RemindMe

helping you to regain your independence

Project Closure Report

May 2023

Table of Contents

Project Overview

This project set out with the aim of using technology to improve quality of life (QOL) for those with dementia or other cognitive diseases. It was concerned with the way that recent advancements in augmented reality (AR) could allow the creation of an invaluable tool to aid individuals as they complete their activities of daily living (ADLs) and support them in remaining as independent as possible, for as long as possible.

Specifically, this project sought to create a mobile AR app and an accompanying desktop or web app to allow users to create and access custom, tailored instructions, written by them and in their own words.

These would act as a portable and accessible database of information, which vulnerable users could access when and where they need some guidance on how to complete a specific task.

This project also aimed to work with subject matter experts in the field of dementia and cognitive impairments, to determine if and how the technology could be used to positively impact the target audience. Their feedback, supported by an array of rich academic studies, were to be the main sources of information, providing direction and informing the design and development of the applications.

Ultimately, this project looked to create real social value by using readily available and increasingly accessible technology, building on previous projects and benefiting from the support of professionals and ease of development. This report outlines to what extent this objective has been achieved and why this is the case, as well as suggesting potential avenues for future development should this project be progressed further and the scope be fully realised.

Project Scope

As outlined in the project overview, this project was split into two main deliverables; the **mobile AR application** and the **desktop application**. This section details the different software and services utilised in their creation.

Flutter

Flutter is an open source framework by Google, powered by an open source coding language called Dart. It allows for complex and beautiful user interface design across multiple platforms and devices. Both the desktop and mobile application were written in Flutter, allowing them to work cohesively as a pair. This enabled better looking overall design than other alternatives.

Unity AR Foundation

Unity AR Foundation is a cross-platform framework which allows you to create AR experiences quickly, for multiple systems. This project made use of the **tracked image manager** to detect when a sticker is being scanned and communicate with Flutter to progress the user to that sticker's corresponding instruction page. Unity was enabled in Flutter using the **Flutter unity 3D widget**.

Firebase

Firebase is a set of Google owned cloud computing and data storage services. This project made use of the **Authentication** service and **Cloud Firestore** services to store user information and allow for sign in and personalisation and customisation of content and instructions. This was enabled in Flutter using the **FlutterFIre** implementation framework.

Project Justification

"the literature gives strong evidence that people of all ages and different ***cognitive disabilities respond well*** *to glasses, projectors and* ***hand-held devices eliciting AR assistance****. In comparison to people without cognitive impairments, cognitively impaired people seem to be* ***even more motivated*** *to use AR assistance."* (Blattgerste et al., 2019, p.276)

The academic literature supports using AR technology to create meaningful experiences for people with cognitive impairments, such as dementia. This project is a response to this revelation, working to utilise emerging tech to create real social value.

Research and Preparation

To build on the research and project definition outlined within the **project proposal document**, I conducted a more in-depth analysis of both the approach and the technological profile of the project.

To ensure that this project would in fact deliver social value and act as a useful tool for the target audience, I continued to work with professionals with knowledge of dementia and cognitive impairments, as well as continuing to explore academic research in the area.

This included hosting a workshop with dementia professionals to introduce the idea and gain feedback. Those who attended the workshop were overwhelmingly positive about the idea and its potential to make a real positive impact for the right audience.

You can view the **workshop here**.

To confirm that the suggest technological approach was correct, I conducted further testing into Flutter, Firebase and Unity.

This included, but was not limited to, participating in tutorials, reading the technical documents, exploring past projects, and getting hands on to create my own test applications. I also used this opportunity to explore some alternative software, such as ARCore, A-Frame, and React, as well as ensuring that my past knowledge of PHP and MySQL did not provide a more viable alternative.

My research and preparation confirmed that I was doing the correct thing in the correct way...

Professional Response

The response from dementia, cognitive impairment, and care of older adults professionals has been extremely positive, and the project has been very well received by everyone who has been involved in some capacity or another.

Some of the key points and feedback I have received from professionals are:

- That people are **open to trying new things** and **adapting** to new suggestions.
- Currently, this solution would be great for those who are **earlier in the process** (their dementia journey).
- This project has the potential to provide **social value** and **practical support** to users.
- Allowing users to **access personalised instructions** is a great way to provide **assistance**.
- There is the scope to **extend the offered service** to include other functionality (such as **voice notes**), which would work to **increase the solution's value**.
- This project may be of worth to **other social groups**, both vulnerable users and the general public.

Ultimately, the consensus was that the project was perfectly positioned to provide tangible support to users, and could act as the starting point for a more developed and comprehensive solution with additional functionality and a wider customer base.

Realisation and Outcomes

In the end, I managed to complete all necessary production work, and both applications are fully functional and working together to provide a smooth customer work flow.

By completing an iterative build process, I have been able to make improvements to the design and performance of the finished product, which have resulted in a great and polished solution.

The next couple of pages provide more detail about both the mobile and desktop application, their functionality, and how they deliver value.

The Desktop Application

The desktop application is the beginning of the customer's journey with RemindMe. Upon entering the site, everyone is greeted by the same 'landing page' which is visible to all and provides some information about the purpose of the application.

Users must then create an account using the register function, this creates both a Firebase Authorisation instance for that user, and creates a user specific document within Cloud Firestore.

They're then able to access their home page. From here they can access the Get Started and Get Help pages. At the moment these have limited functionality, but provide insight into future capabilities and functionality. The main purpose of the home page is to select an instruction set to edit. The current choices include the dishwasher, washing machine, tumble dryer, microwave and making a cup of tea.

Once a user has entered an instruction page, they can then type up to six instructions in the corresponding text input areas, selecting the save instructions button to save this data to their Firestore document. They will then be able to view what's currently stored and make edits where required.

Even if the user logs out and logs back in, they will able to view, edit, or create instructions as they see fit.

Ultimately, the desktop application provides a well structured, simple system for users to change instructions and get ready for using the mobile application.

The Mobile Application

Once a user has created an account and uploaded some instructions, they are then ready to access the mobile application. Upon loading the app, they are prompted to login, using the same details as the account they've just created.

They are then sent to the home page. This page is a full screen Unity widget, from which users must scan one of the different stickers. When Unity detects that a sticker has been scanned, it tells Flutter to open a pop-up, which, depending on which sticker has been scanned, allows a user to jump to that instruction set.

From here, users then see their personalised instructions laid out in a step by step format. It's important to note that these can not be edited from the mobile app, but only viewed. This is to stop users from accidentally deleting instructions.

Challenges

Despite the overall success of the project, there were a number of challenges to overcome. These can be split into three main sections.

FlutterFire

There was some initial difficulty in getting Flutter and Firebase to work together, which was crucial for both the authorisation process and the upload/download to database functionality. I solved this by following numerous tutorials and creating a sample app which helped me to understand how the different levels of communication worked and what was needed within the main mobile and desktop applications to present user information.

Flutter Unity Widget

I had an issue with successfully integrating Flutter and Unity, but managed to overcome this by reading the documentation and participating in forums. Once they were integrated, I used scripts within Unity to send Flutter a message whenever a sticker is scanned, and used Flutter code to respond to this message depending on the name of the scanned sticker.

Unity Tracked Images

One of the final problems I had to resolve to complete the project was the fact that my stickers (which were used as tracked images within Unity) were too similar. This resulted in multiple sticker names being sent to Flutter simultaneously, which caused crashes, and the wrong sticker name being identified and sent to Flutter.

To ensure that this would not be an issue in the final version, I added a QR style section to each sticker, and told Unity to look for and scan only this section on each sticker. By adding a number of unique identification points, the app no longer had any issues recognising the correct sticker and displaying the correct functionality from this.

Below are the old and updated sticker.

Original

Updated

Project Success

Overall, the project has been largely successful. Every stage and target outlined in the proposal document has been successfully implemented and met, resulting in a perfectly functional and cohesive mobile and desktop solution.

This prototype build demonstrates that the technology has the potential to create real social value and usefulness for users, in a simple, easy-to-use, but stylish and professional work flow. I feel that this project has done exactly what it set out to do.

The overall solution has used AR technology and mobile technology to respond to the opportunity for making a difference to the lives of the target users, translating complex and emerging tech into a seamless and easily approached user experience and interface.

Please take the time to watch the short video tutorial series that has been produced alongside this report. This will give you additional insight into how the technology functions and the solution creates value for its users.

Future Considerations

Moving forward, it would be good to see the idea behind this project explored in more depth. My research provided many different future considerations and functionality which could help to see this project realised as a readily available solution for all.

For example, it would be good to include additional functionality within the solution itself, such as a more comprehensive user system, and area to upload more generic notes or reminders, a calendar system that helps users to remember appointments or important events, or the ability to upload media (images, voice notes, videos) to their instruction sets. All of this could be easily implemented into future iterations of the solution to create additional value.

Everyone I have spoken to about the project, particularly those from the third sector, has shown enthusiasm and interest in what it's attempting to deliver for vulnerable people, as well as how it could be scaled up to meet the needs of other audiences.

Whilst this project has delivered a fully functional solution, its real strength comes from the ideology behind it and the potential value it could create if explored in the future. It would be great to see this project continued beyond the scope of this initial build. I've no doubt that there is the backing and support needed to make this a reality.

In Summary

This project has identified and realised the potential of AR and mobile technology in creating a useful solution for people with cognitive impairments and dementia, creating real value for users through simple yet complex development and UI design. I'm excited to see where this project can be taken next.

Bibliography

Blattergerste, J., Renner, P. and Pfeiffer, T. 2019. Augmented reality action assistance and learning for cognitively impaired people: a systematic literature review. In: *Proceeding of the 12th ACM International Conference on PErvasive Technologies Related to Assistive Environments (PETRA '19), 5-7 June 2019, Rhodes.* New York: Association for Computing Machinery, pp.270-279.