

Introduction

The UK population is ageing – around 18.2% of the UK population were aged 65 years or over in 2017, compared with 15.9% in 2007; this is projected to grow to 20.7% by 2027 (Office for National Statistics, 2018).

“As well as growing, the population is also ageing. From looking at past patterns, we project that more than a quarter of UK residents will be aged 65 years or over within the next 50 years.”

Sarah Coates, Centre for Ageing and Demography, Office for National Statistics

These trends are similar to those seen in other developed nations.

“...every country in the world is experiencing growth in the number and proportion of older persons in their population” - (U.N., 2019).

As the global population ages, and technology becomes increasingly pervasive, there will be increased demand for digital products and services for older adults. Seniors overwhelmingly view technology as a positive force in society, however, a strong majority feel a lack of confidence in their own ability to utilize it effectively (Anderson and Perrin, 2017). Although corporations focus greatly on targeting young children and teenagers, and have refined the art of marketing to these age groups for various reasons, greater understanding is required for the growing demographic of older adults. Older people are wealthier than younger individuals are, and therefore provide great growth potential as a customer base. The Office for National Statistics gathered the following information on wealth by age group in the UK:

Distribution of aggregate household total wealth by age and wealth component
Great Britain, July 2014 to June 2016

	Property Wealth (net)			Financial Wealth (net)			Physical Wealth			Private Pension Wealth			Total Wealth		
	£ Million	%	Median £	£ Million	%	Median £	£ Million	%	Median £	£ Million	%	Median £	£ Million	%	Median £
16 - 24	2,702	-	0	3,119	-	0	5,404	-	8,000	2,098	-	0	7,084	-	8,000
25 - 34	157,994	3	0	32,679	2	1,000	98,799	8	23,000	128,405	2	7,000	417,877	3	67,000
35 - 44	528,479	12	50,000	121,505	7	2,000	194,196	16	35,000	487,305	9	34,000	1,331,485	10	176,000
45 - 54	910,678	20	91,000	306,199	19	4,000	282,716	23	42,000	1,271,220	24	87,000	2,770,813	22	300,000
55 - 64	1,110,987	24	165,000	408,702	25	14,000	266,090	21	46,000	1,789,598	34	189,000	3,575,377	28	538,000
65 - 74	1,083,091	24	180,000	486,380	30	25,000	229,136	18	46,000	1,216,512	23	162,000	3,015,119	24	495,000
75 - 84	587,312	13	161,000	218,364	13	21,000	131,063	11	38,000	369,669	7	61,000	1,306,408	10	327,000
85 and over	188,930	4	140,000	65,038	4	16,000	40,690	3	29,000	59,324	1	13,000	353,982	3	244,000
All Ages	4,570,174	100	95,000	1,635,748	100	6,000	1,248,092	100	37,000	5,324,130	100	58,000	12,778,146	100	259,000

Source: Wealth and Assets Survey, Office for National Statistics

Notes:

"-" denotes a percentage > -0.5% but < 0.5%

(<https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/adhocs/008149distributionofaggregatehouseholdtotalwealthbyageandwealthcomponentgreatbritainjuly2012tojune2016>)

The [RESEARCH AND INSERT DATA IN CUSTOMER BEHAVIOR AND MARKETING STRATEGIES BASED ON AGE].

For these reasons, this pilot study is being carried out to understand how older adults interact with web services and what motivations/emotional experiences they have when interacting with a website that helps them meet people of the similar demographic.

Internet Use Based On Demographics

A challenge in answering questions based on seniors versus other demographics is how to determine who a senior is. Although ageing is a biological phenomenon, the cut-off points at which someone is classed as a senior has no straightforward demarcating feature. Who is and is not a 'senior' or 'older adult' is mostly an opinion based on various societal and cultural factors. The literature is also divided on this subject as well. A senior or older adult can be 45 according to (Czaja et al., 2013), or 60 years of age according to (Lam and Lam, 2009), or 65 years (Gell et al., 2015; Friemel, 2016; Quan-Haase et al., 2017). There are plenty of examples of other delineating cut-off points. For this specific study, an older adult or senior will be classed as someone who is over the age of 50 and this is for reasons of practicality. The time constraints and resource availability mean this study cannot exclude too many individuals. This cut-off has also been determined to ensure completion of the study in a timely manner.

Demographically, it is clear that younger people use digital media and internet-based services more than older people. The Office for National Statistics reported recently that virtually all individuals between 16 to 34 year old age-range had recently used the internet, compared to 10% of 55-64 year olds who did not use internet in the last three months. The vast majority of 55-64-year olds had also recently used the internet, as shown by the graph below.

FREQUENCY OF INTERNET USE, BY AGE GROUP, 2018

Within the last 3 months

	Age group						All
	16-24	25-34	35-44	45-54	55-64	65+	
Daily or almost every day	100	99	97	92	82	55	86
At least weekly	0	1	2	3	5	9	4
Less than weekly	0	0	0~	1	2	5	2
Did not use in the last 3 months	0	0	0~	4	10	31	9

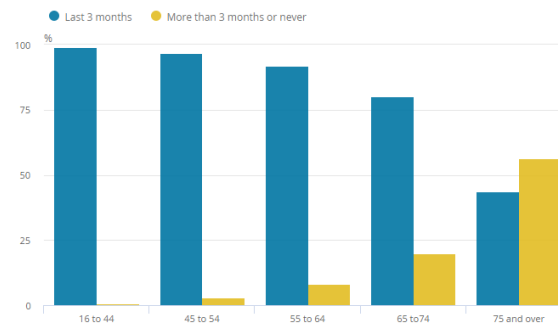
Base: Adults (aged 16+) in Great Britain.

Source: Office for National Statistics

Percentages may not sum to 100 due to independently rounded components.

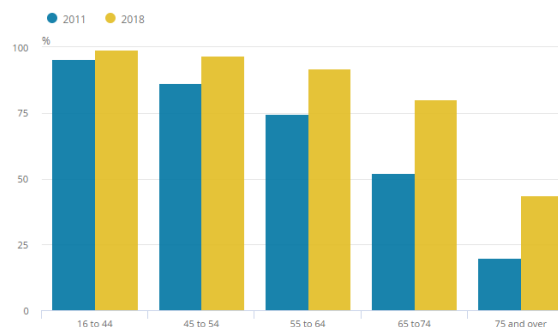
0~ Data too small to display.

Figure 1: Internet users by age group, 2018, UK



Recent internet use has increased among all demographics since 2011

Figure 2: Recent internet use by age group, 2011 and 2018, UK



Source: Office for National Statistics

These statistics are not surprising because UK is an advanced economy and was among the first in the world to adopt internet use on a large scale. Older women are less likely to use the internet than older men (Age UK, 2016, The Internet and Older People in the UK – Key Statistics July 2016). Similarly, disabled individuals, according to the same report are also less likely to use the internet. Socio-economic conditions also are a factor in internet use. Wealthier individuals are more likely to use the internet relative to less wealthy individuals. A report by the English Longitudinal Survey of Ageing (ELSA), looking at individuals over the age of fifty reported that people in deprived areas used the internet with lower frequency (Matthews and Nazroo, 2015).

The type of activities carried out is also a factor. The aforementioned reports and surveys unfortunately did not ask important questions that would have given a more thorough understanding of the reasons behind these factors and habits regarding internet use. Important questions such as whether the older individuals would increase their internet use if there were more targeted services available. Whether they felt alienated on the internet and if the websites they regularly use feel like they have been designed without them in mind. Another important question to ask is whether there is a lack of effective and targeted marketing. Perhaps, many older individuals are unaware of services that they might be very interested in but have not been marketed to. Unfortunately, this information for the UK demographic at least is lacking in these important reports

from AgeUK and Office for National Statistics. Where such information is available, it mentions a lack of interest for the reason for not using the internet use. 61% of non-users over 65 year of age the internet did not interest them (Age UK, 2014 Age UK analysis of ONS Opinions and Lifestyle Survey, Internet Access Module, 2014).

Older Adults And The Challenges They Face When Using Technology

As people age, they undergo changes that affect their ability to use conventional websites. Therefore, although older adults are free and able to use any website available online, they are not able to utilize it as effectively as a website that was specifically designed for their needs. Many seniors have physical or cognitive issues affecting their ability to utilize technology. Almost 75 percent of people over 65 have multiple chronic conditions as opposed to 4 percent of 20-44 years age group (Anderson G, 2009). Chronic conditions such as arthritis and overall reduced mobility means they have difficulty using the mouse and keyboard. This affects how they can interact with a website. If a website requires a lot of clicking, and the user feels pain during that movement due to arthritis or severe RSI for example, they are likely to have a negative experience and not return to that service. Similarly, if typing causes discomfort and the website relies heavily on typing, then again, a negative experience and low user retention from the seniors age-group is likely.

Older people also feel more socially isolated relative to younger demographics, exacerbating chronic conditions and resulting in increased mental health issues (Cornwell EY, 2009). It is difficult to know how this affects their use of web services. One way in which it may affect them is in the choice of colours, themes and imagery utilized by a website. A socially isolated individual may not relate to a website using lots of images of groups. This can cause the isolated individual to not feel like that website is targeted towards them, leading to them not using it. Similarly, using themes and colours depicting outdoors could prevent engagement from disabled individuals with mobility issues. Social isolation can increase introverted aspects of an individual's personality and extroverted imagery, such as group photos with bright colours depicting outdoor activities can prevent engagement from such individuals.

Eyesight also declines with age and so the colours, fonts, placement of items and many other aspects of design need to be considered carefully. Colour perception changes and loss of contrast sensitivity occurs. There is likely to be significant variation in the level of vision decline among the population.

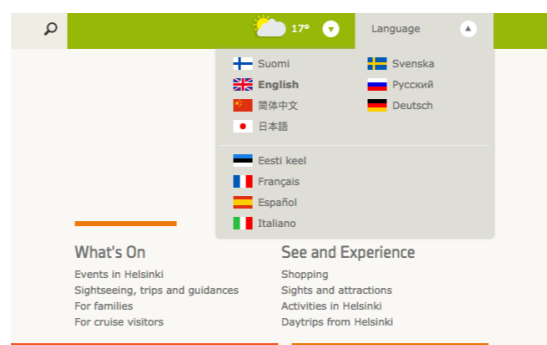
They also have challenges keeping up with technology trends. Seniors are likely to favour a service that is simple, with minimal distractions and with only useful information presented, over a service using the latest website design trends.

Although hearing declines as well, it is not relevant for this study. If a service was to allow voice communication or multimedia, then decline in hearing must also be considered when designing and implementing web services.

Careful consideration must be given to all of all the aforementioned factors when designing a service for seniors because they directly impact a user's ability to engage and interact with the service. Good user experience and user interface ensures that the target audience has a positive engagement from first contact to the last use-case.

However, it is very challenging to design a truly universal service that can appeal to all use-cases when dealing with seniors. One of the reasons is the kaleidoscopic issues and their distributed nature. Although most seniors are affected by a common set of factors, they are not equally affected. Impaired vision for example is not an all-or-nothing condition. Some have slightly impaired vision, while others have severely impaired vision. All of the conditions related to age fall under a spectrum. Furthermore, there are specific conditions that are only suffered by a minority of seniors. This problem is exacerbated by the fact that 'seniors' or 'older adult' is not well defined and can span four to five decade, or just under half of a normal western human life-span. There is likely to be great variation in the severity of a given condition among a population. A service designed for users with severely impaired vision is likely to be significantly different than one designed for slightly impaired individuals. Because of these factors it is extremely difficult to produce a web service that can adequately cater to all seniors. Therefore, a service must be very clear in what the target audience is and be specific. Although this is likely to reduce profit potential and thus reduce likelihood of a service emerging in the private sector. However, it is a good option for governmental and charity organizations.

A more expensive alternative is to give a service the ability to change the styling and layout based on user-choice. This can allow different users to select the layout, much like you can change the language:



This will allow maximum coverage for users with different conditions by dynamically changing the layout and styling based on user requirements. W3C recommends that a website gives users the ability to change font [REF W3C] through buttons provided. This can be extended to all other accessibility requirements. However, the development and maintenance costs would be significant, and, therefore this solution will not be tenable for most scenarios. But, a governmental project with sufficient funding could achieve this.

Website Updates

Change is part of an Information System offering. Software is in constant flux. Websites often undergo changes in appearance to incorporate the latest trends and add new features. Sometimes, the design is completely revamped and the user must re-learn the website and how it works post-update. Any website aiming to help seniors must be very careful in their approach to updates in the website's appearance. Individuals with the most debilitating conditions and the most isolated have the most to gain with a web service aiming to help them find friendship and companionship as they are the primary audience. These same individuals, on average, are likely to take the longest in getting familiar with the website and only once they are confident with how the website works, can they truly benefit from it to the maximum potential benefit.

If the website is updating its appearance often, then the user will never truly master the website and therefore be less effective in their use. Furthermore, changes made often can cause frustration and negative experience, causing the most critical users to stop engagement.

Of course, it is unrealistic to expect a website to never change appearance. However, changes must be extremely small, well thought out, beneficial to the user, and most importantly, they must be necessary. If a major re-design is necessary, then it must be broken into stages. The user must be told in advance so they anticipate it and training must be provided for those who choose to use the training material. This can be in the form of videos or tooltips explaining new changes and where things have moved to. Any new features added must be advertised clearly and repeatedly so the user can begin using it, instead of being unaware of its addition.

Interviews and Anecdotal Evidence

As part of this study various people were spoken to either in person or through e-mail/social-media to get some local and immediate views and experiences regarding technology and web services and older adults. Libraries, charities and contacts through friends and family were spoken to and asked about their experiences when using technology and web services in general. Some people reported an increased competence and engagement over the years when compared to their use of internet

services ten years ago. This was generally attributed to the increased variety and accessibility of these services relative to ten years ago.

However, there were also sentiments expressed that the pace of change in the language used on the internet and the 'web culture' was very fast paced and more suited for younger individuals who were quicker in getting familiar with these rapid changes. Two people reported not knowing what 'lol' – (equivalent to expressing laughter) - and other commonly used shorthand notations commonly used during internet and social media communication. This made them feel less able to engage with websites comments section for example and dampened their confidence in feeling part of the 'web' community.

Library services that offer free lessons to individuals in using computers and the internet reported that older individuals often do find it challenging to engage with web services. This is exacerbated if they are not able to use a computer proficiently either. Without the necessary skills to use a computer properly and with confidence, engaging with dynamic web services is going to be extremely challenging. The staff reported that a lot of these users want to be able to use computers for basic services such as checking e-mail, Facebook or use skype in order to stay in contact with friends and family. These are very familiar and pervasive services. The training staff expressed doubt that some of these individuals will be able to learn and use a new unfamiliar web service without actual training on the service. Although, they said that a minority would be able to if enough incentive was there. This is of course anecdotal and an opinion, but these sentiments do highlight challenges that older individuals face with web services. It also means that potentially, if a service was popular and in demand, there will be increased likelihood for adaptation by greater number of seniors.

An interesting and commonly expressed view was that many older adults use their digital devices to play games as a form of entertainment. Any potential web service based on people meeting up based on familiar interests is likely to have significant competition from games. Further research will need to be done to know exactly why games are much more popular than internet use among at least some portion of the senior population that use digital devices regularly. One potential explanation is that games provide immediate entertainment and pleasure, whereas, searching and trying to engage with people online, waiting for responses and potentially having a negative experience is a relatively less pleasurable experience. Perhaps, older adults who do feel isolated find it easier to 'escape', through these games as they feel there is no alternative or are not aware of how to find engaging alternatives to the games. All of this is of course an opinion and personal

interpretation but does highlight interesting venues for further research if more understanding is required.

Potential Benefits of the Internet for Older Adults

Internet use can help alleviate, or at the very least mitigate many of the negative factors that affect seniors. The different activities available on the internet can allow them to enrich their daily experience, but it is critical for them to be aware of what is available. Furthermore, they must have sufficient IT skills to be able to make use of web services. Previous studies have noted many benefits of computer and web use for seniors (Xie B, 2011). For example, lack of mobility is no longer a barrier because the person suffering from such circumstances can communicate with others from the comfort of their home. Online shopping, events booking, health information and banking are some of the tasks that can be achieved through web services, thus reducing the stress of commuting and mobility challenges and bringing convenience (Gatto SL et al, 2008). Of course, it will take time for seniors to fully realize the benefits of online services due to the reduced use and skill gap. But, over-time, this is likely to improve as digital devices penetrate deeper into everyday use and due to increased awareness.

Recommended Design Choices (Accessibility and Usability)

Oxford dictionary defines accessibility as the 'quality of being easy to obtain or use'.



However, different design paradigms target different user groups which can result in non-targeted groups being unable to use the website effectively or at all. Web accessibility means that the design of a website aims to allow ease-of-use for people with disabilities and other issues that reduce their ability to use websites effectively.

The World Wide Web Consortium (W3C) is the main international standards organization for the world wide web. It has member organizations and full-time staff, including software developers, that develop web standards (W3.org, 2019). They have recommendations for web development targeting to provide accessibility and ease-of-use that are detailed in the 'Web Content Accessibility Guidelines' - WCAG 2.1. It covers a wide range of recommendations on how to make web content more accessible. These guidelines are specifically targeted to ensure accessibility for 'people with disabilities, including accommodations for blindness and low vision, deafness and hearing loss, limited movement, speech disabilities, photosensitivity and combinations of these, and some

accommodation for learning disabilities and cognitive limitations; but will not address every user need for people with these disabilities.’ (**WCAG 2.1 Abstract**). ‘These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general.’ (**WCAG 2.1 Background**). WCAG 2.1 was specifically initiated with the aim of improving accessibility recommendations for users with cognitive or learning disabilities, users with diminished vision and users with disability on mobile devices.

The WCAG has a defined hierarchy for the purposes of organising the information. It is a top-down approach, going from general to increasingly specific. At the top are four accessibility ‘**Principles**’ which consist of *perceivable*, *operable*, *understandable* and *robust*. Under these principles are ‘**Guidelines**’ which provide basic goals to achieve accessibility under the principles. These guidelines are not specific enough to be testable. The next level down is the ‘**Success Criteria**’ which provides testable criteria for the guideline. There are three degrees of success criteria for conformance testing: A (lowest), AA and AAA (highest). Lastly, there is a ‘**Sufficient and Advisory Techniques**’ section that can be either *sufficient* in meeting the success criteria or *advisory* (i.e recommended). This is a little confusing but will become clearer as specific recommendations are analysed to determine whether they will be incorporated in the prototype for this study.[**It is notable that**

WCAG itself admits that even if AAA criteria is achieved, it is no guarantee of complete accessibility for all users and highlights the challenge accessibility presents. This will be discussed more in the critical analysis section.

ACCESSIBILITY IS AN ON-GOING PROCESS OF LEARNING AND ITERATIVE IMPROVEMENT. NOT A SINGLE SHOT SUCCESS.]

The four principles are defined by the WCAG as follows:

- **Perceivable:** ‘Information and user interface components must be presentable to users in ways they can perceive.’
- **Operable:** ‘User interface components and navigation must be operable.’
- **Understandable:** ‘Information and the operation of user interface must be understandable.’
- **Robust:** ‘Content must be robust enough that it can be interpreted by a wide variety of user agents, including assistive technologies.’

Following are the most important and relevant recommendations within the WCAG, and will be the primary recommendations used when designing the website for this project. This list is by no means

exhaustive and recommendations that were not strictly necessary for the purposes of this study have been omitted as they were not applicable, achievable or necessary.

[DESCRIBE HOW FOLLOWING SECTION IS LAID OUT. EXPLAIN G GUIDELINE AND C CRITERIA COMMENTARY AT END FOR IN DEPTH ANALYSIS]

- **Text size** – Older individuals require large text because of declining vision, including text within form input fields, buttons and hyperlinks.

Criteria 1.4.4, AA Resize text says: “text can be resized without assistive technology up to 200 percent without the loss of content or functionality”.

- Application and techniques to consider: -

- Use a relative font-size styling in CSS - i.e ‘%’ and ‘em’ instead of ‘px’. Leads to more effective resizing. All fonts in this project use ‘em’ for font-sizes. One such example is as follows from the profiles page:

```
.profile-info p {  
  color: black;  
  font-size: 2em;  
  font-weight: bold;  
  line-height: 2em;  
  letter-spacing: 0.5em;  
}
```

- Providing large fonts by default. All text in the prototype website is large and in bold to give it extra visibility.

[CSS EXAMPLE AND IMAGE EXAMPLE]

- Providing controls that allow users to change the size of all text up to 200%. There are controls provided at the top-left to change font-size. The controls can be moved to any corner of the screen to fit user needs. Here is an example of the website at 100% and 200% magnification for comparison.

[IMAGE EXAMPLE]

- **Text style and text layout** – Text style and presentation can greatly affect readability for individuals with declining vision.

Criteria 1.4.8, AAA Visual Presentation says: “requirements on text style, text justification, line spacing, line length, and horizontal scrolling”.

- Application and techniques to consider: -

- Readable fonts. There is no specific recommendation for which fonts to use, but general consensus is to use san-serif fonts (e.g Arial, Verdana) as they are more legible than serif fonts (Times New Roman). This is also the opinion of PennState university, which recommends Verdana as the most accessible font (Accessibility at Penn State, 2019).
- Avoiding italics text. Italic text is difficult to read for individuals with declining vision and therefore is not used for this project.
- Sufficient line and letter spacing. This breaks up text, leading to increased legibility. By default, all text on the website uses ‘0.7px’ letter-spacing. Guideline 188 (G188) within *Criteria 1.4.8* suggests ‘Providing a button on the page to increase line spaces and paragraph spaces’. This is similar to the

controls for font-size and therefore is incorporated within those controls. The user can change the letter spacing according to their needs.

- Avoid overusing different styles on individual pages. This provides consistency and allows user to learn the website quickly.

- **Colour & Contrast** - “requires a higher contrast ratio of at least 7:1 for the visual presentation of text and images”.
 - High contrast is required to make it easier to decipher the difference between text and background.
- **CAPTCHA** – 'Completely Automated Public Turing tests to tell Computers and Humans Apart' are security checks to limit computer bots misusing websites. These are particularly challenging for seniors due to their nature. The text is not clear and it is not a user-friendly experience. An example of a CAPTCHA:
 - Alternative CAPTCHAs must be used.
- **Hyperlinks** - “Many older people need links to be particularly clear and identifiable due to declining vision and cognition.”
 - Explanatory text with the link that describes what and where the link navigates to.
 - Making links visually distinct from common text.
 - Consistency with links to make it easier to learn the website's landscape.
- **Navigation and Location** - “Many older people need navigation to be particularly clear due to declining cognitive abilities.”
 - Multiple ways to get to the same location so the user does not struggle finding the one single way. If one way is confusing for them, they have other options available.
 - Make it easy for the user to identify which page they are on and what its purpose is.
- **Mouse and Keyboard Use** - “It is difficult for some older people to use a mouse due to declining vision or dexterity. Some older people cannot use a mouse well or at all and instead use a keyboard.”
 - Input fields should have a way to clarify that they are expecting user input.

- Recommendation is to have the website be able to be used independent of the mouse.
- **Distractions** - “Some older people are particularly distracted by any movement and sound on web pages”
 - One recommendation regarding this says “interruptions can be postponed or suppressed”
 - Avoiding pop ups.

This is a particularly good example of websites and web development being geared towards a younger demographic. Animations and elaborate CSS stylesheets with many moving parts are used extensively in web development. As our service is only for older adults, we will not have any distracting content to adhere to the minimization of distractions. Only static content will be used. This is also likely to result in performance benefits.

- **Page Organization** - “Many older people are inexperienced web users without advanced browsing habits and therefore read the whole page, so good page organization is important.”
 - 2.4.10 - Section Headings (AAA) says “section headings are used to organize the content”
 - G130: Providing descriptive headings
 - G131: Providing descriptive labels
 - G141: Organizing a page using headings
- **Page Refresh and Updates** - “Some older people with declining vision or cognition can miss content that automatically updates or refreshes in a page.”
 - 3.2.5 - Change on Request (AAA) says “changes of context are initiated only by user request or a mechanism is available to turn off such changes”
 - G80: Providing a submit button to initiate a change of context
 - G13: Describing what will happen before a change to a form control that causes a change of context to occur is made
- **Instructions and input assistance** - It is difficult for some older people to understand the requirements of forms and transactions.
 - 3.3.2 - Labels or Instructions (A) says “labels or instructions are provided when content requires user input”

- 3.3.5 - Help (AAA) says “context-sensitive help is available”
- 3.2.4 - Consistent Identification (AA) says “components that have the same functionality within a set of Web pages are identified consistently”
- G184: Providing text instructions at the beginning of a form or set of fields that describes the necessary input
- Providing linear form design and grouping similar items (future link)
- G194: Providing spell checking and suggestions for text input
- G89: Providing expected data format and example
- G197: Using labels, names, and text alternatives consistently for content that has the same functionality

Literature review reference: Aspects of Web Design affecting the elderly - Forms.

- ***Error prevention and recovery for forms*** - It is difficult for some older people to use forms and complete transactions due to declining cognitive abilities.
 - 3.3.4 - Error Prevention (Legal, Financial, Data) (AA) says that pages with legal commitments or financial transactions have reversible submissions and can be checked and corrected
 - 3.3.6 - Error Prevention (All) (AAA) says that users can check and correct any information they submit
 - 3.3.1 - Error Identification (A) says “if an input error is automatically detected, the item that is in error is identified and the error is described to the user”
 - 3.3.3 - Error Suggestion (AA) says “if an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user”
 - G98: Providing the ability for the user to review and correct answers before submitting
 - Accepting input data in a variety of formats (future link)
 - Informing the user what irreversible action is about to happen (future link)
 - Making error messages easy to understand and distinguishable from other text in the Web page (future link)
 - G83: Providing text descriptions to identify required fields that were not completed
 - G85: Providing a text description when user input falls outside the required format or values
 - G139: Creating a mechanism that allows users to jump to errors
 - Re-displaying a form with a summary of errors (future link)
 - G177: Providing suggested correction text
 - Providing a text description that contains information about the number of input errors, suggestions for corrections to each item, and instructions on how to proceed (future link)

More techniques are listed under the success criteria for [Guideline 3.3

- Input Assistance (<http://www.w3.org/WAI/WCAG20/quickref/#minimize-error-reversible>) in “How to Meet WCAG 2.0”.

Literature review reference: Aspects of Web Design affecting the elderly - Forms.

Notable accessibility criteria not used in this project

Because accessibility is such a vast topic and all-encompassing, time constraints prevented the use of many techniques that would be extremely helpful in a real-world scenario. This section will document criteria not used in the project but is worth studying and incorporating in a more substantial study.

Can do these: -

- C17: Scaling form elements which contain text

Usability and Usability Testing

Economic Reasons for Services Targeting Seniors

As individuals get older, on average, they accumulate more wealth (<https://www.gov.uk/government/statistics/distribution-of-median-and-mean-income-and-tax-by-age-range-and-gender-2010-to-2011>). Many factors contribute to this, for example as workers gain experience, they command great salaries. Inheritance, equity release, compound interest and shares are all accumulated through a person's lifetime. This means that there is profit potential for web services targeting seniors. Additionally, as individuals retire, they are going to have much more time available to spend on such services. The profit potential is likely to increase because over time, more individuals are getting exposed to technology and gaining necessary skills required to navigate the web effectively. This is likely to result in increasingly tech savvy seniors going forward.

Once web services are established, they can grow and increase engagement by innovating age-appropriate design methodologies. Just as websites have transformed in the past decade based on research on how users interact with web services, greater understanding of age-appropriate design can produce similar results for websites designed for seniors. With greater understanding, better designed websites can be produced with increased engagement potential.

Social and Cultural Reasons For Services Targeting Seniors

From a humanitarian perspective, society should be inclusive and work for all its citizens. Of course, it is impossible to have a perfect society, but it is a good ideal to strive towards in order for progress to occur. By increasing targeted services for seniors, there is likely to be a long-term increase in inclusion for this age group. This will mean increased quality of life and happiness for seniors and society as a whole.

Charities that aim to help elderly people could utilize web services to increase their portfolio of charity activities. For example, a charity dealing with elderly citizens facing loneliness could use a web service to advertise activities or post other content that will help their clients engage more and help them get more involved. If there is a regular meet up or activity, a person with reduced mobility can engage with the event through the website. Or, if an older person is feeling isolated and has

developed social anxiety because of prolonged reduced human contact, they might find it easier to engage with others online before becoming more comfortable with face-to-face interactions.

Many unique opportunities are possible, but they all require a greater understanding of how to develop a web service that older people truly find engaging and easy to use. Without engagement, any such endeavour is likely to have minimal impact.

Safety Issues And GDPR

There are unique challenges that emerge when dealing with seniors using websites that will hold personal, identifiable data, such as names, date of births and e-mail addresses. Although the risk of frauds online is present for all demographics, the elderly are uniquely susceptible to these. Because seniors spend less time using the internet and are less experienced with technologies, they are in some cases less likely to identify a website or e-mail that looks legitimate for all intents and purposes except for very subtle clues that are hard to find. This factor coupled with reduced cognition gives rise to unique vulnerabilities. An older person is also likely to be more negatively affected by such an experience, especially if they are pensioners or not working as they are likely aware of the increased difficulty in regaining the lost monies. For this reason, any web service targeting seniors must not be negligent with security and implement very strong encryption to secure their customers.

GDPR compliance will also be achieved more easily with strong security. A secure web service is likely to attract loyalty from, customers and will be more profitable.

Design Review

[Need to show flow chart of paths]

[SIMILAR FEATURES CONSISTENT THROUGHOUT. Input forms have same look I.e border and background colour. Using similar regions to build cues and trust with user I.e input area, information area, tooltip area etc. Might get 'busy' lots going on. Only highlight critical areas to provide 'visual map'. Simplified nav so only need homepage. Real service unlikely but minimize cyclomatic complexity of website. Ideally just want homepage or GO BACK. Tried to keep things centralized I.e nav bar centralized after designing to have each end. Realized elderly have declining peripheral view so centralized is most effective [REF]]

[difficult to do input placeholder text as conflicts contrast requirements. If you use full opacity, looks like input field is already filled. Lower opacity helps identify it as input field but conflicts contrast requirements.]

For the pilot study, there were three pages constructed for the evaluation. A fully functioning website will have more pages and greater content than the one used for the evaluation, so it is important to recognize that this prototype is not a complete product. It is sufficient only for a pilot study.

To aid accessibility and improve usability, similar elements were formatted the same way throughout the website. [PUT SPECIFIC HTML/CSS DETAILS ABOUT ELEMENTS]. Buttons for example did not change the appearance between pages with all buttons sharing the same CSS properties as follows:

Font colour:

Font size:

Width:

Height:

Background colour:

Most websites attempt to have a consistent layout between pages; however, they usually have slight variations between pages. Buttons are normally different sizes and so are the block of texts. The prototype designed for this pilot study on the other hand does not have any variation between different pages. All buttons and input fields are the same size and consistent appearance. By striving for maximum consistency in appearance between the pages, the aim is to allow the user to get familiar with the web service quickly. Seeing the same elements throughout is also likely to reduce confusion. This simple choice could aid in reducing the cognitive load for users that have declining cognition. Simplicity and consistency are likely to be critical in aiding such users and providing a positive interaction with the web service.

All pages share the same font [INSERT FONT DETAILS AND JUSTIFICATIONS BASED ON W3C RECOMMENDATIONS] and consistent font sizes for specific sections to aid clarity and usability. Each page has a clear navigation bar at the top of the page with easy to identify links and a place on the far left to add identifying logo/name of the service. Navigation bar was placed on the top of the page because this is one of the most commonly used places to place navigation related content. The other most commonly used alternative is to have a navigation bar on the left. A web service aiming to increase accessibility and ease of use should provide the ability to change the position of the navigation bar. This is not exceptionally complicated from a coding perspective and would allow a user to modify the look and feel of the web service to their own needs. It would also increase accessibility for those who find it more comfortable to have navigation on the left side of the page.

One W3C recommendation that was not adopted for this prototype is to have more than one way to navigate the website. A possible implementation could be a small navigation helper tab at the bottom left or right with contrasting colours and descriptive label clarifying it as a navigation tab. This is to provide multiple ways to access resources, so the user is more likely to find the page they are looking for in case they are not competent web users. Although this would be useful in a larger project with many more navigation pathways and pages, for this simple prototype it would have added unnecessary confusion and clutter. This is especially true since the prototype website will be used for a short period of time and the user will not have as much time to get used to the web service relative to them using it in their personal time and at their own leisure. The prototype is also not complex enough to warrant multiple navigation regions.

It is important to realize that the extent to which a web service adopts the various accessibility and ease of use recommendations depends on various factors. A major factor will depend on the goals of the service and the target demographic. The older the target audience, the greater the accessibility will need to be. Another important consideration is the profit motive. If a charity is producing a web service, then they only need to cater to their specific audience. If, however the web service needs to be profitable, then some compromises will need to be made to increase potential audiences that can use the web service. Greater accessibility results in an easier to use website, but the overall look and feel suffer. Therefore, users not requiring extremely high accessibility are likely to seek out alternative websites that are more appealing.

Login page:

The login page comprises a simple HTML form that requires a username and password. There are clarifying labels to let the user know that it is a login form and there are two input fields requiring username and password. The input fields themselves have placeholders identifying them as input fields for username and password. To submit the form, there is a large button with the text 'Submit Button' written inside. A regular service would require a registration capability as well. All of the communication between client and server need to be secured through HTTPS secured socket communication to ensure personal information is encrypted over the internet.

Profiles/Search page:

A page like this will be the first page the user sees. It will have a search capability under the navigation bar, where the user can search for other users based on location or hobby interests. Other people's profiles will appear under the search bar with their profile picture and information about themselves. Information such as age, name and hobbies will be displayed under the picture.

This will help the user find critical information quickly so they can find people they want to contact. By being able to search, they will find people nearby and interested in similar hobbies, which will provide good user experience as the user is not going to experience frustration or other negative experiences, because the search feature allows the user to find others they are more likely to have a fruitful and positive experience with. An older individual is unlikely to be willing to travel extensively to find a friend or companion. Although, they may be willing to have a pen pal scenario where contact is solely digital or letters based, instead of one-to-one meet up.

In a real-world scenario, the user will provide information on which city or town they live in and hobbies the user is interested in. These will be from a pre-selected list so comparisons are made easily between other users and for matching people together. Therefore, as all this information will be available, the initial profiles page will already contain people that are close to the user and have similar interests. This will further make the website more user friendly and easier to use as the user once the user registers correctly. A more extensive study should study optimal registration methodologies for seniors. A lot of information and input is normally required during registration, including e-mail verification capability. This is likely to be a cause of confusion for many seniors not familiar with web services.

Messaging capability:

Any website of this kind attempting to allow seniors to meet will require a secure, reliable and easy to use messaging capability to facilitate communication. Fonts used and contrast are critical. This aspect of the website can be improved greatly as there are many factors and changes that can be made to provide a more age-appropriate and targeted experience. Currently used paradigms are designed for younger individuals, through providing animations and emojis that are more appealing to younger individuals. [ANALYSE EMOJIS FOR AGE-APPROPRIATE DESIGN].

Evaluation

For the evaluation the prototype website was used by individuals over 50 years of age. They were asked to perform four simple steps. In a more in-depth study, this aspect can be greatly improved by carrying out extensive testing and evaluation. Real world use-cases and evaluations are the only reliable way to determine how accurately theory matches reality. It also allows a diversity of knowledge to emerge by allowing the possibility to study people from different backgrounds. For this evaluation, users were asked to perform four steps:

- Simulate a log-in step by logging in using the details provided.
- Perform search for a specific hobby to get users with that hobby listed in their profile.

- Select a user from the post-search list to go to their profile.
- Send them a message to evaluate the messaging service and its usability.
- Complete a questionnaire.

Results

Section to talk about results of evaluation.

Review Other Sites Designed For Older Users

This section could be extremely expansive. However, for the interest of time and brevity, it will be limited in scope. It will look at design choices made by other websites that are aimed at seniors and determine whether they comply with W3C accessibility criteria. A common theme with many websites was the balance required between looking visually appealing, and completely complying with the W3C recommendations. This is expected and understandable. A service that complies fully with the W3C recommendations would be extremely easy and straightforward to use but will not look very aesthetically appealing. However, an extremely aesthetically appealing website will not be usable for seniors. A good implementation that strikes this balance rather well is

www.seniormatch.com [*INSERT IMAGES*]

After showing this to a few seniors, some of them commented positively about that image of the couple. It made them feel '*welcomed*' and made them feel that '*the website was designed with them in mind*'. A few also positively commented on the use of an image pertaining to walking on the beach because they too shared the desire to have a similar experience. Although, one person negatively commented on the use of the tagline: 'You don't have to be alone' above the search form because it seemed to imply that the default state of an older person is to be alone and that they need this site's help to '*alleviate some condition*'.

In terms of accessibility, this site does get many things right. There is no clutter or distracting animations. Everything is laid out neatly. The text is rather small, but that is the balanced approach where some accessibility is sacrificed for aesthetic improvement. A big improvement to accessibility could be a capability to increase font size from easy to use controls. Perhaps buttons like the following: -

(BUTTON IMAGE HERE!)

The default font could be slightly larger without significantly affecting aesthetics. An example of good and clutter free layout used in this website is as follows: -

The navigation bar sticks to the top, always providing guidance and navigation to user. To increase accessibility, there could be another navigation area to ensure multiple routes to the same resource.

The italics font used in Fig. X is also

Critical Analysis and Future Steps

- Sign in step presents challenges. Users have to leave the website to use 3rd party services. Cannot control design of 3rd party services.
- Deeper understanding of updating the website to prevent negative experiences and reduced engagement.
- Improve design for different browser sizes and screen sizes.
- Try different CSS, Fonts, layouts etc.
- Different sentences/instructions i.e 'Button to Login', 'Click here to Login', 'Login Button' etc. 'Enter password', 'Enter password' here, 'Click here to enter password' etc.

Although this study attempts to increase understanding of web design and development for older citizens, attempting for an inclusive and universal understanding, it is important to understand the limits of what is presented here. It is also important to judge what steps can be taken next for further understanding and knowledge to emerge. This study is most applicable for a western audience. There will be knowledge applicable to all older adults, but cultural differences are likely to have a significant impact on how people interact with a website. An example of this is that a significant amount of people uses languages that are read from right to left, which is the opposite of English. Hence, they are likely to be more comfortable with websites oriented that way. This means that the layout of the website built for this project is not going to be suitable for people from significantly different cultures. A truly universal system must take into account these differences between internet users.

In fact, there are likely to be subtle differences between the way seniors use web services within European countries. Furthermore, seniors from other English-speaking countries such as USA, Canada, Australia and New Zealand for example are likely to be additional differences in their

expectations and abilities to use web services. This pilot study and its result are most relevant to the UK population; however, the literature review contains references to studies that were carried out in USA. Unfortunately, there has been no comparative study that analyses how seniors in different countries use web services and their experiences and expectations when using a web service. In order to make a universally appealing web service for seniors, data must be collected from different countries and compared to get a better understanding of differences and various needs based on geographical and cultural differences.

An aspect of web service design for seniors that can be further researched is browser compatibility. As HTML, CSS and JavaScript has evolved, older browser versions are not able to process the latest features. Therefore, any website that will be deployed must undergo extensive backwards compatibility testing to ensure the website is fully functional on older browsers. Older adults are less likely to continually upgrade their computers and are likely to not have the latest browsers installed. In fact, it is probable that a lot of seniors rely on pre-installed software. Careful consideration must be given to ensure the website works well under older browsers.

A real-world service of this kind can make major improvements for the messaging aspect that allows communication. Messaging service is likely to be critical and often used by users. One way a website that targets vulnerable adults with potential disabilities affecting hand use and cognition can provide assistance is to consider assisting the messaging aspect of the web service. Age-appropriate emojis or 'gifs/memes' that can help convey complex messages quickly can provide assistance by minimizing the typing required. A person suffering severe hand arthritis will be able to mitigate negative experiences by using these emojis and reducing dependency on typing. The less they have to type, the more they are able to use the web service. Some users may never physically meet individuals through the service either through choice or disability. Instead, they may only communicate with others online as pen-pals. Another way they can be assisted is to have pre-written messages that are commonly used that can be accessed through a few clicks, or keyboard shortcut. For example, introduction and pleasantries are done often. Similarly, asking where someone is from or their interests is also very common. There are many sentences that are commonly used. Instead of typing these for each user, if it is available as a click, then this can provide great assistance for disabled users.

[LIMITING TARGET AUDIENCE TO ENSURE GOOD DESIGN AND USABILITY WILL REDUCE PROFIT POTENTIAL AND REDUCE LIKELIHOOD OF SERVICE EMERGING. GOOD OPTION FOR CHARITIES WHO HAVE SPECIFIC AUDIENCES]

[TRIAL DIFFERENT LAYOUTS, STYLES. THE DIFFERENT STYLES ON SAME SITE (CHOOSE LANGUAGE KIND OF SITUATION) TO DETERMINE EFFECTIVENESS]

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[What is different between this service and others? More accessibility shown by comparison. Not money driven. Good venue for charities. Simplified design. Future options not available I.e dynamic layout. Prototype. Contains errors I.e scroll during messaging does not scroll to bottom.]