# Literature Review:

## Alzheimer’s and Dementia Research:

The article written by (Elfaki and Alotaibi, 2018) analyses the effect in which m-health (mobile health) services such a smartphones can have on those suffering from Alzheimer’s, the article looks at research conducted using applications and devices used within the past 10 years of the paper being written from 2008-2018 and evaluates how this may have impacted those suffering from the condition. This article looked at applications ranging from memory games to test/improve the users memory, but also to applications called ‘Backup Memory’ and ‘Tweri’. The articles analysis of Backup Memory in particular does somewhat relate to the artefact being produced, this application provided photographs of relatives and friends of the user in order to remind them who they are. This was found by the article to “helps the patient to remember who the person is more quickly”. While the artefact is related more to speech/text reminders to the user, seeing the positive effect visual reminders can have on those with memory conditions seems to show that reminders would be useful on both the average person and those suffering from these conditions in order to be able to recall dates, events and daily jobs.

Research conducted within the article by (Cahill, Macijauskiene, Nygård, Faulkner and Hagen, 2007) looks at how with the “absence of a cure for Alzheimer's disease and the related dementias” that technology could be of benefit to those living with dementia currently. The article also looks at a brief history of the disease and the growing concern it has with life expectancy continuing to increase. One of the technologies the article looks at is ‘mobile’ technologies which could be used personally by the user rather than technologies such as CCTV or monitoring systems. The authors decided came to the conclusion that whatever the technology, when used it should “give a feeling of independence to the person” and “support skills maintained or do not emphasise lost skills”. The artefact planned will be personally used on a mobile device by the user and the use of voice recognition technology to assist the person in their day-to-day life seems to correlate well with the needs outlined in the article. If this is focused on during development it seems that the augmented memory app would be of use to those suffering from dementia and Alzheimer’s. While this research unfortunately didn’t look specifically into the success certain technologies may have it did help is directing the focus of the application and understanding the needs of those with dementia and Alzheimer’s.

## Memory Research/Social Aspects:

The research by (Chen and Wang, 2010) looks at how the effects memory aids can have in both young and older adults. As the artefact is to create a memory aid application this research is very relevant. The article found that memory recollection ability decreases with age, however the use of memory aids and memory cues were found to increase this ability with participants. Due to the relevance of this research to the artefact it demonstrates how an application focused on providing memory aids/cues would be useful in helping both younger and older adults in recollecting daily tasks, events and people. While this research didn’t analyse specifically the effect a mobile application could have in this topic, the research it did find could definitely be applied in the creation of ab ‘Augmented Memory Mobile App’.

The article written by (Wahlheim, Smith and Delaney, 2019) looks at the effect reminders may have on memory. The study took a wide variety of 48 participants and conducted 4 studies to determine if the hypothesis was correct. From the article it was found that both cue-response and cue only reminders both positively impacted memory recollection, with the former being of most benefit. As the artefact being produced is planned to use some form of reminder given to the user on or close to the date/event they want to remember or a task they need to complete the fact that it was found that reminders could improve memory and help participants recall words, demonstrates that the artefact would have potential to succeed as a memory app if reminders were correctly incorporated. Overall, this research is of great relevance and a benefit to the design and creation of the final artefact.

## Voice Technology:

In (Berger and Ludwig, 2007) research was conducted to find out whether or not voice assisted technology could reduce user error in employees. This research looked at a variety of companies and previous research conducted to decide whether or not this could improve employee performance. It also looked at the use of voice in feedback and computer instruction. The outcome of this was that employees performed on average less errors when completing their job compared to their baseline without feedback. This research didn’t link as closely to the artefact as it initially seemed however following the positive results of the research could suggest that if the artefact relayed the reminder by audio rather than text it could be more beneficial however this depends on what route the eventual artefact takes.

## Technology and Age:

A look at (Venkatesh, Thong and Xu, 2012) evaluates the use of technology and the effect age may have on it. It found that older generations with older men in particular tended to be “driven by habit” and were unlikely to try new and emerging technologies. Older women were also found to be more dependant on “external resources” to use the technology. Younger people were found to enjoy learning to use technologies more than older people. Whilst this research doesn’t specifically look at mobile technologies or apps, the link between use of new technologies and age is still useful in determining the target audience and how to design the artefact around it. As there some focus on designing the artefact to be helpful to those with dementia and Alzheimer’s, understanding the way in which older people tend to use technologies is still of use.

## Usability/UI:

One conference paper (Ohkawa, Kodama, Konno, Zhao and Mitsuishi, 2018) developed and analysed an application used to teach language classes to students. In the paper it goes into detail about the application created, its design flaws as well as the ways in which it can be improved. The first detail the article went into was how a UI has to be tailored to the app being created, stating that the “UI is not designed for intermittent learning”. The article also considers that the UI has to make any information that may be useful to the student easy to access as well as readily available. From this journal it becomes apparent that when creating the artefact care will have to be taken to design the UI specifically for the application. While this article is describing an app used for language classes not an ‘Augmented Memory Mobile App’ the point of making any information the user may want readily accessible through the UI is still relevant. One point to consider however is that this application was also developed in Japan, the country where an application is developed can have differences in UI design to fit their audience (Cuberto, 2018).

## Technology choice:

There is a wide variety of languages and technologies relevant to the artefact that can be chosen from. There is a choice to be made on if artefact is to be designed to be cross platform or designed with a single platform in mind.

Currently the two major mobile operating systems are iOS and Android with each one controlling around 50% of the UK market share each (StatCounter Global Stats, 2019)

Android applications are typically made within Android Studio (Android Developers, 2020). Android apps default programming language is Java, one of the most developed for and popular programming languages as of 2020. Java (Oracle Help Center, 2020) being one of the most popular languages in use as well as being around since 1996 means that there is a large amount of pre-existing documentation, API’s, guides and applications already is use which can help in developing for the Android platform. Use of Java and the Android Studio framework is currently also taught by the University of Wolverhampton which is where most of my experience lies.

For iOS, Swift (Apple Inc, 2020) is the most commonly used language. Swift is commonly regarded as “easy to learn” (Apple, 2019) and constantly changing and being developed. One downside to Swift however is that currently it is only really used to develop applications within Apple devices however as this artefact is only planned to be developed for mobile devices this shouldn’t be an issue. The Swift language being newer does also have less available material for assistance when designing and developing applications which could somewhat limit the potential of what could be achieved with the artefact.

## API’s:

Googles currently makes a large variety of API’s fit for use on mobile devices, their speech to text being one of them (Google Cloud, 2020). The benefits of this API are that it works with most devices on both iOS and Android and is considered to be of a high quality. As of 2020 it supports 125 languages and can use both live audio and audio files to be converted into text. This technology however isn’t free and is priced by the minute of use by Google.

An alternative is Androids own speech recogniser (Android Speech, 2019). This is limited to working only on Android devices and due to the fact, it uses intents which return arrays of strings it is less accurate for speech to text conversion than using an audio file. “android.speech” is completely free, this when considered with the fact that the artefact is only planned as a prototype which may not need the full accuracy other services offer could mean that the android speech recogniser is preferable.

## Ethical Aspects:

The journal article written by (Shneiderman, 2000) looks into both the legal and ethical obligations of a company to provide a service to as many users as possible regardless of age, learning or ability. His research found that websites created should be kept as simple and standardised as possible so that once a user learns how to follow one website, they can use nearly any kind, this can be applied to app design from this. While typically research from this long ago is typically discredited Shneiderman has created various publication on usability and UI design and is credited as one of the most influential people into research in this area. This article also looks into the fact that those suffering from visual disabilities need to be accommodated for when designing an application, this is especially important considering 2 million people in the UK suffer from vision loss (NHS, 2017) and the Royal National Institute of Blind People (RNIB, 2017) found that one in five people will suffer some type of sight loss in their lifetime. While creating the artefact it will be important to keep usability issues in consideration so that it will be accessible to a large range of users regardless of their background.

## Legal/Security Aspects:

From a legal standpoint, creators of applications and software have certain legal obligations to secure the data of their users correctly, ensure only necessary data is taken and that the application wont cause harm or promote criminal activities to their users. The Data Protection Act (GOV.UK, 2018) states that any data collected must be “kept to date”, “used fairly, lawfully and transparently” as well as “used in a way that is adequate, relevant and limited to only what is necessary”. This means that all data collected during the creation of the artefact as well as actually used by the artefact itself must be used for a specific purpose and removed once no longer needed. In relation to the artefact any recordings taken in use of the application must be removed once a reminder has been set, and any information must not be used for anything outside of the purpose of the artefact. The Data Protection Act of 2018 also states that data “handled in a way that ensures appropriate security, including protection against unlawful or unauthorised processing, access, loss, destruction or damage”. This can be achieved through making sure data is properly encrypted as well as passwords, data can only be accessed by the user and relevant parties and not able to be accessed by others without the user’s consent. Companies also have an obligation to make sure data the users’ data is not able to be lost accidentally or destroyed.

When developing for a platform such as android there are various things that can be done in order to correctly secure and protect data. On Androids developer page for security (Android Security, 2019) various methods are stated. It is encouraged that all data is encrypted on the device in the event that there is an attempt by someone other than the user to access data. Internal storage is encouraged to be used as it can be modified by other applications. The use of permissions within an application is also very important, the fewer permissions requested by the application makes it less likely for important data to be stolen if the app were to be compromised. Input validation is another input security method in order to prevent injection attacks and overflow errors that may corrupt or change data.

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