeting the elderly</p> <p>Get elderly people interested and willing to learn</p>	<p>Posters to raise awareness (Be respectful and relevant, use large font, do not include jargon, network with associates of senior citizens to gain trust and be supportive)</p>

<p>Training Older Adults To Use New Technology (Hickman et al, 2007)</p>	<p>System Training Guided Action Training Guided Attention Training</p>	<p>Guided Action Training involves giving a step by step of how to perform tasks, participants performed faster and more accurately Guided Attention Training involves the working memory and participants performed better when instructions were taken away</p>	<p>Create a story board of listed actions to take (guided action training) Level up</p>
<p>Cybersecurity – Threats Challenges and Opportunities (Wong, 2016)</p>	<p>Elderly’s knowledge of cybercrime Elderly are vulnerable as they have assets More likely to be targeted due to vulnerability Even be exploited by family and carers due to lack of knowledge</p>	<p>Being targeted and exploited would be more difficult if the elderly had some awareness of the crimes that can be committed</p>	<p>Small list of the most likely cybercrimes with brief explanation and help sheet</p>
<p>Only the Tip of the Iceberg: Fraud Against Older</p>	<p>Elderly being targeted More money Socially isolated</p>	<p>Targeted as they are seen as being vulnerable therefore take</p>	<p>All of the above</p>

People (George et al, 2015)		away the vulnerability and they may start to be targeted less	
Teaching IT to Seniors (Kordy, 2015)	Elderly top ways of learning Listening to teachers and videos Advice from teachers or videos Using computers themselves	Workshops with teachers Advice sessions Independent work on computers with options for help available	Getting young people to do workshops and lessons for elderly to attend

Objective 2	Design packages to advance computer security knowledge and develop the packages in a way that they can be deployed anywhere		
Objective 3	Create and deploy content for the European funded project, Eduweb (User, 2017), to reach at least 500 users to expand the digital community and gain as much coverage as possible.		
Research Question 2	What pedagogy can be successfully used for young people educating the elderly for staying safe when conducting their online tasks?		
Research Question 3	What design packages can be tested, used and deployed anywhere to create a digital community for the elderly?		

Table 4 Systematic Literature Review Objectives 2 + 3

Papers	Description	Method	Example
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<p>Who's the Mentor now? A Word of Caution About Reverse Business Mentoring (Ashton & Petrin, 2010)</p>	<p>Reverse Psychology Reverse mentoring "Mentor Up" Young people successfully teaching old people Both gain confidence</p>	<p>Team young people who have recently received safety awareness education and get them to exchange their knowledge Elderly tend to ask their younger relatives to help them</p>	<p>A group of young people (school kids?) who want extracurricular/ extra credit helping willing elderly people to learn</p>
<p>Vault guide to Management and Leadership Development Programs (Proctor & Gamble, 2008)</p>	<p>Leadership Programs and Training Need 'students' to be empowered through action learning Discussions of goals Formal and informal support Join up programs for minorities Access to resources</p>	<p>Real life problems that elderly will come across or be targeted against Performance based learning rather than reading</p>	<p>Join up likeminded adults with similar modifications</p>
<p>Education and Learning for the Elderly: Why, How, What (Boulton-Lewis, 2010)</p>	<p>How do they want to learn? Organised activity as well as one on one conversations Reading, conversation and educational television</p>	<p>Crave challenges Ways to improve brain skills and functions Using working memory in small amounts to build its use</p>	<p>Group discussions Individual discussions</p>

EduWeb: Combating Digital Exclusion: Children Educate Digitally Illiterate Adults in Safe and Creative Web (EduWeb, 2017)	Young coaches Young coaches taught how to coach digitally illiterate	Digital learning allowing people to choose what is relevant and interesting to them	Mobile learning Gamify rather than grading Involvement in social media Young coaches with support of teachers and experts
(Wilkinson et al, 2017)	Educational Material Specification	Specified learning outcomes	“By the end of this you will be able to”
Gamification and Serious Games for Personalised Health (McCallum, 2012)	Gamification Form of learning that elderly people respond well to and can play independently	Being taught without having to keep asking for help	Simple and educational games used instead of exams
Gamification and the Future of Education (Oxford Analytica, 2016).	Four freedoms Freedom of failure Freedom to experiment Freedom to see a problem from a different perspective Freedom of effort	Taking the pressure off of learning to make fun and interactive ways for participants to get involved	Low intensity simple games where information is used as a key to success

Research	Reports and back up real life stories for storyboards
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Table 5 Systematic Literature Review Research

Papers	Description	Method	Example
Gil From London (Judge, 2015)	Fake Profile Podcast Karen met Gil Harper on Facebook He claimed to be an old English widow Son was suspicious so investigated Turned out to be foreign	Story of a widow meeting someone online (dating site or social media) and him ending up being fake	Storyboard
Flood of Romance Scams Defrauds Older Victims (Baker, 2016)	Sunmola Case Nigerian citizen operating in South Africa Fake profiles on Plenty of Fish, eHarmony Use pictures of real people	Story of a widow meeting someone online (dating site or social media) and him ending up being fake Foreign using someone else's pictures	Storyboard Dating Scam
Top Online Scams Used By Cyber Criminals to Trick You (Rijnetu, 2017)	Top Scams Romance scams Phishing	Scams that can be made into storyboards from real life cases	Storyboards Romance scams Phishing

	Fake shopping websites		Fake shopping websites
Online Shopping Scams (Scamwatch, 2018)	Illegitimate Websites Warning signs Protecting yourself Reports with financial loss 61.8%	Fake websites that you enter credit card details and pay money for items and never receive anything	Storyboard Illegitimate Websites
Dating & Romance Scam: Georgina's Facebook Fiancé leaves her flat broke (Scamwatch, 2018)	Real Life Dating Scam Foreign serviceman dating English woman over Facebook She transfers him money to cover his tax as he claims his bank card is not working Over \$100,000 to help him	Dating online Never met significant other Gain trust, love, relationship Do anything to help them out, even send money	Storyboard Dating Scam
Typologies and Victims of Fraud (Button et al, 2010)	Victims Consumer fraud is higher risk for elderly than other crimes Unknowing victims that are oblivious when they succumb to fraud	Elderly people being vulnerable	All of the above

<p>I Fell For a Phishing Scam: A Case Study (Conner, 2017)</p>	<p>Jacks Story Email from 'bank' Clicks link in email to enter personal details Fraudsters got enough details to steal Jacks identity Applied for a credit card in Jacks name</p>	<p>Consequences of clicking links in emails Do not trust anything until you have checked</p>	<p>Storyboard Phishing scam</p>
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2.2 Qualitative Literature Review

A review of relevant literature has been conducted to better understand the gap in the market for the elderly's learning needs and available pedagogies. This will increase the knowledge that is necessary to correspond with the projects aims and focus on the most important techniques that can be used to achieve the projects objectives.

2.2.1 Overview

In 2015, the UK governments expenditure on science, engineering and technology reached £11.4 billion due to its importance in young people's lives (ONS, 2015). One in three adults have low or no ICT skills (Bacsich, 2015) and funding for adult education is a major problem throughout Europe. In 2013, 79% of people aged 65 and over could confidently communicate via email (Age UK, 2013) whilst 20% felt confident using social media. This demonstrates that the older demographic are beginning to incorporate technology into their lives. However, this creates a community of online users that have had no education on the use of the internet or its dangers. Organisations such as NSPCC and BBC Bitesize have pages dedicated to online safety for children and parents, yet it is not just children who are vulnerable online. The financial loss of elderly people is likely to be twice as much as any other demographic (George et al, 2015) as well as social isolation increasing online vulnerability due to having less of a chance to discuss matters with others.

2.2.2 Digital Exclusion

It is likely that "traditional" or non-technological services will diminish completely as their uses have already begun to decrease (Lahtirinta & Kimppa, 2006), affecting services like the banking sector and medical assistance. This could cause unnecessary stress, especially for the elderly, due to the services they have grown accustomed to ceasing to exist. Banks are reducing staff and closing their uneconomic branches to begin experimenting with new concepts, focusing heavily on technology (Sullivan et al, 2014). In the UK, there has been a 30% growth of online banking usage between 2007 and 2017 (Statista, 2018). The government is considering changing their services to "digital by default", terminating the original service and moving it all online (Jellinek, 2011). The benefits include independence and ease of access, however this could add to the struggle of the digitally illiterate.

The older demographic are a group of people that need this public service for tasks such as pensions, council tax and disability allowances, therefore their existence becoming solely online may become a hindrance.

2.2.3 Current Solutions

Affordability, lack of confidence and the fear of change are contributing factors to elderly people staying offline (Age UK, 2009). Digital exclusion is being noticed by the government as they try to embed digital inclusion into their policies to make ICT design features appropriate for older people (Government Office for Science, 2014). Movements are being made to raise awareness about the benefits of being online and obtaining skills in technology (Age UK, 2009). Despite this, the awareness and training is limited solely to the importance of being online, with no incorporation of the importance of online safety.

The default method for elderly people learning about technology is to ask their younger relatives. There are online guides and websites for young people to help older family members stay safe online (Ingram & Stone, 2014). However, this is insufficient due to the presumption that everyone has somebody available (Span, 2013) as this does not factor in that some elderly people have no relatives or their relatives are not willing to sacrifice their time. There are websites and blogs such as the Senior Advisor (Senior Advisor, 2015) that provide information for elderly people. However, sites like Seniors Advisor become laborious and boring because of the amount of information they put into one document, losing the attention of the user. Also, their use of “jargon” can end up alienating the people (Business Editorial Staff, 2017) and elderly people either have to look for a “jargon buster” (Get Safe Online, 2018) or they will inevitably give up.

Organisations such as Age UK (Age UK, 2017) supply online facilities in which elderly people can find training courses to sign up to. There are three main factors for adults to begin learning – personal characteristics, reasons for participation and the context in which they learn (Mortimore, 1999) indicating that it has to be a personal choice for them to take it seriously. This develops the idea that there has to be motivation for older adults to take such actions, whilst also creating social exclusion for the people who cannot afford to participate. In addition to this, there

have been campaigns held such as the Festival of Learning (FOL, 2018), although this is only relevant for people willing to get involved and does not tackle the issues directly.

In 2016, 10.4% of age 65 and over are in still employment, compared to 5.5% in 1992 (ONS, 2016), indicating that there is an increase of elderly people still in the workforce. People in this bracket may have online awareness training available at work. However, this does not tackle the main issue as the majority of elderly people cannot access luxuries like awareness training and need a solution that will work.

2.2.4 Online Usage

In 2015, 5.9 million adults (11%) had never used the internet (ONS, 2015), with three million of these people being aged 75 and over. However, despite the use of the internet being lower in older age groups, the proportion of older adults that had never used the internet decreased by 15% between 2011 and 2015 (Kirk, 2015). Even though elderly people are beginning to use the internet more, they use a smaller range of online activities (Age UK, 2016). The five main online activities used by elderly people are communication, general browsing, social media, entertainment and transactions. This means there is becoming an eco-system of elderly people that are new to the internet that missed out on the education that younger adults had access to (*See Figure 1*).

STS: Elderly Peoples Online Use Ecosystem

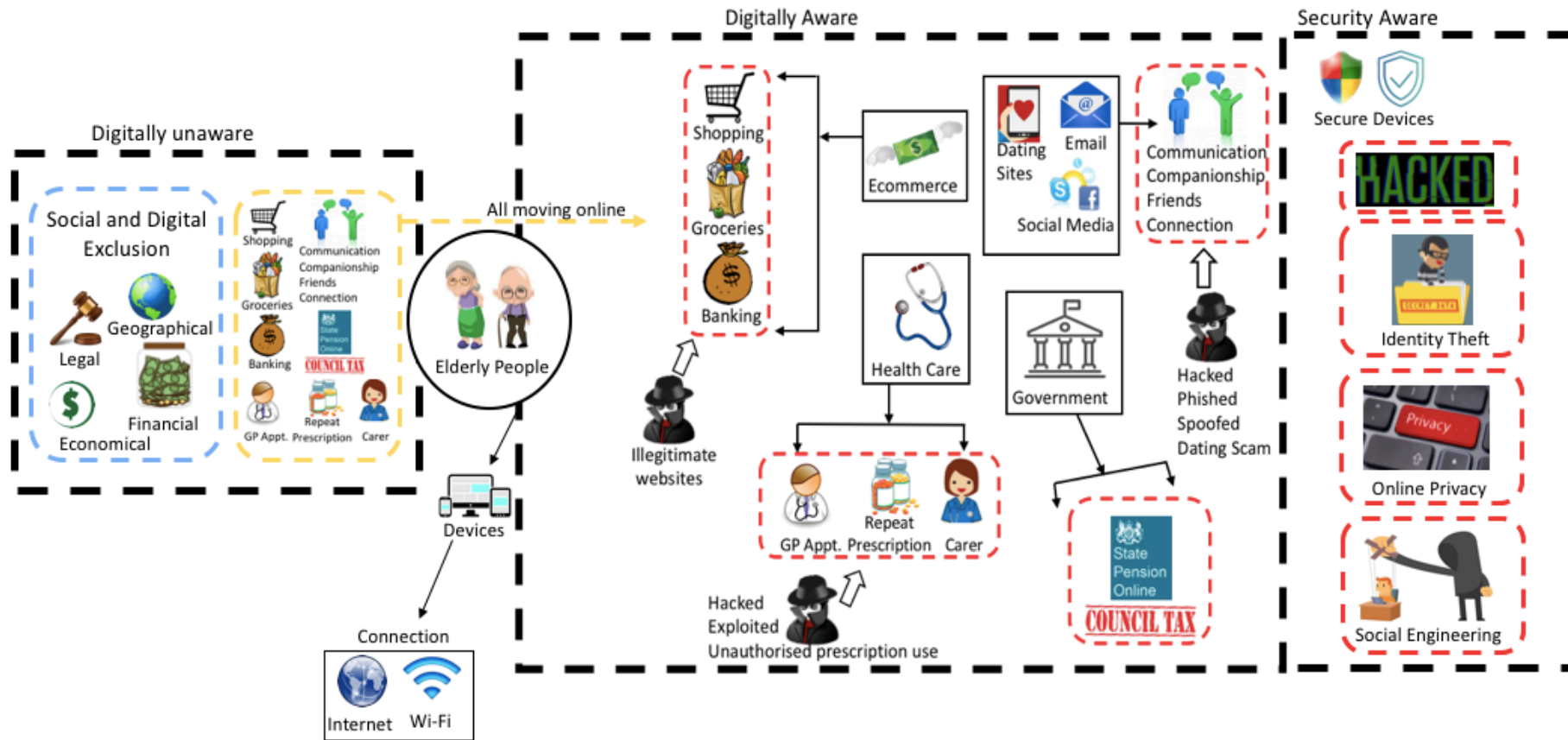


Figure 1 Rich Picture








Key	
	Connections
	Protected shields that are needed to prevent attacks and corresponding threats they shield
	Attackers/Threats
	Awareness Environments
	Middle space overlapping both awareness environments indicating elderly people are on the edge of both
	Reasons for social/digital exclusion
	Examples of everyday things where "traditional" methods are being removed and new methods are solely online

Figure 2 Rich Picture Key

Figure 1 indicates the eco-system of elderly peoples presence on the internet; the digitally unaware, digitally aware and security aware. This highlights the range of activities that elderly people use, where the digitally unaware are moving online into the digitally aware environment. The protective shields around each activity is indicative of the protection that the security aware have for each threat.

2.2.5 Threat Analysis

Cybercrime can be defined as crimes committed on the internet using the computer as a tool as well as targeting victims (Dashora, 2011). A popular type of cybercrime is social engineering. Social engineering is a hackers clever manipulation to exploit a humans natural tendency to trust (Granger, 2001) It requires minimal technical knowledge and is an effective way of gaining unauthorised access (White, 2015). It is also considered to be one of the biggest attacks to online security (Albladi & Weir, 2016). Human based deception is a common type of social engineering attack whereby humans are manipulated to give out personal information (Power & Forte, 2006). A popular social engineering activity is phishing, acting as trusted personnel to steal personal information, usually sent via a malicious link within an email. Between 2007 and 2008 there was an increase of 66% of phishing websites detected (Campbell, 2010). This shows that they are on the rise and if elderly people cannot recognise phishing they are more likely to fall victim to it.

In 2015, changes to pension law were made allowing people from the age of 55 to access a lump sum payment from their pension pot (HMRC, 2015). After this,

attackers started pension scams offering to help release pensions before the age of 55 (FCA, 2017). The City Of London Police estimate that £9 million was lost to pension scams in 2015 (Age UK, 2016). This highlights the evolution of cybercriminals as they become accustomed to creating relevant attacks that can be easily mistaken for reality.

A popular cybercrime that older adults are vulnerable to are dating scams (May, 2014). A dating scam is where the criminal will create a fake dating profile to take advantage of people looking for romantic partners (Scamwatch, 2018) and play on emotional triggers to get their victim to send money or personal details. Typical victims are females between the ages of 45 and 70 who are looking for companionship (Hickey, 2015). BCC News reported that the number of people defrauded through online dating scams rose in 2016 in the UK (Cacciottolo & Rees, 2017). Just under 4000 victims admitted to being targeted and a record £39 million was handed over. However, due to people being too embarrassed to report being scammed, it is difficult to get an accurate measure of the extent as it is estimated that under 5% of victims report scams (Age UK, 2016).

Over half of people aged 65 and over believe they have been a target of a scam (Age UK, 2016). A third of elderly people who became victims lost over £1,000 or more as well as a lot of cases losing over £100K. The financial impact these scams have can cause mental and physical deterioration for an older person. Everyone who comes online is exposed to these kinds of risks and having no education will increase the success cybercriminals.

In 2015, 21% of older adults claim they are financially secure and rarely find they have too little money (Dixon, 2015), 21% claim they are in the best financial position and never run out of money whilst 12% have some disposable income but would run out of money if they were not careful. This indicates that over half of older people are in a financially stable position. Online criminals can target anyone in the world from a remote location and the majority of the time their goal is fraud (National Audit Office, 2017). Fraud is a criminal deception for financial or personal gain (Oxford University Press, 2018) and is a major threat amongst the elderly. In the UK, the wealth of the elderly is reported regularly in newspapers with information on pensions and

exemptions such as National Insurance, TV licenses and travel (Wintour, 2015). This knowledge creates an idea amongst cybercriminals that the elderly are a good financial target.

Those aged 55-65 make up 18% of the population but control around 30% of the wealth, whilst those aged 65-75 make up 14% of the population and control 19% of the wealth (Somerset-Webb, 2016). In general terms, elderly people have accumulated more wealth than those in younger generations (Vernon, 2015), therefore increasing their risk of being targeted as a perception is built that elderly people have savings and assets. Add in factors that increase vulnerability such as isolation and physical decline and this combination forms the perfect candidate for attack, meaning threats are undoubtedly going to be high amongst this demographic (FBI, 2018). Key stereotypes of old age are isolation and loneliness (Davidson & Rossall, 2015) thus old age itself is thought of as involving greater challenges and a reduced capacity to respond (Grundy, 2006). BBC News have reported many different cases where the elderly have been exploited due to isolation or loneliness. One case informs that a carer manipulated an elderly lady into giving over her bank details and changing her will to benefit her as the family was not offering any support (BBC News, 2017) whilst others describe of widows being defrauded through a funeral plan for their late husband (BBC News, 2015). Anyone can become victim to fraud but specific types of fraud are conducted against certain groups of people (Age UK, 2015). Therefore, lacking education can be the final factor that inevitably amounts to successful attacks. *Figure 3* is an attack tree showing the threats associated with this project from the literature found.

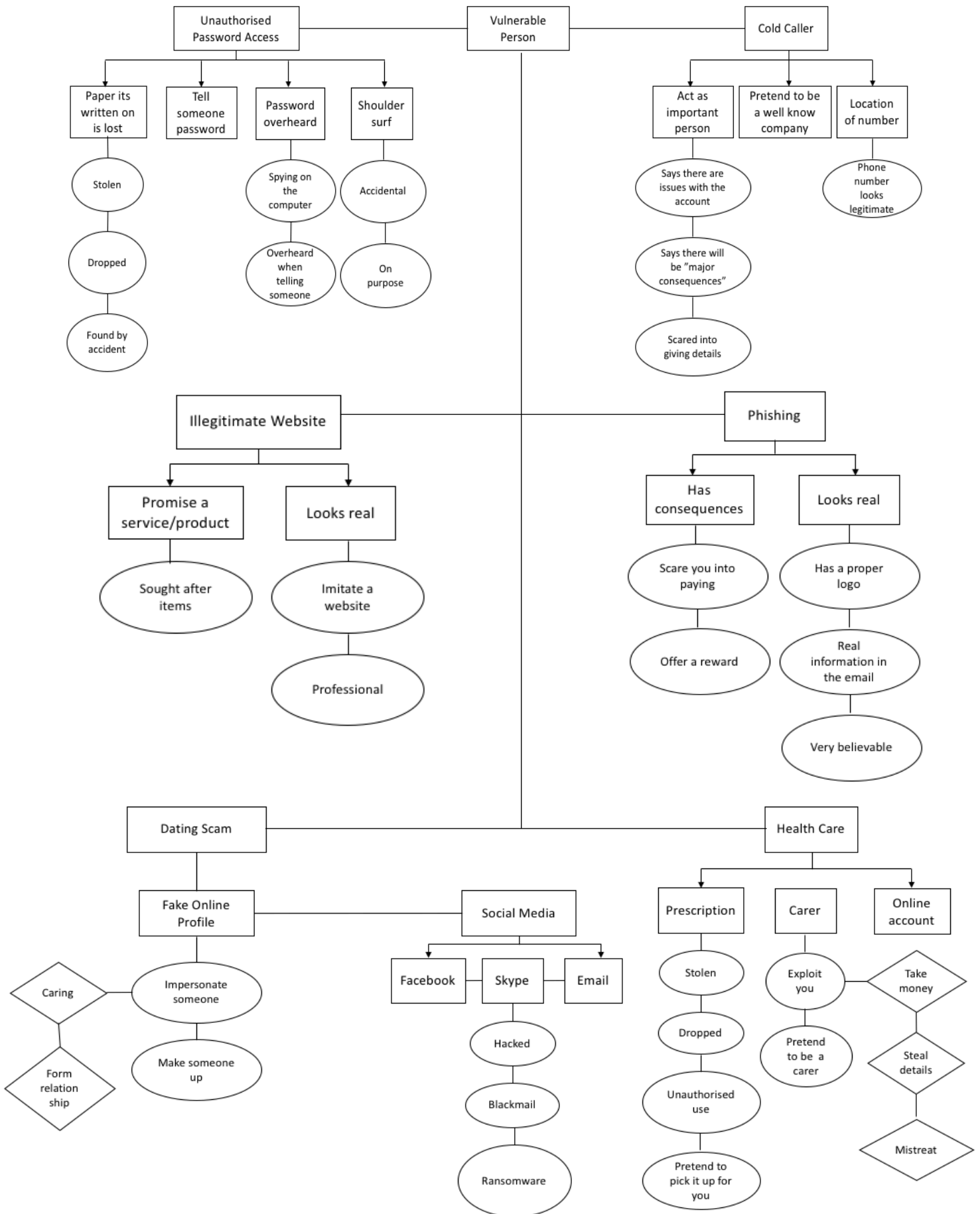


Figure 3 Attack Tree

2.2.6 Preventions/Need for Information

If the risks and effects of electronic impersonation are ever going to be managed, concentration must be on preventing and detecting fraudulent transactions (Schneier, 2008). Depending purely on defence poses significant risks and therefore having a good offense is often the best cyber defence. Understanding what a cyber-attack is and the importance of having protection is a critical factor of prevention (Teymourlouei, 2015). The government trying to design features appropriate for older people highlights that the issue has been recognised (Government Office for Science, 2014). However, preventions created using technological solutions do not solve the issues of online safety, as the omnipresence of technology does not necessarily give elderly people any motivation to learn new abilities and they find that that acts as a barrier in the process (Iancu, 2017). Studies show that more precautions are taken by people who have previously been a victim to social engineering, yet people who have never experienced it do not maintain much vigilance (Workman, 2007).

2.2.7 Pedagogy

The education of children, the majority of the time, comes before the education of adults (Mortimore, 1999) as well as adults having less resources available. Cyber safety is a huge focus for children and is spread worldwide (Pusey & Sadera, 2014), and although the threats of being manipulated online are similar and equally important for elderly people, it gets less recognition. Teaching older adults can be a more complex task than teaching children due to their psychological and social differences. Elderly peoples learning needs and preferences may not change drastically between them and young people, however specific needs such as accessing the digital world should be focused on (McNair, 2011). A willingness to learn is more likely if they are more aware of the dangers of being online but only a minority of elderly people can rely on awareness and training from their workplace as 9.5million of over 65's are taking advantage of retirement (The Telegraph, 2018).

Organisations such as The USAA Education Foundation (The USAAEF, 2008) provide online booklets on internet safety, an example of the current teaching method that older adults are expected to use. This method involves manually looking up tools and tips listed online. However, although there are excellent educational

resources out there (Winterton, 2016) this has not been a sustainable way of reaching the target audience, leaving the more commonly used method and potentially most effective; asking a younger relative. Most millennials can offer examples of trying to teach an older family member how to use technology and become frustrated by their lack of knowledge (Levinson, 2017), also leading the elderly to feel like an annoyance.

The suggested pedagogy for this project is creating content and using a safe space for younger, digitally literate people to teach the digitally excluded (Economou, 2017). This concept promotes a type of interaction that can energise old people (Ashton & Petrin, 2010) whilst making a more comfortable environment for young people to feel equality amongst people they see as authoritative figures. School children in Cardiff were given the opportunity to teach elderly people about the digital world and enjoyed teaching someone rather than being taught (BBC News, 2018), and this idea resonates with young adults as well. Using this pedagogy of young people teaching the old eliminates the didactics assumedly involved when adults are taught by other adults as they are more likely to be seen as a guidance rather than instructing (Economou, 2017). Embedding education about safety measures whilst learning how to use technology can ensure that online safety is complied to immediately and will not have to be learnt after the fact.

Using EduWeb creates a platform that can reach a large target audience. EduWeb is structured in a way that accommodates the pedagogy that this project is following. By creating authentic artefacts, giving learners the choice of what to learn, guiding the participant through their intended outcomes and then allowing them to reflect corresponds to the framework EduWeb focuses on (Wilkinson et al, 2017). Gamification is also used within EduWeb as an educational tool to motivate older adults (Economou, 2017). Gamification is the use of gaming elements and approaches to promote active learning and provide motivation and fun (Kiryakova, 2014). EduWeb gamifies grading systems by abandoning typical grading and introducing experience points (Economou, 2017) with failure being allowed to encourage perseverance. The ability to deploy content in this way facilitates the ethos of this project of the transfer of knowledge from young to old and combatting digital exclusion safely

3.0 Chapter 3 – Methodology

3.1 Project Management

Iterative development is a method used to simplify the completion of a process by carrying out each action individually and continuing using repeated cycles. Each smaller part of the project can be designed, developed and evaluated without a finalised completion of any part needed to move on. Iterative development allows for each part of the process to be evaluated against the requirements rather than leaving the evaluation to the end. The flexibility of this encourages each step to be formulated accurately and to the best standard. This enables each individual process to be accounted for and adapted accordingly should any issues occur.

3.1.1 Instructional Design Methods

Initially, different instructional design models were compared as a way of deciding which process would be most fitting for this project. The criteria that this model would cater to include a short time frame and having a small team containing the project manager and the supervisor.

The most appropriate model chosen was the successive approximation model (SAM) as its cyclical process allowed the project to be easily tailored (*See Figure 4*). This approach allowed for regular sprint meetings that provided support and guidance towards the goal. This ensured that the members involved in the project were kept up to date and any problems that occurred could be solved quickly. This supports an iterative approach which would prove necessary in the development stages of this project. Using an agile process provided a successful approach choice due to the dynamic environment in which the project took place. Having a set time limit on the project meant that if parts of the development did not initially work, rapid adaptations would need to be made to ensure time was managed correctly. Each requirement could be reconsidered if the results did not achieve the desired effect whilst ideas and prototypes could be changed if they did not fit to the requirements. Additionally, due to the short duration of the project, evaluations could be drawn after each step, providing adequate guidance on the progress being made. This approach ensured

that rather than finding mistakes at the end changes could be made after each advance.

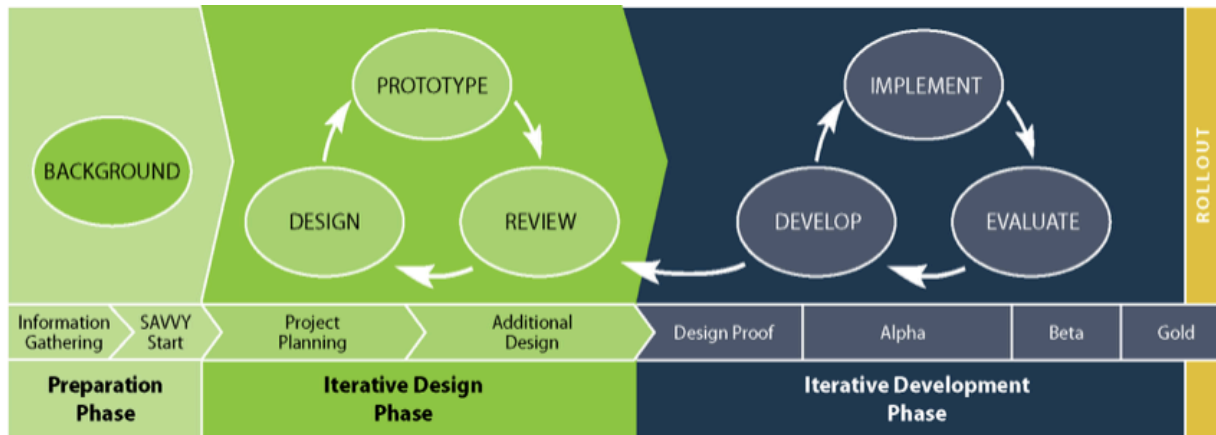


Figure 4 SAM Model (Allen Interactions, 2018)

3.1.2 ADDIE Process

The ADDIE model, an acronym for analyse, design, develop, implement and evaluation, was another instructional design method considered for this project. ADDIE follows a systematic approach (Rimmer, 2017) with each step having to be completed successfully before the next one can begin. ADDIE is a waterfall approach thus each action is performed in the correct order and adaptations can only be made when operating on that action. In light of this project, the linear structure would limit the effectiveness of the development and implementation stages. This model is becoming considered outdated as its inflexibility creates too many constraints (Allen, 2012). The process that the ADDIE model follows is the correct structure for this project therefore was a good candidate. However, the inability to deviate away from the current action would have obstructed its progression.

3.1.3 Soft Systems Methodology and Rich Picture

Peter Checklands soft systems methodology (SSM) was created as an organised way of dealing with real life complex systems, using a seven stage approach (Checkland & Scholes, 1999). This methodology is used for organisational process modelling and uses an initial appreciation of the problem situation containing 'real world' activities that could be relevant solutions to the problem. This puts together practical approaches to begin identifying a solution to the problem. All people

involved may have different opinions on what the problem is or what constitutes the purpose, therefore this methodology aids problems that are not clear cut (Walsh, 2015). One of these steps includes creating a rich picture (See *Figure 1*). A rich picture, visual representations of the root definition, is used to show the eco system of elderly people in cyberspace. This is a way to observe the client within the problem situation. Having an illustration of the cyber world can portray the engagement that elderly people have with technology. The rich picture can then highlight the threats associated within each component whilst also being able to focus upon what parts of technology are becoming compulsory in everyday life. This gives a general view of the problem situation and can be a way of targeting the risks.

3.1.4 Threat Analysis

Using the rich picture of the eco system of how elderly people interact with technology, an attack tree was created. "Attack trees provide a formal, methodical way of describing the security of systems" (Schneier, 1999). This supplies a visual representation of relevant attacks in a tree structure, with the root node being the goal and the leaf nodes being approaches that can be used to accomplish this. Attack trees operate as building blocks for threat enumeration (Shostack, 2014) and indicate the exact mechanisms used to conduct each threat.

Different ways of threat modelling were considered, including STRIDE. STRIDE is an acronym for spoofing, tampering, repudiation, information disclosure, denial of service and elevation of privilege (Shostack, 2014). Each of these categories are the reverse of properties the system should be aiming for; authenticity and integrity. STRIDE is likely to be represented in the format of a table where each category shows the threat, a definition and typical victims alongside the corresponding property. However, it was thought that this did not portray a complete perception of the attacks and methods used to perform the attacks.

3.1.5 EduWeb

EduWeb is a platform developed as part of the Erasmus funded EU project for combatting digital exclusion, sponsored by many different educational institutions across Europe (EduWeb, 2017). EduWeb is a website that gives an incentive for young people to teach old people in a safe and creative web space whilst tackling

the main issue of digital exclusion (Ntemkas, 2017). It is structured in a way that allows students to become educators as well as the digitally excluded having a choice about what they are learning. This was chosen over other methods such as Word Press as the structure allows for ease of access and the ability to reach a specific target audience. Word Press is a free software that allows you to create an online space for personal publication (Balkhi, 2015), with its open source nature accommodating to all manner of needs. However, the constraints this method held would have affected the time frame and scalability of the project. EduWeb has been designed for global outreach and already has an appeal to the target market, therefore exploiting this platform allows for a larger reach to the most appropriate candidates. The way EduWeb is presented collaborates young and old adults and can assist both into achieving their goals. The developed cyber risk awareness packages can be deployed on EduWeb and should receive a greater leverage into the target market than other potential methods.

3.2 Establishing Requirements

3.2.1 Overview

When completing a project that involves a target audience, requirements need to be established. This involves the target audience and the team or analyst specifying the obligations of the project. Requirements need to be realistic for the project goal and the time frame, as well as being a guide for the project to follow. A requirements specification needs to be developed and the requirements need to be elicited and analysed appropriately to aid in the success of the project.

3.2.2 Questionnaires

A short questionnaire was created to gather opinions and motivations of the target audience. Questionnaires are a quick and efficient way of gathering information from respondents (McLeod, 2018) by asking a series of questions that are relevant to the project. The questionnaire consisted of 10 questions (see Appendix F) and was focused on internet use, perceptions of online safety and what techniques are preferred when learning.

Online questionnaires are usually the most popular method to reach a larger audience. Technical challenges often occur when conducting online surveys with older adults, with the most common limitation being the inability to use the internet (Remillard et al, 2014). Sharing a link to a questionnaire on social media is a method widely used when carrying out research as there are automated technological tools that can collect, store and analyse large volumes of data (Staff et al, 2016) yet this was thought to be unproductive due to its constraints. These include participants not understanding the link is a questionnaire, not having many elderly people on social media and not understanding the layout of the questionnaire without guidance. Therefore, due to a lot of the target market being digitally excluded, more traditional methods were used. The questionnaire was created and sent via email to those who understood this process and could easily fill it in and send it back. Alternatively, it was sent to a relative who could guide the participant and then send the completed questionnaire back. Printed copies were also handed out and guidance was given to those who needed it as well as a focus group completing the questionnaire during their session.

The questionnaire was completed by 50 elderly people over the course of a month due to the difficulty in accessing a wide audience of this demographic. The amount of people who completed the questionnaire was based upon the amount of elderly people that could be accessed that were in the age range between 65-80. This is so that the perspectives of the correct target audience could be reached and accurate results could be gathered

3.2.3 Focus Group

A focus group was held accommodating 7 elderly people. This group size was chosen as a larger group is more likely to limit each individuals opportunities and be more difficult to control (Powell & Single, 1996) yet fewer would have limited the range of experiences. All participants were chosen as their demographic fit into the criteria of the focus group, ages 65-80.

There were 7 participants in the group to ensure there was a variety of different opinions collected so that the results could explore different angles. It consisted of a range of males and females due to claims that women are less likely to use the

internet than men (Age UK, 2016) and that separate genders learn differently as well as having contrasting attitudes towards this topic. The focus group was used to elicit requirements from the target audience and gain insight into the opinions of elderly people. Each participant signed a consent form to allow notes on the discussion to be written and used appropriately for this project as well as ensuring they consented to the data they provided being used (see Appendix G). The group was asked to consent for the session to be audio recorded, however due to some scepticism amongst the group, the session was not audio recorded and notes were taken instead (See Appendix H). The group was focused around a questionnaire that had been previously constructed and confirmed by the project supervisor. Each member completed the questionnaire, some needed help in writing their responses, and then the group began having an open discussion about the topics within the questionnaire. This was to get a better understanding into how the target audience perceived this project. Being able to hear the beliefs, perspectives and basic understanding of technology itself as well as pinpointing online safety as a key feature of the pedagogy.

3.2.4 MoSCoW Requirements

When dealing with requirements it is essential to understand that all of them will be important. However, using this technique, the requirements can be prioritised in order to understand what the target market value most and ensure this corroborates with the analysts idea of the project. This is imperative for both the target market and the analyst so that they know what is possible within the time frame and context of the situation. MoSCoW requirements are done using a must have, should have, could have and would have (MSCW) process, providing categories that discussed requirements can be embedded into. The four categories include:

1. Must have: a critical requirement that must be adhered to in a time critical manner in order for the project to be successful.
2. Should have: an important requirement, however does not need to be completed on such a strict time as the must have requirements
3. Could have: a desirable requirement that would add a lot to the users overall satisfaction of the project if the time permits. However, if it cannot be completed on time the project will still be a success.

4. Won't have: these requirements are not planned into the time schedule but can be reconsidered should time permit in the end stages of the project.

The complete MoSCoW requirements are shown in Appendix I

3.2.5 Requirements Analysis

The results gathered from the questionnaires will be analysed by the researcher and input into Microsoft Excel where each question will have its own sheet that can be displayed in a way chosen by the researcher. The chosen method is to show the information in pie charts with percentages for each of the answers. Chapter 4 will discuss any text based responses.

3.3 Design Methodologies

3.3.1 Prototyping

As part of the design methodology prototypes were created as a design technique for the project. After the initial requirements for the project are established, prototypes of the main content can be created. The initial drafts and prototypes should give an idea of what the content will be like when it has been completed. These will act as a demonstration into whether the product is ready to move into production stages (Elverum & Welo, 2014). This methodology for design works accurately alongside the chosen model for this project (SAM) and the prototypes took the form of storyboards (see Appendix J).

4.0 Chapter 4 – Requirements Analysis

4.1 Overview

After literature identified the current problems (See 2.2), a set of requirements were created to achieve solutions towards these problems. Determining requirements provides a narrative definition that will lead to the most satisfactory product and successful completion (Maciaszek, 2007). A requirements analysis involves tasks that are necessary for the artefact to achieve its goals (UACEG, 2010).

Requirements typically involve three different stages:-

1. Elicitation - methods of communicating with the target audience to gather research and resolve what the requirements should be, including interviews, questionnaires and observation (Maciaszek, 2007)
2. Analysis – coming to an understanding about any unclear or ambiguous requirements (UACEG, 2010)
3. Documentation – Final requirements are clearly recorded in an easily understood manner including Natural-Language documents, MoSCoW and use cases.

4.1.1 Elicitation, Analysis and Documentation

For this project, the requirements elicitation techniques were questionnaires and a focus group (See 3.2). The documentation technique chosen for these requirements was using the MoSCoW template (See 3.2.4). This was due to its ease of use and clear prioritisation scheme, meaning it is not as time consuming as other methods such as Volere but still provides confidence for the user (Ma, 2009).

4.1.2 MoSCoW Requirements

The MoSCoW requirements template provided a guide of how the requirements should be presented. It is explained in *Chapter 3.2.4* that the process involves prioritising the requirements from Must have to Won't have. The final requirements captured stem from the rich picture of the eco system of elderly's online usage, attack trees, questionnaires and a focus group. In addition to this, regular Sprint meetings with the project supervisor ensured that focus was kept throughout as well as contact being established with EduWeb when necessary.

4.1.3 Questionnaire Analysis

Gathering research through a questionnaire (See Appendix F) captured requirements from the target audiences perspective, ensuring that each requirement could be tailor made to create the best solution to the problem. The questionnaire was distributed to 50 people aged 65 – 80 (See Chapter 3.2.2).

Firstly, it could not be assumed that all participants had used the internet, therefore question 1 (See Figure 5) was used to gain an insight into this.

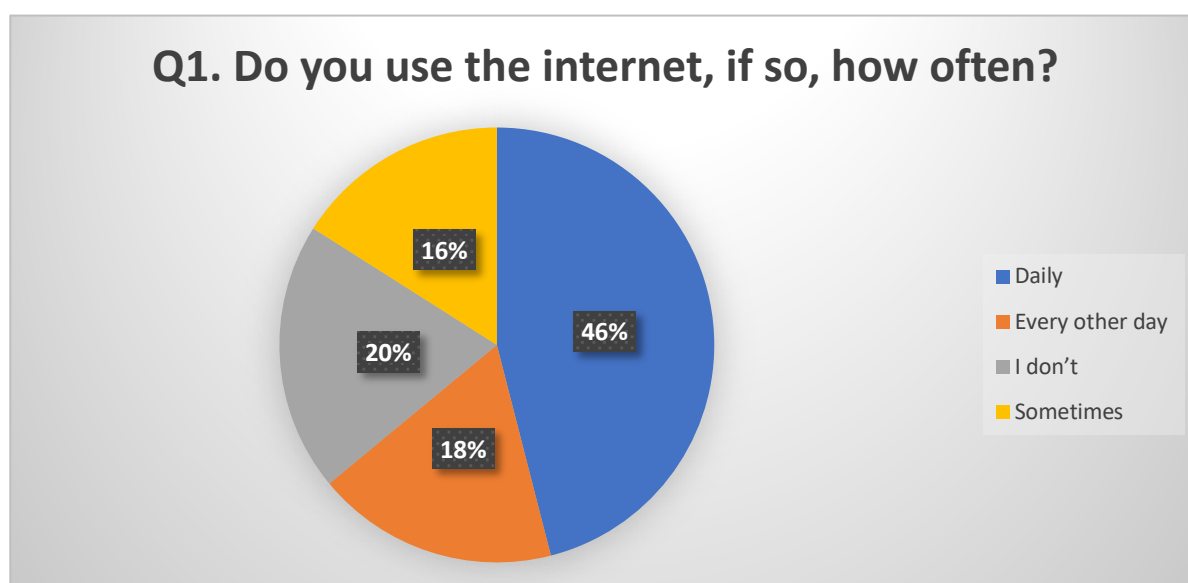


Figure 5 Question 1

Participants were then asked to inform of what they do on the internet when they use it (See Figure 6). Literature had already indicated the five main activities elderly people do online (See 2.2.4), therefore this was further evidence that could specify where the online danger lies for the elderly.

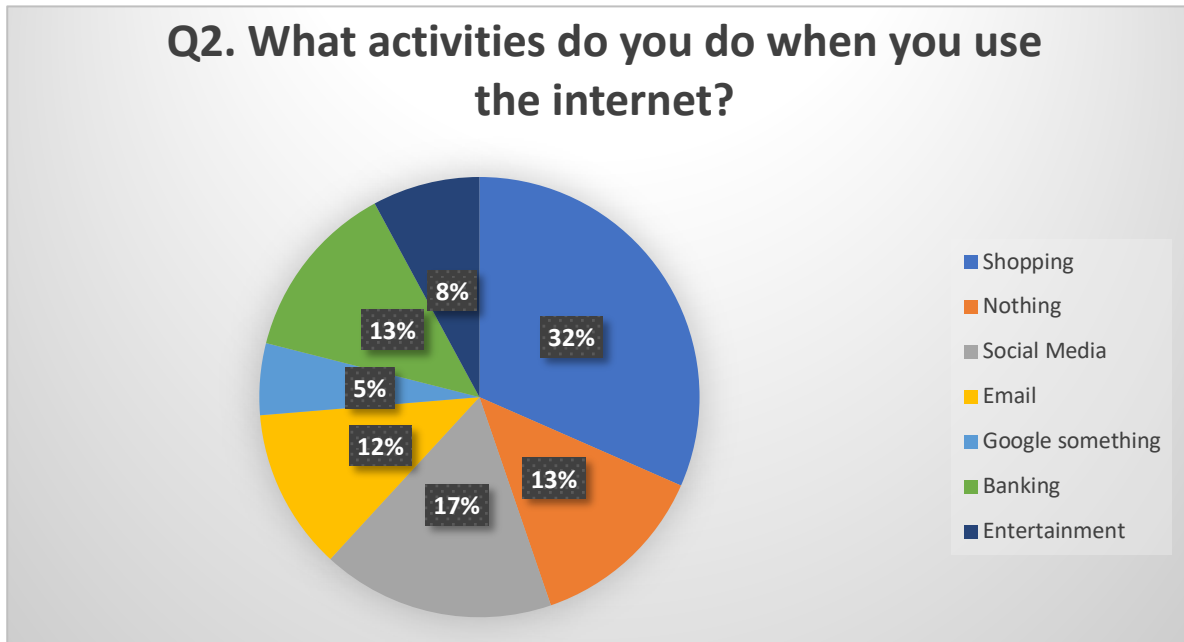


Figure 6 Question 2

Lack of education on technology can make it an extremely difficult environment to be around and Question 3 (See Figure 7) indicates the perspectives elderly people have about this. Question 3 also asked why people find the internet frustrating, and whilst many participants did not expand, typical answers included that it does not do what they want it to, or they get to certain points and cannot figure out how to move on.

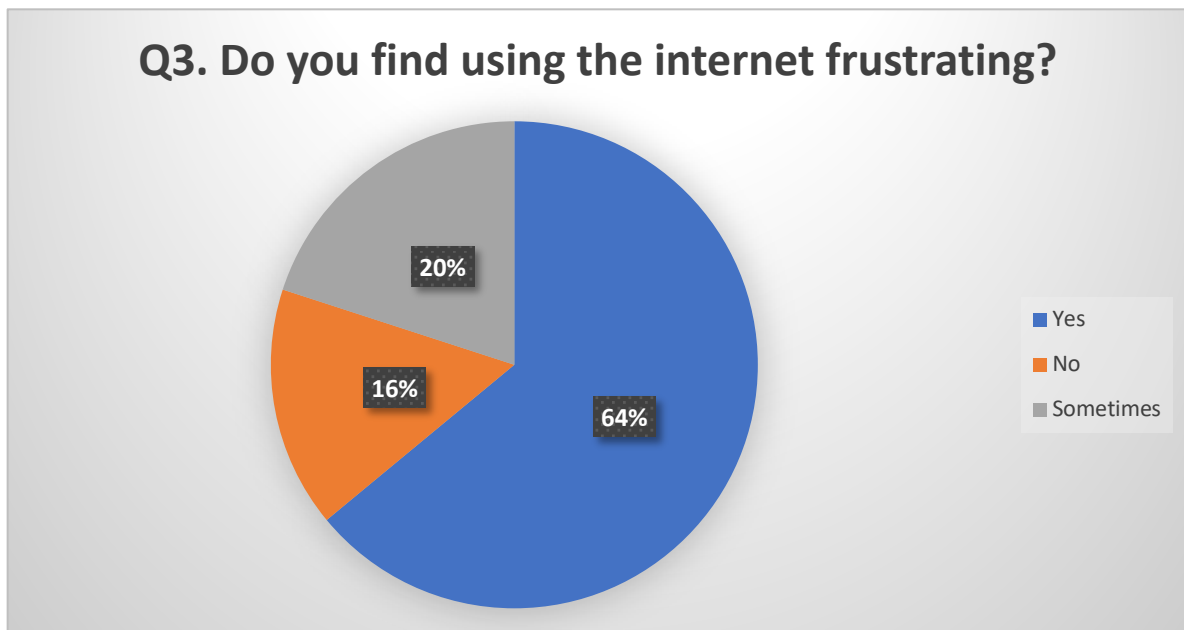


Figure 7 Question 3

Question 4 (See Figure 8) was used to gain insight into how the participants felt about online safety and highlighted that the issue is definitely noticed by the elderly.

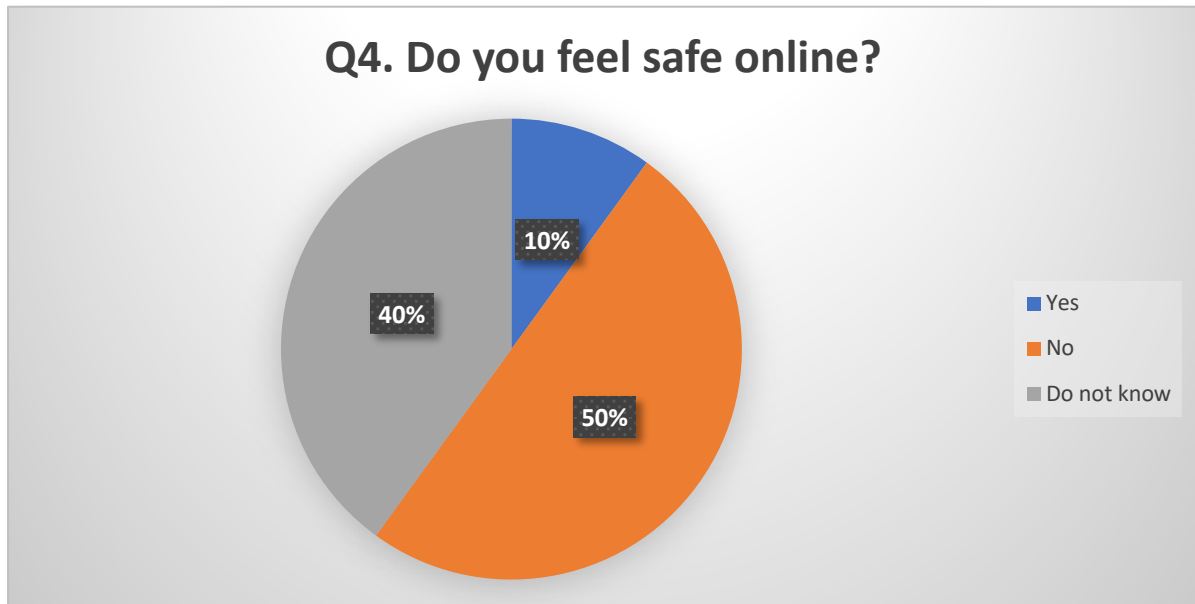


Figure 8 Question 4

Figure 8 indicates a significant problem within society as only 10% of participants feel safe online. Half said they do not feel safe online whilst the rest did not know and this conveys the lack of knowledge.

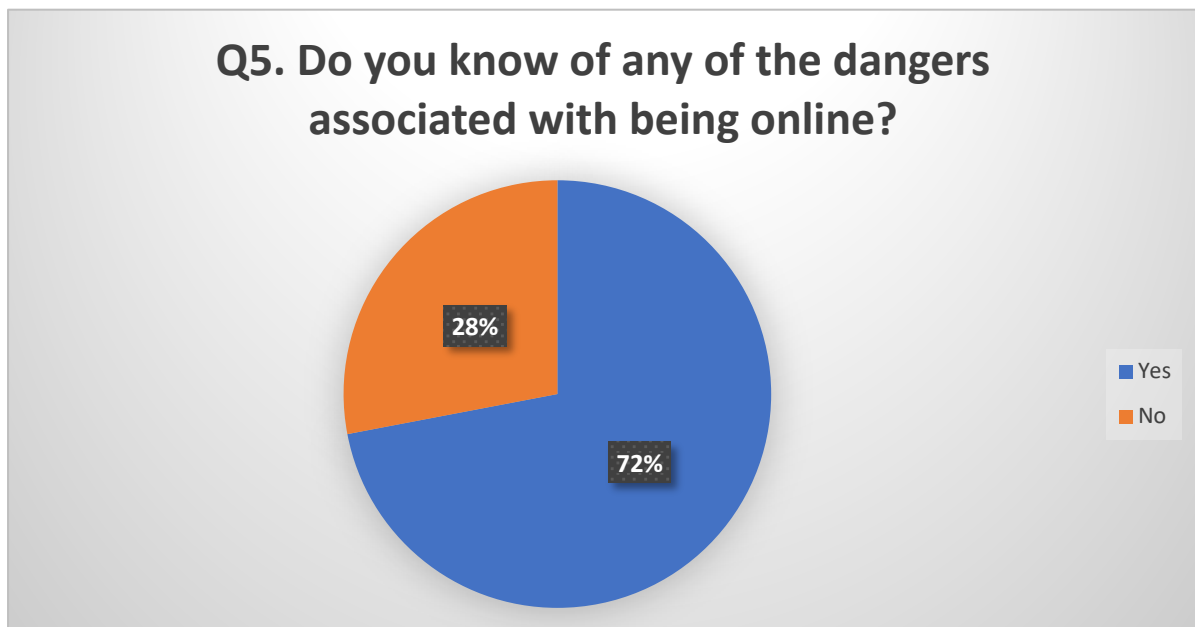


Figure 9 Question 5

Expanding upon Question 4 to gain insight into the depth of knowledge associated with online safety, Question 5 (See Figure 9) delved into the known dangers.

The majority of participants indicated that they did know of dangers associated with being online. The result came back with some participants not giving an explanation. However, there was not a wide range of answers showing that the knowledge is limited (See Figure 10)

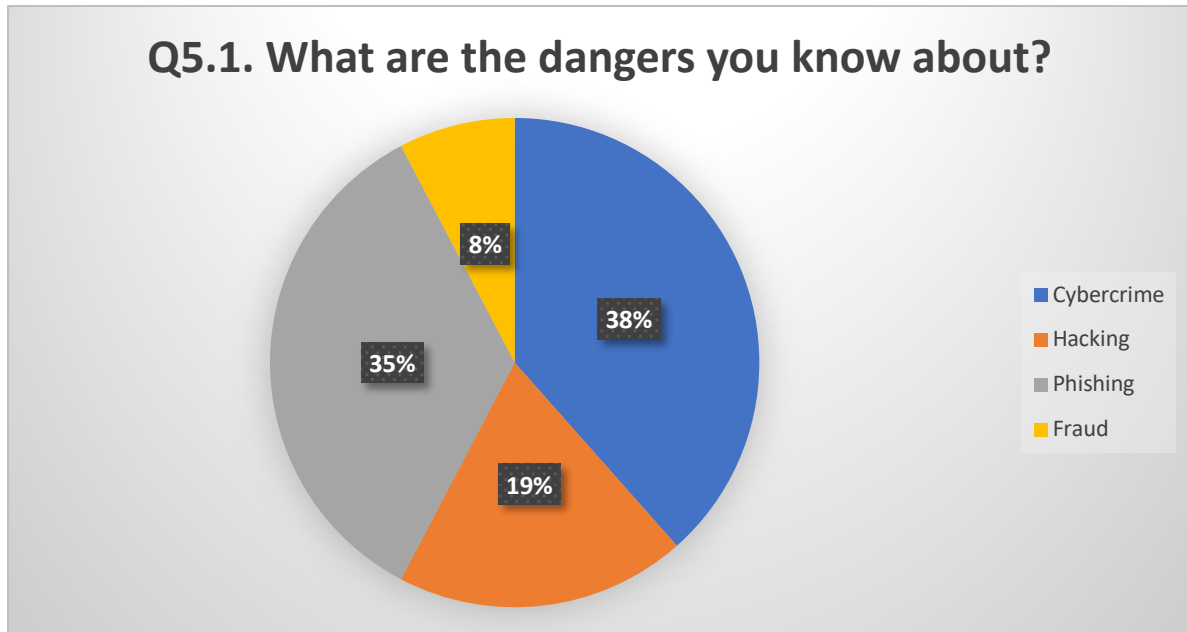


Figure 10 Question 5.1

The theme of the questionnaire then moved towards their perspectives on young people as digital educators. Firstly finding out if they do use this technique for digital

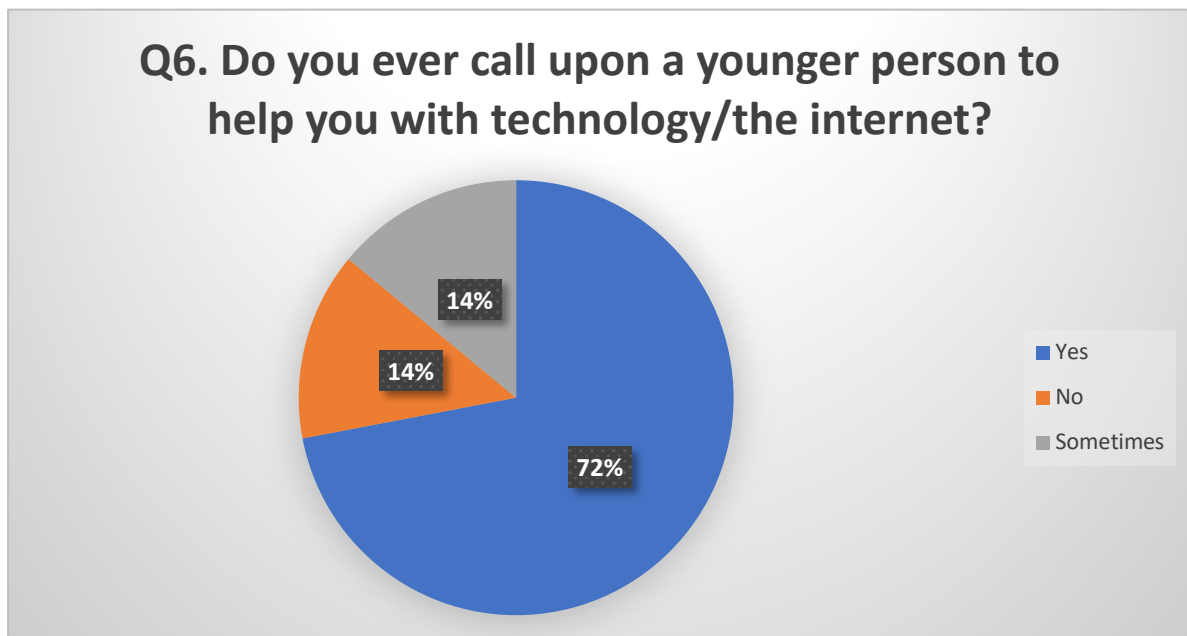


Figure 11 Question 6

knowledge (See Figure 11) with the majority claiming they have been helped by a younger person.

Children and grandchildren came up with the highest results for Question 7 (See Figure 12), however there were a wider range of answers that were not relatives meaning that elderly people have actively sought out information from external sources. This also indicates that some elderly people do not have younger relatives to help them or that want to sacrifice their time (See 2.2.3) showing the need for a space to find educators

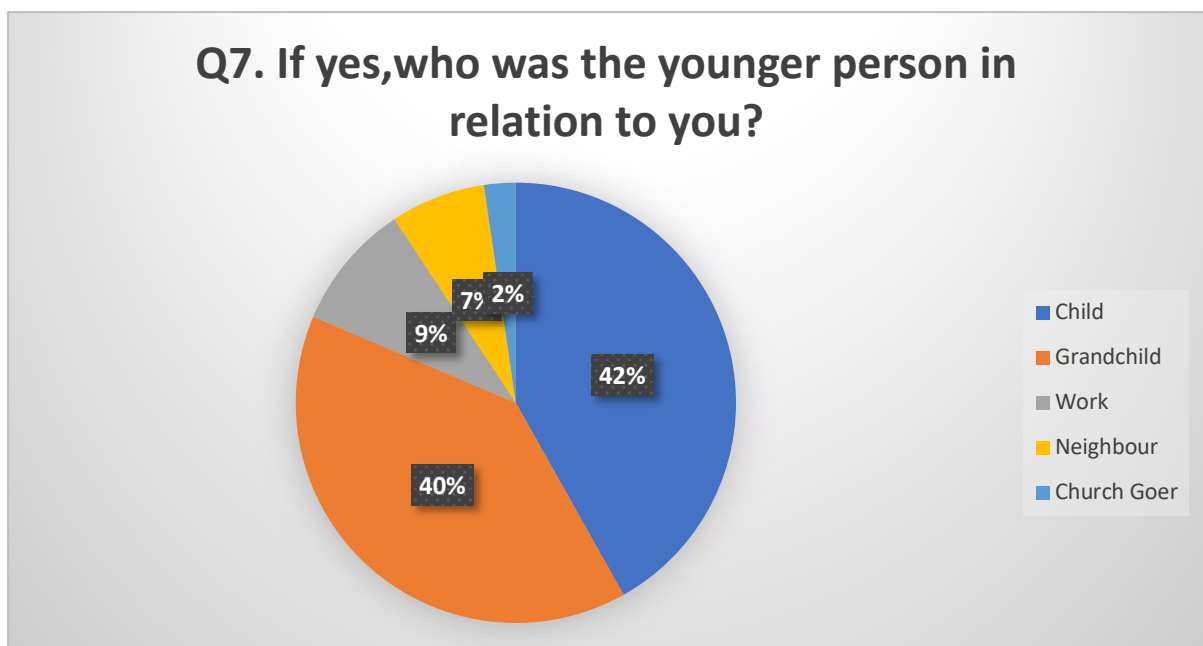


Figure 12 Question 7

Questions 6 and 7 were not specific to online safety, therefore alone they are only evidence of using technology rather than online safety. Question 8 (See Figure 13) was used to understand if the younger people they have been taught by included online safety and the majority said no indicating it is not seen as a priority.



Figure 13 Question 8

Question 9 (See Figure 14) gained insight into how participants feel after they have been helped by younger people. The general consensus indicated that they feel more confident that they have someone to help them, yet when they are left to do it alone they still do not feel confident.

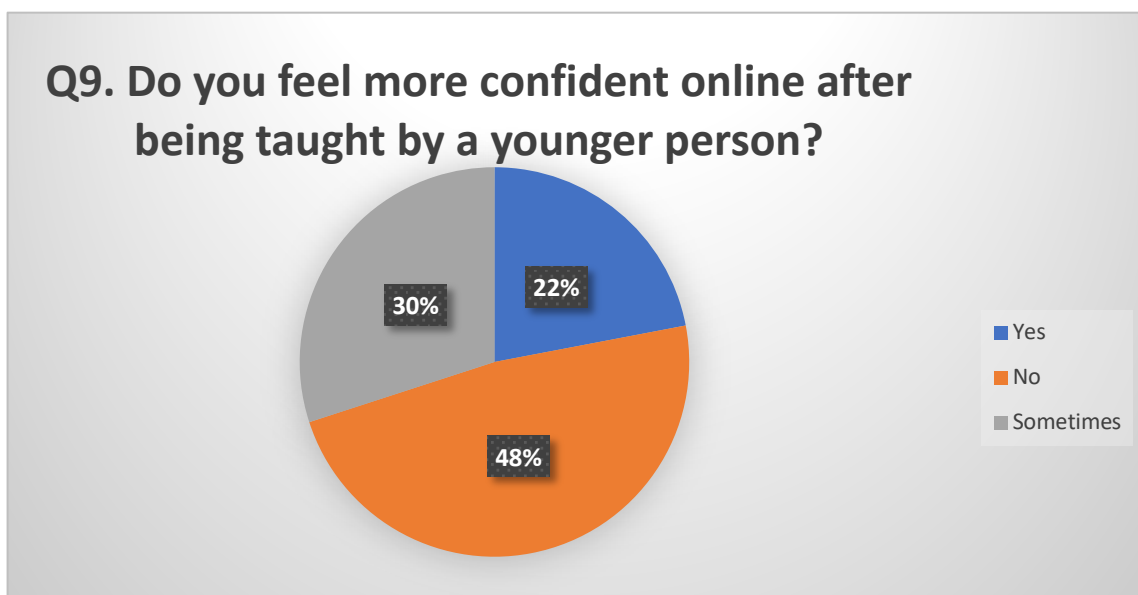


Figure 14 Question 9

A final question was then asked to give insight into the specific types of online learning elderly people would prefer. This was to ensure that all content being produced for the artefact would be relevant. *Figure 15* indicates a wide range of activities that the participants chose as a way to learn online about technology and online safety. Videos (28%) and assisted practical (22%) were the top two methods with the third and fourth methods being much further behind with guides (14%) and games (13%).

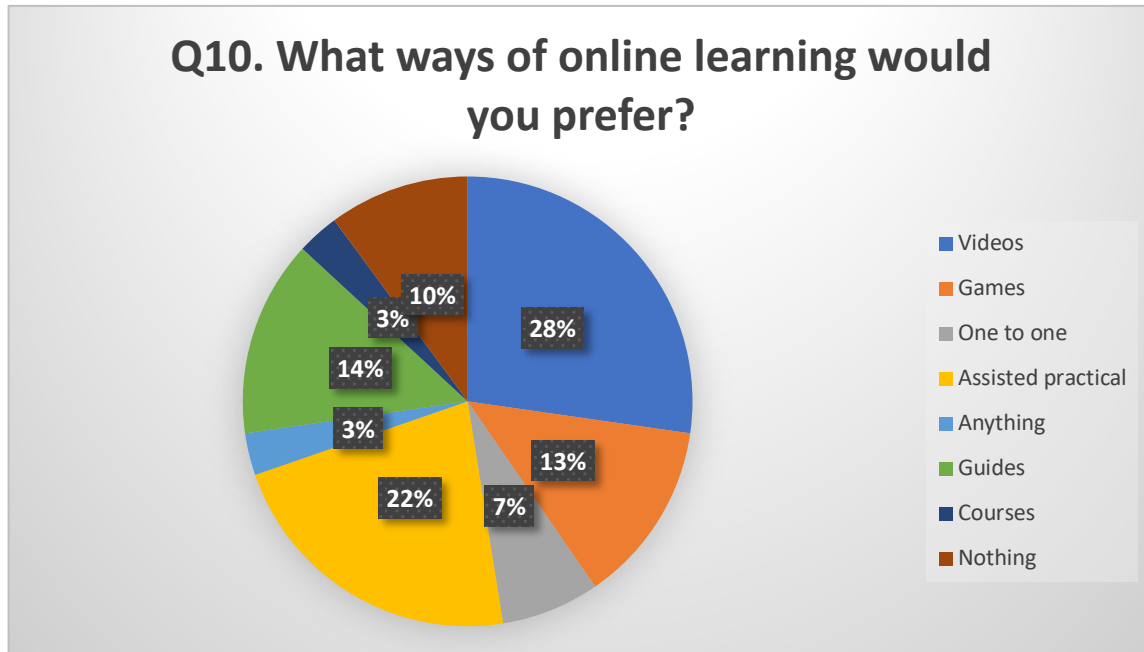


Figure 15 Question 10

This questionnaire provided perspectives on the current issues that are being explored within this project from a real-life target audience. Collecting information that can be checked against the literature found in *Chapter 2.1* gives a wider perspective on the problems whilst also giving a deeper understanding of solutions that can be incorporated within the requirements for the artefact.

4.1.4 Focus Group Analysis

Holding a focus group containing members of the target audience was used as a group interview process that got a range of different perspectives (See 3.2.3). The topic of discussion was steered by the researcher and all participants consented for their information to be used in this research (See Appendix G) as notes were being taken. An explanation of the project and the problems associated were given and the group gave their insight into what solutions they felt would improve their lives. This focus group lead to the elicitation of requirements and allowed for clarification and discussions on what the target audience see as the most important. To see the complete set of notes taken during the focus group see Appendix H.

4.1.5 Summary

This chapter allowed for requirements to be elicited through the methods that were deemed most useful for this project. The results and findings from all elicitation methods were presented here to be analysed and documented appropriately.

5.0 Chapter 5 – Design

5.1 Overview

After the initial requirements analysis were completed, drafts could be made for the first designs to commence. The designs and techniques used were storyboarding and prototyping providing a clear standard method of pre-visualisation of what the artefacts aimed to achieve (Teng et al, 2014). Each prototype could be adjusted accordingly in iteration until all MoSCoW requirements were met justifying the method of choice and ensuring that time and resources could be preserved. This means that no errors would be made when beginning the development of the actual artefact, eliminating as many mistakes as possible. This design methodology corresponds efficiently to the instructional design method SAM, highlighting its useful iterative process.

5.1.2 EduWeb Platform

As the EduWeb platform was already created for the purpose of young people teaching the old, an exploration went into the types of courses and content that are currently available on the website. The EduWeb project distils certain principles that can be put into practice (Wilkinson et al, 2017) and therefore when designing content these principles had to be considered. Some principles such as users choice are already concentrated on within EduWeb. However, real-world problems, intended outcomes and reflection had to be incorporated into the design process. By browsing through the courses already available on the EduWeb website and reading their students training booklet (Economou, 2017), it became apparent how the EduWeb learning design approach should be laid out.

5.1.3 Design: Storyboarding and Guides

After the literature review had revealed the main issues affecting the elderly's safety online and identified the best techniques to educate the elderly, stories were created to indicate these events and the impacts they can have. A storyboard is an illustrated series of actions displayed in a sequence (Teng et al, 2014). Storyboarding offers an alternative approach to hand drawing design ideas and results in a much clearer representation of the desired outcome (Jones, 2008). This method was chosen for this project due to its self-explanatory nature and versatility. Once a storyboard is created, it can be used for a range of different artefacts and therefore corresponded

to the cyclical attributes of SAM. Designs were all completed on the “Storyboard That” website which provided characters and backdrops, whilst also allowing for personal image uploads so the storyboard could be as tailor made as desired. This website was chosen over other similar services such as “Canva” due to its variety of functions and ease of use. “Storyboard That” provided sub-sections for each setting, character and object meaning that searching for an image would not be a difficult task. All characters and objects could be repositioned, even allowing for facial expressions to be changed, adding depth to the storyboard and creating feeling within the story. The storyboards were also designed in a way that would be interesting yet educational for the target audience to meet requirements (See Appendix I). *Figure 16* shows an example of the storyboards created (See Appendix J for more details).

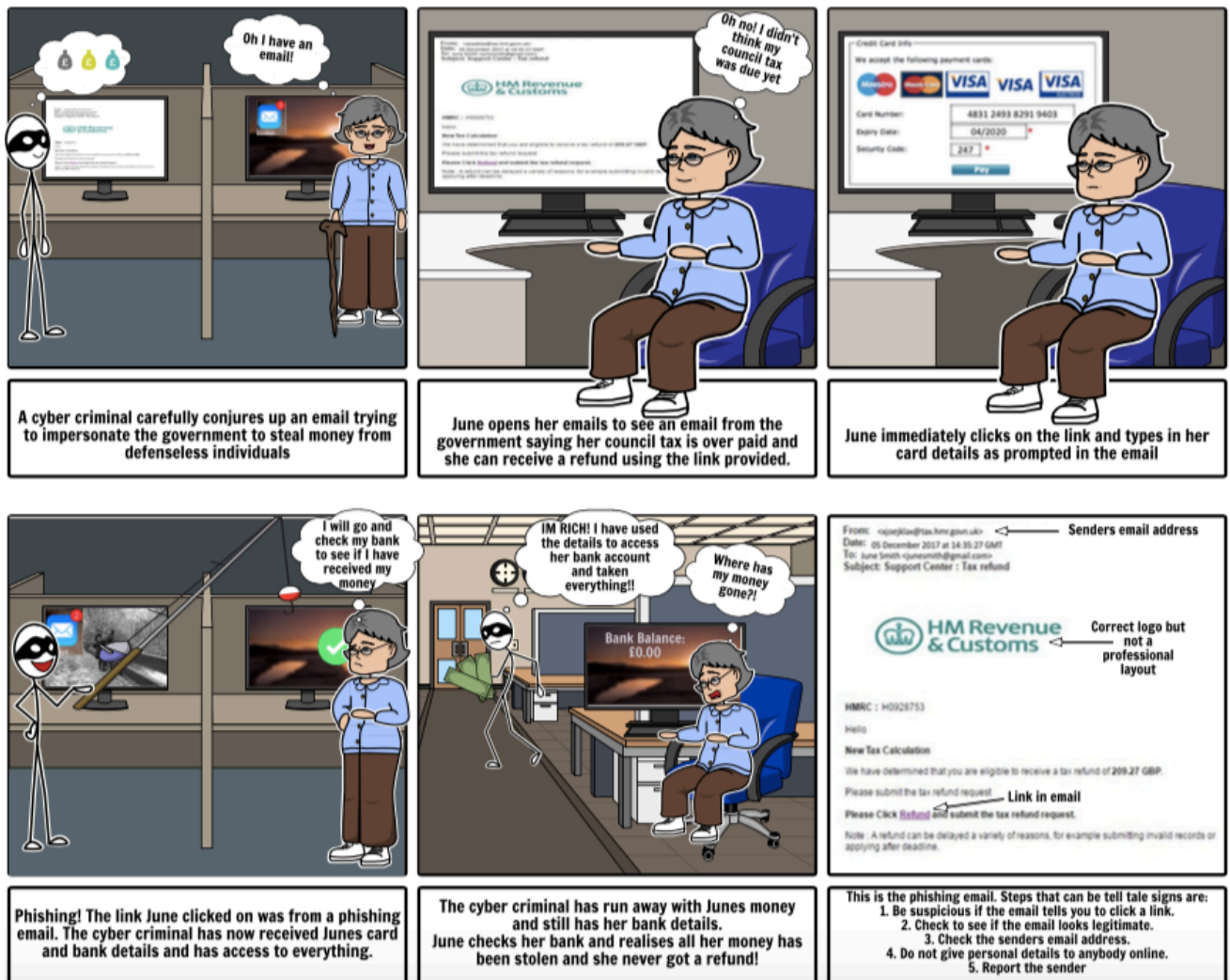


Figure 16 Storyboard A: Phishing

A guide was designed to inform users with steps on how a strong password can be accomplished. A similar style of step by step guide is currently available on the EduWeb website such as the “Steps to Create a Skype Account” course (EduWeb, 2017). Using this existing material, as well as the Students Training Booklet (Economou, 2017) provided on the website, the correct structure, presentation and aesthetics could be designed within the guide to conform to EduWeb standards. EduWeb has an online coach, Webbie, a robot character that is used to provide information (See Appendix K). Webbie takes on different colours depending on the content he is coaching and different postures depending on his role. This provides a visual idea of what is being taught, therefore in the design phase Webbie was chosen to be green representing ‘Be Informed’ with a variety of different poses, depending on what the guide was teaching at that time. These methods corresponded with the second objective (See Table 2) to design packages that can increase computer security knowledge. These designs included education, tips and knowledge about online safety.

5.1.4 EduWeb Modules

After requirements had been established, discussions in Sprint meetings focused on what the threat analysis in Chapter 2 had revealed with social engineering being a popular type of cybercrime with the majority of these attacks defrauding elderly people. This remained the major theme for the topics being designed as courses and content onto EduWeb. With this information, a social engineering attack tree could be created to highlight the main threats and potential attacks associated with elderly people being online. This built the initial design idea for the modules that would eventually be implemented onto EduWeb

5.1.5 Attack Trees

To understand the threats associated with elderly people and their internet usage, an attack tree was utilised. A visual representation that highlights the goals and steps taken to reach each target was necessary to analyse each path in which a threat could transpire (Schneier, 2008). By designing in a tree like structure, a simple yet effective analysis can be conducted. This can also lead to new threats arising as each branch can stimulate new ideas. See *Figure 3 Threat Analysis* for full attack tree.

6.0 Chapter 6 - Implementation

6.1 Overview

Following on from the design chapter, implementation discusses the ways in which the designs were transformed into content and how it was executed and uploaded onto EduWeb.

6.1.1 Creation of Infographics and Guides

One method for implementing the storyboards from the design chapter was to create infographics. An infographic is a picture that combines data or ideas with design in a manner that can succinctly and easily portray complicated information (Smiciklas, 2012). The infographics were created as a way to display the ideas formed in the design phase into data represented in an informative and educational manner.

Storyboard B was the initial design for the dating scam infographic. The infographic included six important signs to look out for when using dating websites or if it is thought that a scam might be occurring. Each of the six signs had a short, easy to read heading that corresponds to real-life cases as well as a longer explanation if someone needs any of the headings expanded upon. The online website "Venngage" was used to create the infographics as there was a range of styles that could suit varying different messages and accommodate all the information chosen to be presented.

An infographic was created to provide quick information about strong passwords. Online banking systems and shopping sites, along with other activities elderly people use, store financial information (Gaw & Felton, 2006). Memorability and usability always come before security and therefore when people are creating accounts they tend to choose something that is easy and will remember or they reuse an old password (Cranor & Garfinkel, 2005). Due to literature showing that cognitive decline presents itself in elderly people (APA, 2018), and lack of education revealing that people may not know the risks of a weak password, these issues add to elderly peoples vulnerabilities.

Following on from this, a guide was created to inform users in more depth about how to create a strong password. Requirements specified that the elderly would like ways

to learn independently (See Appendix I). The implementation focused mainly on adding important information in the initial guide design (See 5.1.3).

<u>Guide Structure</u>	
Section	Reason
Lesson Description	Provides insight into what the guide is teaching
Aims	Ensures the user knows what they are aiming to achieve with this guide
Necessary Resources	When completing this guide, some basic resources and equipment are needed
Basic Skills	When completing this guide, basic skills are required to get to the initial stages where this guide starts
Time	An estimated time is given to allow users to know how long they will spend on the guide
Step By Step	In the guide, six simple steps, including screenshots, were provided for users to follow along and achieve the goals of the guide
Tips	A list of safety tips were provided after the steps are taking to aid the users in their post-guide activities
Warning	A warning was provided to indicate the consequences that could occur if password strength is not abided by
Lesson Assessment	A lesson assessment table is provided at the end of the guide to ensure that the aims were achieved. There are 'yes' or 'no' boxes provided for the user to find out if they have accomplished the guide or if they need to familiarise themselves with it again

Table 6 Guide Structure

Table 6 indicates the structure of the guide and justifies why each section was implemented.

6.1.2 Creation of Animation

Another method of implementing the storyboards was to create an educational animation. An animation is a simulated motion picture whereby pictures of characters and objects are represented with apparent motion (Mayer & Moreno, 2002). This method of implementation was chosen due to its great potential to improve human learning as well as providing an entertainment factor that can capture and maintain the interest of the user. This is also an ideal way of providing young educators with visual prompts that can be used as a foundation for teaching older adults. The chosen topic was covering an aspect of social engineer; phishing. This was due to the requirements elicitation specifying that this was a big fear amongst the target audience as well as literature showing it is on the rise (See 2.2.5).

Adobe Animate CC was the program chosen to create the animation. This was due to the program allowing a variety of features which could best portray what was included in the designs. Pictures from the designs were used for the characters and objects due to it looking more professional than hand drawing. Once the animation was created in Adobe Animate CC, it was uploaded onto Adobe After Effects. This was to increase entertainment value and make the animation run more smoothly.

6.1.3 Implementation onto EduWeb

To meet the third objective (See Table 2) and gain as much exposure on the content as possible, it was uploaded onto the EduWeb website that provides a guide for "Adding L-bundles (EduWeb, 2017). An L-bundles is a collection of educational materials. This formed a course where different forms of content can be uploaded and accessed by anyone on the website. The material was uploaded under relevant titles for ease of access and tags were attached to each piece of content so that students or educators can easily locate the material they wish to use. This upload also indicates that the content can be deployed anywhere, meeting the projects second objective (See Table 2)

7.0 Chapter 7– Testing and Evaluation

7.1 Overview

An evaluation took place to discuss each process and method undertaken throughout the project. This is to ensure that all objectives (See 1.0) and requirements were met and the project achieved its goals to the best ability.

7.1.1 Literature Review Evaluation

The purpose of chapter 2 was to investigate the problem areas, threats and current solutions surrounding the topic. Literature indicated that this problem is recognised within society yet a complete and successful solution was unreachable to most. However, it indicated what the elderly use the internet for and the types of learning that make for successful content. This approach contributed to all aspects of the requirements, design and implementation stages of the project.

<u>Objectives Met:</u>	
1.	Identify the top best learning techniques to integrate elderly people into the digital age and the best teaching techniques for digital citizens using fun and interactive features and technologies.

Table 7 Literature Objectives Met - 1

7.1.2 Methodology Evaluation

The methodology chosen was SAM (See 3.1.1) which includes evaluation as part of its design. The cyclical process allows for changes throughout the duration of the project (See Figure 4). Drawing an evaluation after each step in the process allowed for errors to be identified and corrected. Thus the development cycle continues until the most suitable artefact is produced.

7.1.3 Requirements Analysis Evaluation

This chapter allowed for interaction between the researcher and the target audience. The questionnaire and focus group provided evidence that corresponded with the background study and were the correct techniques chosen to meet the criteria of this project. These techniques could have also been used to gather information about the perspectives of young people and their incentives to teach older people.

<u>Objectives Met:</u>	
1.	Identify the top best learning techniques to integrate elderly people into the digital age and the best teaching techniques for digital citizens using fun and interactive features and technologies.

Table 8 Requirements Objectives Met - 1

MoSCoW requirements was used as the method to analyse and document the projects requirements (See Appendix L), therefore the Must have and Should have requirements were evaluated using the same format. A 'Criteria' heading was added to indicate what was done to reach each requirement and a 'Met? Y/N' heading to portray if each requirement was met (See Appendix L).

7.1.4 Design and Implementation Evaluation

The design and implementation stages allowed for the final two objectives to be met. The design phase allowed for initial ideas (See 5.0) to be formed including all of the relevant specified requirements. This was where objective two was completed allowing for relevant computer security knowledge to be incorporated within design packages.

Implementation allowed for the designs to be created into packages that could be deployed anywhere if required, but specifically onto EduWeb. The implementations of all aspects of the artefact, with specific topics and educational material, were successfully uploaded onto EduWeb (See 6.0) which is a safe environment for a digitally excluded community to thrive. This meets the third objective as well as giving the artefact the best possible coverage

<u>Objectives Met:</u>	
2.	Design packages to advance computer security knowledge and develop the packages in a way that they can be deployed anywhere.
3.	Create and deploy content for the European funded project, Eduweb (EduWeb, 2017), to reach and expand the digital community and gain as much coverage as possible.

Table 9 Design and Implementation Objectives Met - 2 + 3

7.1.5 Heuristic Evaluation of the Artefact

Jakob Nielsen developed a usability technique using a set of heuristics (Preece, 2002). This method of evaluation consists of evaluators examining the interface of the system to determine whether elements of the interface need improvement (Nielsen, 1995).

A heuristic evaluation was conducted by an external user to determine the success of the content from. This is significant to the project as its success is determined by its usability and understanding from the target audience.

Table 10 Heuristic Evaluation

Heuristic	Issue	Notes
Visibility of system status: feedback	N/A	Learning outcomes, assessment tables allow for good feedback
Match between system and the real world: metaphor	N/A	Easy to understand. Matched to real life cases. All in the correct order and instructions easy to follow
User control and freedom: navigation	N/A	Allowed for independence, all aspects can be completed freely and options can be chosen
Consistency and standards	N/A	All work followed the same format and style as the website. Very professional
Error prevention	Error did not occur but not sure what to do in the case that it does	Add instructions on what to do if an error does occur (e.g. who to contact)

Recognition rather than recall: user memory	N/A	All content recognisable and self-explanatory that recall is not necessary
Flexibility and efficiency of use	N/A	Guides can be used by anyone, printed if necessary. Video was easy to access and ran smoothly
Aesthetic and minimalist design: visual design principles	N/A	Eye catching with ample information whilst also keeping it simple. Video designed well, understood throughout with preventions added
Help users recognize, diagnose, and recover from errors: error recovery	No error occurred or any indication of what to do if one does occur	If something went wrong there is no direction or ease of use in that scenario
Help and documentation	Artefact itself was documented well but there was no information backing it up	Articles could back up the stories. Explanations of each could show why the topics are being discussed

8.0 Chapter 8 – Conclusion and Future Work

8.1 Conclusion

Overall, this project has produced an effective awareness package that can be deployed anywhere (See Appendix M). All objectives were met as well as the research questions being answered sufficiently throughout. The problem area was specified and examined using literature based research and determined why current solutions had not been successful enough to combat online vulnerability amongst the elderly.

Different methods of eliciting requirements were used to provide further evidence and gain a better understanding of real life solutions. A questionnaire was used to produce a wider range of perspectives from the target audience and decipher learning preferences. To centralise this research, a focus group was held to concentrate on any ambiguities that became present throughout the project and resulted in a perceptive and direct approach. This ensured that a full requirements analysis could take place, and coupled with the literature research, guaranteed that the artefact met the success criteria.

A collaboration with EduWeb allowed a safe space for all content to reach as many elderly people as possible as well as providing an incentive for young people to become educators. Artefact designs were influenced by EduWeb and their current layouts to maintain professionalism and fun. By using a successive approximation model it allowed for any necessary adaptations to be made to the designs. Implementation onto the website was easily managed and their use of gamification as a tool corresponded to the ideals of this project.

Appropriate testing and evaluation was conducted to determine the success of the artefact and to gain feedback on the product. This established the success of each objective and ensured that all results were measured correctly against a set of heuristics.

The findings of this project will contribute to the community of the digitally illiterate as well as the older demographic to decrease their online vulnerabilities and eliminate risks. With technological advances being so prevalent in today's society, a new

approach to raising awareness amongst this group will be greatly appreciated and begin to close the digital divide.

8.2 Future Work

Future work on this project will include expanding on the 'Won't have' MoSCoW requirement (See Appendix I). This means that content can start being designed and created to cover all aspects of the issues associated with online security. A wider range of topics in a variety of content would begin to build larger courses that elderly people could enrol in and gain a wider perspective on the issues they face.

Workshops, courses and one on ones could be arranged between the educators so that any issues that occur could be tackled in a positive manner and experience can be gained by both parties. The produced content could also be used within different social media communities to further the outreach of the project.

Word Count: 9926

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Legislation

Education Reform Act 1988

Data Protection Act 1998

Appendix A – Definition of Terms

Gamification – “Application of typical elements of game playing to encourage engagement with a product” (Oxford University Press, 2009).

Pedagogy – “Method and practice of teaching” (Oxford University Press, 2009).

Fraud – “Wrongful or criminal deception intended to result in financial or personal gain” (Oxford University Press, 2009).

Demographic – “Relating to the structure of populations” (Oxford University Press, 2009).

EduWeb - an EU funded website designed as a way for children to educate the digitally illiterate in online safety (Eduweb, 2017).

Didactics – “The science, art or practice of teaching” (Oxford University Press, 2009).

ICT – Information and Communication Technologies.

Appendix B – Project Proposal

Undergraduate Project Proposal Form

Degree Title: Forensics Computing and Security	Student's Name: Zoe Carter
	Supervisor's Name: Edward Apeh
	Project Title/Area: An awareness package for combatting fraud amongst the elderly using Eduweb

B1: Project Overview

1.1 Problem definition - use one sentence to summarise the problem:

A lot has been done to reduce digital illiteracy, however, particularly amongst the elderly, awareness is needed to combat personally identifiable information (PII) and reduce risks to identity theft.

1.2 Background - please provide brief background information, e.g., client:

Elderly people have been known to reach out to their younger relatives to get help with their computers as they have access yet have no ability or awareness. The population has grown older – and lived longer (STAT, 2017) yet computer education in school did not become popular until, at the earliest, 1995 (Web.csulb.edu, 2017). Being online with no knowledge can be dangerous as people with digital illiteracy are more likely to fall into the traps of phishing emails and giving personal details to illegitimate people. Seniors are seen as an easy opportunity as they are often vulnerable and less educated (Sollitto, 2017).

1.3 Aims and objectives – what are the aims and objectives of your project?

This project aims to create content to develop skills to protect the elderly against online threats, identity theft and information security. This project will improve security awareness and provide a place for seniors to become more informed of cyber issues. Simultaneously, security aware digital citizens will be given the means to successfully train the older generations in a fun and engaging way.

Objectives –

1. Identify the top best learning techniques to integrate elderly people into the digital age and the best teaching techniques for digital citizens using fun and interactive features and technologies.
2. Design packages to advance computer security knowledge and develop the packages in a way that they can be deployed anywhere

3. Create and deploy content for the European funded project, Eduweb (User, 2017), to reach at least 500 users to expand the digital community and gain as much coverage as possible.

B2: Artefact

2.1: What is the artefact that you intend to produce?

Creative and innovative content that can be accessed via the Eduweb website to combat identity theft. Gamification, video clips and blog posts that together will create a training guide for educators and a learning environment for the digitally illiterate.

2.2 How is your artefact actionable (i.e., routes to exploitation in the technology domain)?

This artefact will be a route to sharing content. The content will teach security techniques for the elderly to become cyber aware. This will not only spread commercial dissemination but also academic dissemination and thus bring light to digital illiteracy whilst simultaneously combatting digital exclusion. Having a larger audience, using Eduweb, will raise awareness around identity theft, being a step in the right direction of changing societies views on protecting themselves online. This will be actionable as it will highlight the best teaching techniques and share them with those in need. A lot of education has occurred to get digital citizens where they are; giving an opportunity for them to share their knowledge. This can then be spread academically, be it using workshops and/or festivals of learning.

B3: Evaluation

3.1 How are you going to evaluate your work?

Once the content has been designed and created, it will be launched onto the Eduweb website and immediately be put into practice. I will use Nielsen's 10 Heuristics to evaluate my work, in particular, matching between the system and the real world and help and documentation. I will then quantifiably evaluate these results in a report.

3.2 Why is this project honours worthy?

This project is honours worthy as it deals with a real-life issue whilst bringing together everything I have learnt throughout my degree. Digital exclusion can be difficult to deal with and overwhelming to combat thus this project adds value to humanity. It meets BCS requirements whilst also aligning to individual requirements.

3.3 How does this project relate to your degree title outcomes?

My degree title BSc (Hons) Forensics Computing and Security is very heavily focused on all aspects of online security. This project highlights how crucial security is when going online and teaches the elderly the dangers. This aligns with the content learnt in the Ethical Hacking module in second year. Learning these skills without knowledge of the risks and how to prevent them can cause many more issues, therefore adding it into basic training is the best way to implement it into this society. Creating usable content will incorporate my third-year modules; Human Factors and Security by Design.

3.4 How does your project meet the BCS Undergraduate Project Requirements?

This project will solve societal problems of security when released onto the Eduweb site. Extensive research and analysis will go into finding out the best information and techniques to solve the issues at hand. More importantly, creating content that successfully combats security issues such as identity theft of the elderly. Eduweb will be used as a platform due to its

geographical links creating cohesion and promoting the share economy meeting a real need in a wider context. The content will be creative and innovative to keep security aware digital citizens interested and build them up to be skilled teachers of security. Incorporating all of this will be a self-managed project with in depth evaluation of the whole process.

3.5 What are the risks in this project and how are you going to manage them?

The risks of this project are that the content is not engaging enough to interest the users. This will be managed by getting the users involved in the early stages of the creation process. To do this, I will use an agile approach and conduct regular sprints to collect feedback, looking for ways of creating engaging content. Another risk will be that the content is not complete in time. However, I will plan my time beforehand using a Gantt chart and include weekly scrums. I will have specific deliverables in my Gantt chart, reflecting on how to spread out my time equally to meet my deadlines.

B4: Proposal References

4.1 Please provide references if you have used any.

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B5: Ethics

5.1 Have you submitted the ethics checklist to your supervisor?

Yes

5.2 Has the checklist been approved by your supervisor?

Yes

B6: Proposed Gantt Chart Plan

Month	Semester 1	January	February				March				April				May			
Week Commencing		29th	5th	12th	19th	26th	5th	12th	19th	26th	2nd	9th	16th	23th	30th	7th	14th	
										Easter Holidays							Bank Holiday	
Project Proposal																		
Research top 10 techniques																		
Investigate types of content to create																		
Review best techniques to use in awareness package																		
Gather requirements and start designs for packages																		
Produce design plans to meet requirements																		
Prototype the plans to see if they execute correctly																		
Develop the prototype into content for awareness package																		
Gather responses from prototypes																		
Correct any issues from the feedback gathered																		
Add packages to the Eduweb website																		
Update and respond to feedback																		
Test and critically evaluate project																		
Perform user tests																		
Evaluate against success criteria, aims and objectives																		
Self Evaluate																		
Dissertation																		
Interim Review																		
Hand In																		

Appendix C – Final Gantt Chart

Month	Semester 1	January					February					March					April					May	
Week Commencing		29th	5th	12th	19th	26th	5th	12th	19th	26th	2nd	9th	16th	23th	30th	7th	14th						
										Easter Holidays								Bank Holiday					
Project Proposal																							
Research top 10 techniques																							
Investigate types of content to create																							
Review best techniques to use in awareness package																							
Gather requirements and start designs for packages																							
Produce design plans to meet requirements																							
Prototype the plans to see if they execute correctly																							
Develop the prototype into content for awareness package																							
Gather responses from prototypes																							
Correct any issues from the feedback gathered																							
Add packages to the Eduweb website																							
Update and respond to feedback																							
Test and critically evaluate project																							
Perform user tests																							
Evaluate against success criteria, aims and objectives																							
Self Evaluate																							
Dissertation																							
Interim Review																							
Hand In																							

Appendix D – Ethics Checklist

D1: Student Details

Name	Zoe Carter
School	Faculty of Science & Technology
Course	BSc Forensics Computing & Security
Have you received external funding to support this research project?	Yes
Please list any persons or institutions that you will be conducting joint research with, both internal to BU as well as external collaborators.	Centre for Excellence in Learning

D2: Project Details

Title	An awareness package for combatting identity theft amongst the elderly using Eduweb
Proposed Start Date	29-January-2018
Proposed End Date	31-August-2018 – Note this is not the submission deadline!
Supervisor	Edward Apeh
Summary (including detail on background methodology, sample, outcomes, etc.)	
<p>A lot has been done to reduce digital illiteracy, however, particularly amongst the elderly, awareness is needed to combat personally identifiable information (PII) and reduce risks to identity theft. Elderly people have been known to reach out to their younger relatives to get help with their computers as they have access yet have no ability or awareness. Being online with no knowledge can be dangerous as people with digital illiteracy are more likely to fall into the traps of phishing emails and giving personal details to illegitimate people. This project aims to create content to develop skills to protect the elderly against online threats, identity theft and information security. This project will improve security awareness and provide a place for seniors to become more informed of cyber issues. Simultaneously, security aware digital citizens will be given the means to successfully train the older generations in a fun and engaging way. The developed cyber risk awareness packages will be deployed on EduWeb – a platform developed as part of the Erasmus funded EU project for combating digital exclusion. The EduWeb platform learns itself nicely to my project as it is designed to encourage the younger generation, through gamification, to teach their elderly parents the digital skills they have learnt. I intend to leverage this inbuilt feature of the EduWeb platform to research techniques of how best to transfer knowledge between two different age groups and develop cyber awareness packages for combatting identity theft amongst the elderly to deploy on Eduweb.</p>	

D3: External Ethics Review (Answer “Yes” go to 4, “No” go to 5)

Does your research require external review through the NHS National Research Ethics Service (NRES) or through another external Ethics Committee?	No
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D4: External Ethics Review Continued

Answered "Yes" to question 3 will conclude the BU Ethics Review so you do not need to answer the following questions. Note you will need to obtain external ethical approval before commencing your research.

D5: Research Literature (Answer "Yes" go to 6, "No" go to 7)

Is your research solely literature based?	No
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D6: Research Literature Continued (**Either answer will conclude the review**)

Will you have access to personal data that allows you to identify individuals OR access to confidential corporate or company data (that is not covered by confidentiality terms within an agreement or by a separate confidentiality agreement)?	Choose an item.
Describe how you will collect, manage and store the personal data (taking into consideration the Data Protection Act and the Data Protection Principles).	

D7: Human Participants Part 1 (Answer "Yes" go to 8, "No" go to 12)

Will your research project involve interaction with human participants as primary sources of data (e.g. interview, observation, original survey)?	Yes
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D8: Human Participants Part 2 (Answer **any** "Yes" go to 9)

Does your research specifically involve participants who are considered vulnerable (i.e. children, those with cognitive impairment, those in unequal relationships—such as your own students, prison inmates, etc.)?	No
Does the study involve participants age 16 or over who are unable to give informed consent (i.e. people with learning disabilities)? NOTE: All research that falls under the auspices of the Mental Capacity Act 2005 must be reviewed by NHS NRES.	No
Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited? (i.e. students at school, members of self-help group, residents of Nursing home?)	No
Will it be necessary for participants to take part in your study without their knowledge and consent at the time (i.e. covert observation of people in non-public places)?	No
Will the study involve discussion of sensitive topics (i.e. sexual activity, drug use, criminal activity)?	No

D9: Human Participants Part 2 Continued

Describe how you will deal with the ethical issues with human participants?

D10: Human Participants Part 3 (Answer **any** “Yes” go to 11, **all** “No” go to 12)

Could your research induce psychological stress or anxiety, cause harm or have negative consequences for the participant or researcher (beyond the risks encountered in normal life)?	No
Will your research involve prolonged or repetitive testing?	No
Will the research involve the collection of audio materials?	No
Will your research involve the collection of photographic or video materials?	No
Will financial or other inducements (other than reasonable expenses and compensation for time) be offered to participants?	No

D11: Human Participants Part 3 Continued

Please explain below why your research project involves the above mentioned criteria (be sure to explain why the sensitive criterion is essential to your project's success). Give a summary of the ethical issues and any action that will be taken to address these. Explain how you will obtain informed consent (and from whom) and how you will inform the participant(s) about the research project (i.e. participant information sheet). A sample consent form and participant information sheet can be found on the Research Ethics website.

D12: Final Review

Will you have access to personal data that allows you to identify individuals OR access to confidential corporate or company data (that is not covered by confidentiality terms within an agreement or by a separate confidentiality agreement)?	No
Will your research take place outside the UK (including any and all stages of research: collection, storage, analysis, etc.)?	No
Please use the below text box to highlight any other ethical concerns or risks that may arise during your research that have not been covered in this form.	

The following section is to be filled by the supervisor only

D13: Supervisor's Review: Approve

Please leave your comments: The proposed "An awareness package for combatting identity theft amongst the elderly using Eduweb" project is ethical to conduct and the proposed method of investigation is appropriate, thorough and ethical. The proposed project also meets the requirements of BU's Research Ethics Principles as stipulated in *8B – Research Ethics Code of Practice: Policy and Procedure*.

Appendix E – Interim Review

Undergraduate Project Interim Review

To be completed and signed by the Supervisor and student during week commencing 5 March 2018.

Student: Zoe Carter	Supervisor: Dr Edward Apeh
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Assessment

1. Define the problem <i>Has the problem been defined, has the artefact been identified and have objectives been set?</i>	Yes
Comments:	
2. Review other work <i>Is there evidence of appropriate research?</i>	Yes
Comments:	
3. Analysis, Design & Implementation of artefact <i>Is there evidence of appropriate analysis of the problem and development of a solution?</i>	To some extent
Comments: Work has commenced on gathering the requirements as well as designing and implementing the artefact.	
4. Dissertation <i>Have sections of the dissertation been written and has the Supervisor seen these?</i>	To some extent
Comments: The introduction and literature review chapters have been completed to a good level. Significant progress as also been done on the Methodology. Although work has been done on requirement analysis, design & implementation, the corresponding chapters have not yet been written.	
5. Planning & progress <i>Is there an acceptable plan for this project and is it being followed?</i>	Yes
Comments:	
6. Overall assessment	Satisfactory
Signed: Supervisor:Dr. Edward Apeh..... Student:Zoe Carter..... Date:06/03/18.....	

Supervisor to retain the signed form and supply the student with a copy if required.

Supervisor to upload the form on MyBU and grade the student as 1 (satisfactory), 0.5 (uncertain) and 0 (unsatisfactory).

Supervisor to notify the Project Tutor if the student is at risk of failing the Project.

Appendix F - Questionnaire

Questionnaire Research

I am currently studying Forensic Computing and Security at Bournemouth University. I am in my final year researching and writing my dissertation to create educational content for elderly people to learn how to stay safe online. A lot of resources have gone into school curriculums to create safe environments for children and to give them the knowledge they need to keep themselves safe. I am hoping to create an equally safe environment for people who did not have the opportunity to receive education on technology.

1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

3. Do you find using the internet frustrating and why?

4. Do you feel safe online? (Please circle)
 Yes / No / Do not know

5. Do you know of any of the dangers associated with being online? If yes, please specify.
 Yes / No

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)
 Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

8. Have these people ever taught you about staying safe online?

9. Do you feel more confident online after being taught by a younger person? If yes, please specify why.

10. What ways of online learning would you prefer? (e.g. Videos, reading, games etc.)

Appendix G – Focus Group Questionnaires and Corresponding Consent Forms

Questionnaire Research

I am currently studying Forensic Computing and Security at Bournemouth University. I am in my final year researching and writing my dissertation to create educational content for elderly people to learn how to stay safe online. A lot of resources have gone into school curriculums to create safe environments for children and to give them the knowledge they need to keep themselves safe. I am hoping to create an equally safe environment for people who did not have the opportunity to receive education on technology.

1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

DAILY

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

SHOPPING

3. Do you find using the internet frustrating and why?

SOME TIME

4. Do you feel safe online? (Please circle)

Yes / No / Do not know

5. Do you know of any of the dangers associated with being online? If yes, please specify.

Yes / No

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

SON + GRANDSON.

8. Have these people ever taught you about staying safe online?

YES

Research Consent Form

Participant Information

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Title of project - An awareness package for combatting identity theft amongst the elderly using Eduweb

I confirm that I have read and understood the participant information surrounding the project.

I can confirm that I have had the opportunity to ask any questions and the researcher has answered my questions about the study to my satisfaction.

I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without giving a reason and without any consequences.

I understand that I can withdraw my data from the study at any time.

I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available

I consent to audio/video/interviews being recorded as part of the project – Yes / No
RATHER NOT

Name of participant	Date	Signature
G. M. BURWICK HOWAN	10.4.18	G. M. Burwick Howan
-----	-----	-----

Name of researcher	Date	Signature
Zoe Carter	10/4/18	ZCarter
-----	-----	-----

Questionnaire Research

I am currently studying Forensic Computing and Security at Bournemouth University. I am in my final year researching and writing my dissertation to create educational content for elderly people to learn how to stay safe online. A lot of resources have gone into school curriculums to create safe environments for children and to give them the knowledge they need to keep themselves safe. I am hoping to create an equally safe environment for people who did not have the opportunity to receive education on technology.

1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

Every other day

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

Nothing in particular

3. Do you find using the internet frustrating and why?

No

4. Do you feel safe online? (Please circle)

Yes / No / Do not know

5. Do you know of any of the dangers associated with being online?
If yes, please specify.

Yes / No

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No on rare occasions

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

My daughter

8. Have these people ever taught you about staying safe online?

No

Research Consent Form

Participant Information

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I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available

I consent to audio/video/interviews being recorded as part of the project – Yes / No

Name of participant

Date

10/4/18

Signature



Tony Offord

Name of researcher

Date

Signature

Zoe Carter

10/4/18

ZCarter

Classification: OFFICIAL-SENSITIVE

Questionnaire Research

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1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

DAILY

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

FACEBOOK - OUTLOOK - GOOGLE.

3. Do you find using the internet frustrating and why?

4. Do you feel safe online? (Please circle)

Yes / No / Do not know

5. Do you know of any of the dangers associated with being online? If yes, please specify.

Yes / No CYBERCRIME

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

GRANDDAUGHTER - PEOPLE I WORK WITH.

8. Have these people ever taught you about staying safe online?

YES

9. Do you feel more confident online after being taught by a younger person? If yes, please specify why.

I STILL DO NOT FEEL SAFE ONLINE.

10. What ways of online learning would you prefer? (e.g. Videos, reading, games etc.)

ONE TO ONE.

Classification: OFFICIAL-SENSITIVE

Research Consent Form

Participant Information

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I can confirm that I have had the opportunity to ask any questions and the researcher has answered my questions about the study to my satisfaction.

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I understand that I can withdraw my data from the study at any time.

I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available

I consent to audio/video/interviews being recorded as part of the project – Yes / No

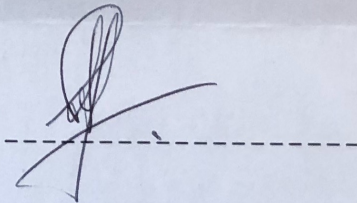
Name of participant

Date

Signature

STEPHEN SULLY

18-04-18

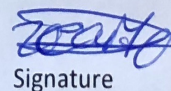


Zoe Carter

Name of researcher

18-04-18

Date



Signature

Classification: OFFICIAL-SENSITIVE

Questionnaire Research

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1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)
2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)
3. Do you find using the internet frustrating and why? *GUESS - THINGS DISAPPEAR AND I HAVE TO START FROM SCRATCH.*
4. Do you feel safe online? (Please circle)
 Yes / No / Do not know
5. Do you know of any of the dangers associated with being online? If yes, please specify.
 Yes / No
6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)
 Yes / No
7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)
CHILDREN
8. Have these people ever taught you about staying safe online?
NO
9. Do you feel more confident online after being taught by a younger person? If yes, please specify why.
YES. THEY KNOW WHAT THEY ARE DOING.
10. What ways of online learning would you prefer? (e.g. Videos, reading, games etc.)

Classification: OFFICIAL-SENSITIVE

Research Consent Form

Participant Information

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Title of project - An awareness package for combatting identity theft amongst the elderly using Eduweb

I confirm that I have read and understood the participant information surrounding the project. ✓

I can confirm that I have had the opportunity to ask any questions and the researcher has answered my questions about the study to my satisfaction. ✓

I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without giving a reason and without any consequences. ✓

I understand that I can withdraw my data from the study at any time. ✓

I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available. ✓

I consent to audio/video/interviews being recorded as part of the project - Yes / No

Name of participant

Date

Signature

STELLA
ELLIS

10.4.18

Stella Ellis

Name of researcher

Date

Signature

Zoe Carter

10/4/18

Zoe Carter

Questionnaire Research

I am currently studying Forensic Computing and Security at Bournemouth University. I am in my final year researching and writing my dissertation to create educational content for elderly people to learn how to stay safe online. A lot of resources have gone into school curriculums to create safe environments for children and to give them the knowledge they need to keep themselves safe. I am hoping to create an equally safe environment for people who did not have the opportunity to receive education on technology.

1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly) **NO**

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

1. PLAYER - WEATHER

3. Do you find using the internet frustrating and why?

I used to use but - I received some very aggressive messages.

4. Do you feel safe online? (Please circle)

Yes / **No** / Do not know

5. Do you know of any of the dangers associated with being online? If yes, please specify.

Yes / No **see No 3.**

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

My youngest son who runs a computer company

8. Have these people ever taught you about staying safe online?

Yes

Research Consent Form

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I consent to audio/video/interviews being recorded as part of the project – Yes / No

Name of participant

Date

Signature

J.A. Nicholson
J.A. NICHOLSON

10-4-18

J.A. Nicholson

Name of researcher

Date

Signature

Zoe Carter

10/4/18

ZCarter

Questionnaire Research

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1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

Yes — daily

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

e-mail, online shopping, BBC pick up

3. Do you find using the internet frustrating and why?

Yes, limited knowledge + help

4. Do you feel safe online? (Please circle)

Yes / No / Do not know

5. Do you know of any of the dangers associated with being online?
If yes, please specify.

Yes / No

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

—

8. Have these people ever taught you about staying safe online?

—

Research Consent Form

Participant Information

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I consent to audio/video/interviews being recorded as part of the project – Yes / No

Name of participant

Date

Signature

S. SIDDONS

10/4/2018

S. Siddons

Name of researcher

Date

Signature

Zoe Carter

10/4/2018

ZCarter

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1. Do you use the internet and if so, how often? (e.g. daily, weekly, monthly)

daily

2. What activities do you do when you use the internet? (e.g. Facebook, online shopping, online banking etc.)

*e-mail - facetime - banking - shopping
no social media - ever.*

3. Do you find using the internet frustrating and why?

bad connection - confusing language - constant interference - cookies? why?

4. Do you feel safe online? (Please circle)

Yes / No / Do ~~not~~ know

5. Do you know of any of the dangers associated with being online?
If yes, please specify.

Yes / No

6. Do you ever call upon a younger person to help you with technology/the internet? (Please circle)

Yes / No

7. If yes, who was the younger person in relation to you? (e.g. Child, teacher, niece etc.)

child - usually too busy.

8. Have these people ever taught you about staying safe online?

No

Research Consent Form

Participant Information

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I understand that I can withdraw my data from the study at any time.

I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available

I consent to audio/video/interviews being recorded as part of the project – Yes / No

Name of participant

Date

Signature

McDONAGH

10/4/2018

[Handwritten Signature]

Name of researcher

Date

Signature

Zoe Carter

10/4/2018

[Handwritten Signature]

Appendix H – Focus Group Notes

Focus Group	10/4/18
<ul style="list-style-type: none"> - 30 members - majority female - females more willing to talk + understand - All had issues with hearing - Did not want session to be recorded. 	
<u>Discussion</u>	
All very enthusiastic about the subject	
<p>Researcher - explains the project and why they are there Hands out the questionnaire and lets participant read through</p>	
<ul style="list-style-type: none"> * Most participants agree that everything is focused on childrens online safety and adults are forgotten * All recognise the need for it in the up and coming world. * Most have some younger family members who teach them, yet feel bad for asking and wasting their time as well as saying theyre too busy. * No members have been a victim of online fraud, however all have had a phishing email * Some members did not know what a phishing email was until it was explained. * Some members have been victim to trolling + scamming. and it scared them from the internet * Most feel happy using basic technology, but as soon as they reach a problem they are stuck until someone helps * Very interested in having sessions where they can receive help from someone else (any age) * Think young teaching the old is a good concept. * Argument about whether children or elderly are the most vulnerable 	

For children - they don't understand ways of the world because they are too innocent.


- Trust people easily as they do not know what people are capable of
- Have been brought up around technology, so have a wider range of activities to have to stay safe on

For elderly - more trustworthy as they do not know online dangers

- technology is too new for them to understand dangers
- Targetted more for money.
- have more to lose financially.

Conclusion: elderly are more vulnerable to fraud and lack the knowledge to see it happening. However, children are vulnerable to being tempted into meeting a stranger from the internet due to naivety but would be more likely to spot fraud.

- * Wanted insight about phishing.
- * Can all access a website on their own so could access online material for learning
- * Would rather learn about safety with others
- * Kind videos informative and fun but would still like someone to discuss it with afterwards.
- * Do like to do things alone so simple step by step guides are ideal.
- * Main activities - Email and shopping.
- * Known threats - hacking and scamming.
- * Not heard the term 'social engineering'
 - ↳ but heard of types e.g. phishing
- * All are members of communities to stay active and informed
- * Would consider joining a digital community

- 
- * Do not want the pressure of grading.
 - * Use the same passwords or similar ones for everything.
 - * Mentality of 'why would I be targeted' so don't believe they needed strong passwords
 - * Enjoy humour in learning.
 - * Good presentation and simple - attributes for learning material
 - * Would like evidence of attacks happening as its not something they take notice of.
 - * Phishing was a big issue and fear of theirs

Appendix I – MoSCoW Requirements

#	Priority	Requirements	Rationale
1	Must	Identify the best techniques to educate elderly people	If the best techniques are not chosen, they will be unsuccessful
2		Identify a pedagogy that can successfully allow young people to educate the elderly	Interest and facilities have to be available to get this pedagogy to work properly
3		Identify what activities elderly people are likely to use online	This will ensure all information provided is tailor made to suit the target audience
4		Create content that is interesting and educational to the target audience	Content has to be made so people want to learn from it. Focus group discussed they want something quick and simple but educational
5		Evaluate different software for animation and storyboarding techniques	To ensure the best quality work is produced in the most efficient way
6		Deploy the content to EduWeb as a platform to reach the target audience	Content must be accessed by as many people in the specific demographic as possible
7		Include education, tips and knowledge about online safety to advance computer security knowledge	The focus must be on issues of security to help people stay safe online
8		Create an animation about phishing	It is a major issue that results in a lot of people being defrauded or having their identity stolen. Was a fear amongst a lot of elderly in the requirements elicitation process.
9		Analyse threats that are likely within the specified demographic	Knowing the threats associated with elderly people can allow for tailor made content
10		Be in simple terms so that the young and the old can both understand	Current solutions become too complicated to capture the attention of the target audience for long enough
11		Provide an easy guide on how to create a strong password	People do not think it will happen to them so they reuse the same password and do not realise the dangers
12		Raise awareness on personally identifiable information	This information is the key to someone stealing your identity. Many elderly do not know what this involves or how to protect it
13	Should	All storyboards made into some form of awareness package	The main storyboards are the security issues this project is focusing creating awareness on

14		Cover aspects of social engineering as a main topic	Should include what to do and what not to do as well as raising awareness on the issues
15		Include guides as short, fun methods of learning	To provide ways of accomplishing small tasks whilst learning. Allowing users to be independent
16		Add content for a digital community (EduWeb) to provide a place for digitally excluded to feel less isolated	Adding more information is more likely to bring people into the community
17		Create infographics on a range of different safety measures that can be taken	Provides simple yet effective visual way of learning. Quick knowledge for when someone is in doubt
18		Be able to be deployed anywhere	The content is using EduWeb as a platform, however it does not need to be limited to this as deploying it anywhere can reach more people
19		Use gamification rather than a grading system	Level up and get points when completing a course on EduWeb
20		Highlight the importance of having a strong password	When people know the risks associated they are more likely to comply
	Could	Link articles relevant to the content that shows cyber-attacks happening to the elderly in the real world	Shows how serious the issues are and indicates the consequences that have happened in real life
		Run workshops shaped around the content as a testing method	This type of testing could give insight into how the content will work
		Expand on phishing throughout other forms of media, not just email	Show that there is a broad spectrum of ways cyber-attacks can be executed
		Run cyber sessions with the elderly to build a community	This could combat isolation and loneliness as well as digital exclusion to eliminate as many vulnerabilities associated with elderly people
		Collaborate with a school to give young people the opportunity to get involved as an extra-curricular activity	Give people in school an incentive to become educators from a young age and 'network'
	Won't	Create content covering every current security issue	In time all issues could be covered but with the time constraints of the project it is not necessary

Appendix J – Storyboards

J1 – Storyboard A: Phishing

Panel 1: A cyber criminal carefully conjures up an email trying to impersonate the government to steal money from defenseless individuals. (Thought bubble: Oh I have an email!)

Panel 2: June opens her emails to see an email from the government saying her council tax is over paid and she can receive a refund using the link provided. (Thought bubble: Oh no! I didn't think my council tax was due yet)

Panel 3: June immediately clicks on the link and types in her card details as prompted in the email.

Panel 4: Phishing! The link June clicked on was from a phishing email. The cyber criminal has now received Junes card and bank details and has access to everything. (Thought bubble: I will go and check my bank to see if I have received my money)

Panel 5: The cyber criminal has run away with Junes money and still has her bank details. June checks her bank and realises all her money has been stolen and she never got a refund! (Thought bubble: I'M RICH! I have used the details to access her bank account and taken everything!!; Where has my money gone?)

Panel 6: This is the phishing email. Steps that can be tell tale signs are:
 1. Be suspicious if the email tells you to click a link.
 2. Check to see if the email looks legitimate.
 3. Check the senders email address.
 4. Do not give personal details to anybody online.
 5. Report the sender

J2 – Storyboard B: Dating Scam

Panel 1: eharmony profile for John Rudd, English, 63, Work: Real Estate. Message: "Hello Martha".

Panel 2: John's message: "You are the most beautiful person I have ever seen, I would love to grow old with you and come to your painting classes. I love painting too. Xox". Martha's reply: "Oh John, you are so sweet, I am so glad we have so much in common xox".

Panel 3: Martha's question: "When can we meet? Can we at least have a phone call?". John's reply: "Of course we will, I'm busy at the moment but soon, I promise. I bet you have a beautiful voice".

Panel 4: Martha's message: "My mother has fallen ill, I need to pay £20,000 immediately but I'm having trouble with my card. Could you help me, my love?". John's reply: "Oh no, of course I will".

Panel 5: Martha's message: "Sent" (with a green checkmark icon).

Panel 6: A list of 6 red flags for online dating scams:

- Someone showing a lot of interest**
If someone shows a lot of interest in you that will not let you see them or phone them, be suspicious.
- Someone sharing personal information**
If someone shares a lot of their personal details, or asks you to they may be trying to get information about you to steal your identity or money. Never send someone money that you have not met.
- Send valuables for you to resend elsewhere**
If someone wants you to resend such as a phone or a laptop to send on to another location, do not get involved and alert the police immediately as this could be criminal activity.
- Pretend to book flights to see you but never do**
If they keep saying they will fly over to see you, but something always happens that gets in the way. Do not trust that they are who they say they are.
- Ask you for money/bank details for an emergency**
If someone asks you for money or bank details, never send it. However bad the emergency seems it is a well laid trap that you are being scammed.
- Claim they can't afford to travel to see you so ask you to pay**
Trying to make you pay for them to come and see you indicates that they could be just trying to get money from you.

Caption 1: Martha's children encouraged her to set up an online dating profile after she had been widowed a few years earlier. Unexpectedly to Martha, a man called John took a lot of interest in her.

Caption 2: John and Martha got along very well. They were interested in the same things and their conversation flowed. John was very kind to Martha and became besotted by him and they decide they're in an exclusive relationship.

Caption 3: Martha loves John but is getting frustrated that they have never even met or heard each others voices. She asks to John but he quickly makes an excuse and changes the subject.

Caption 4: After months of talking everyday, John comes to Martha in a panic. He claims a member of his family is in trouble and he cannot afford to pay it right now as he is having trouble with his card.

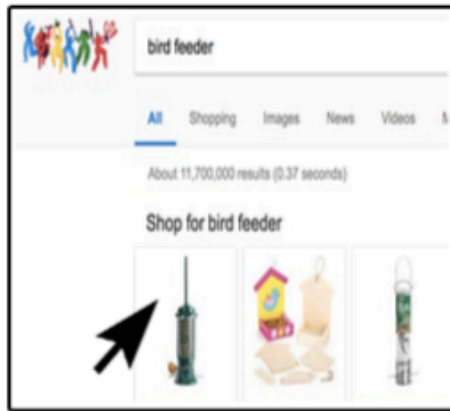
Caption 5: Martha transferred the money. She never heard from John again.

Caption 6: These are 6 things to consider when speaking to an unknown person online.

J3 – Storyboard C: Illegitimate Website



Arthur is going on his tablet to buy a new bird feeder online



Arthur searched 'bird feeder' in a search engine and finds the perfect feeder



Arthur types in his card details to buy his bird feeder



Arthur waited for his bird feeder to arrive. It never did
Arthur had been a victim of inserting personal details into an illegitimate website



Arthur got a call from the bank saying suspicious activity has been happening on his card and transactions have been made somewhere in South America. When Arthur confirms he has not used his card in South America, the bank inform him that his identity must have been stolen



Signs of an illegitimate website are:
1. http: rather than https:
2. Names similar to a big brand (e.g. AmazOn rather than Amazon)
3. Website having bad spelling and grammar
4. The website doesn't have the lock symbol

Appendix K – Webbie



Appendix L – MoSCoW Evaluation

#	Priority	Requirements	Criteria	Met? Y/N
1	Must	Identify the best techniques to educate elderly people	Literature review and background research indicated what techniques are best with questionnaire and focus group backing it up	Y
2		Identify a pedagogy that can successfully allow young people to educate the elderly	Literature review and background research indicated what pedagogies are successful with questionnaire and focus group backing it up	Y
3		Identify what activities elderly people are likely to use online	Literature review and background research indicated what activities elderly people use online with questionnaire and focus group backing it up	Y
4		Create content that is interesting and educational to the target audience	Focus group and questionnaire identified what the elderly would find interesting and content was created accordingly	Y
5		Evaluate different software for animation and storyboarding techniques	Research and recommendations allowed for software comparison to occur to decide what was best for this project	Y
6		Deploy the content to EduWeb as a platform to reach the target audience	Implementation was conducted to successfully upload content onto EduWeb	Y
7		Include education, tips and knowledge about online safety to advance	All content created (guides, infographics and videos) included	Y

		computer security knowledge	education to advance online security knowledge	
8		Create an animation about phishing	Animation about phishing was created and uploaded onto EduWeb	Y
9		Analyse threats that are likely within the specified demographic	Literature review threat analysis and attack trees allowed for identification of threats and how to prevent them	Y
10		Be in simple terms so that the young and the old can both understand	All content was designed and implemented in a way that can be easily accessible to all users	Y
11		Provide an easy guide on how to create a strong password	A guide was created with education on creating strong passwords due to the gap in knowledge found within the questionnaire and focus group	Y
12		Raise awareness on personally identifiable information	An infographic was created to raise awareness on personally identifiable information to ensure the target audience know what needs to be kept private	Y
13	Should	All storyboards made into some form of awareness package	Of the storyboards created, all were made into some form of content and uploaded onto EduWeb	Y
14		Cover aspects of social engineering as a main topic	The animation created focused on an aspect of social engineering (phishing) as well as the literature revealing how easy it is for elderly people to be social engineered	Y

15		Include guides as short, fun methods of learning	Research showed that guides allowed independence yet were fun and effective	Y
16		Add content for a digital community (EduWeb) to provide a place for digitally excluded to feel less isolated	EduWeb is available for a digital community to get involved in learning and content has been added accordingly	Y
17		Create infographics on a range of different safety measures that can be taken	Literature and elicitation showed that simple yet informative infographics are ideal solution	Y
18		Be able to be deployed anywhere	The content was deployed on EduWeb but are in formats that can be used multiple times wherever necessary	Y
19		Use gamification rather than a grading system	EduWeb provides a level up system meaning when users enrol on courses they can level up when they are ready to	Y
20		Highlight the importance of having a strong password	Strong passwords were big issues leading to high risks therefore this issue was covered	Y

Appendix M – Reflection

On reflection, undertaking a project with time constraints that had many different aspects to it increased the possibility of having to adapt from the initial time scale of the project. The SAM agile process was chosen to accommodate this and allowed for a smooth and continuous operation. All changes to the initial timeline of the project were completed without interrupting the main completion deadline.

Finding literature on this subject did prove to be difficult at times due to the idea that traditional methods will be moving online, yet due to the fact they have not been eliminated by this point in the project, literature was not focused on this. Creating the animation for the artefact caused a slight disruption due to software not being readily available. Once the correct software had been chosen it had to be learnt by the creator which made it a slower process than necessary. However, once it was completed the whole artefact came together easily. A major lesson learned throughout this project is that time management has to allow for disruptions and the chosen methodology should complement this to ensure adaptations can be made.