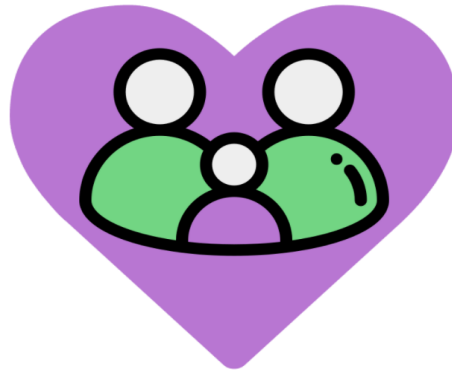# Cherished Memory

Final Report

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Background (Florence)

Alzheimer's disease is a progressive brain disease with no cure that causes memory loss, cognitive loss, and eventually death. [1] Those with the disease can forget their loved ones and thus lose their special connection with them. During our research, we noticed there are not many applications that confront this issue nor are they designed for those with the disease. Apps that exist in the market are generally geared toward maintaining a healthy lifestyle, such as MindMate[2]. For memory aid, Lumosity is an existing memory training app that caters to a general audience. However, it is not designed for users who may have difficulty navigating an app with too many things presented to them. Another useful application is Constant Therapy which provides cognitive, language, and speech therapy for those living with neurological conditions including dementia. The problem with these apps is that they do not serve to help remember personal memories and loved ones, given they are technical training and not personalized. We seek to fulfill this missing piece in existing apps and create a unique, personal experience for our users to help remind them of their loved ones in order to further be able to have meaningful relations with them.

Problem Statement (Chris)

Current technologies to help people with Alzheimer's are not personalized for the user. We aim to provide an application that is intended to assist in remembering important memories and people the patients may forget otherwise. By using an easy-to-read data storage for profiles of their loved ones, as well as playing the quizzes and memory games, the information the patients can look over is constantly reinforced for them. This experience will be entirely

customizable by the patient or along with their caretaker. Patients partake in fun, meaningful games with their loved ones. We hope to be able to allow patients with Alzheimer's to have more meaningful interactions with their friends and family members by having all this information about them available to them to review.

Rationale of Solutions (Chris)

Our application offers a personalized way of cherishing memories and loved ones. We provide a fun variety of quizzes and memory games generated based on the user's uploaded info and media. Whatever is uploaded can also be used to create profiles and scrapbooks of their loved ones and memories. By an integration of recording information and memory games, our approach to help retain and improve cognitive abilities is different from what's out in the market. We focus on strengthening not just general memory ability in the brain but also the real memories they have of their loved ones. We focus on a simple design to ensure it is user-friendly for patients who have a hard time reading text or remembering functionality. It has a Caregiver mode to select that a caretaker or trusted relative can manage the application for them, locking database manipulation with a PIN code, so that the patient cannot just edit or remove information. Another personal component of the application is how it can be enjoyable for the patient and those around them. It is a bonding experience to interactively play through the quizzes and games together.

For hardware, usage of our application requires access to mobile devices, iOS or Android. Our research is based on work done by organizations like Alzheimer's Association and Dementia Care Central. We will continually reach out to senior care centers for Alzheimer's patients to demo the app and receive feedback on usability. When we are ready for production

release, it will be available in the Apple and Google Play app stores and promoted to senior housing and centers.

Design and Development of Systems (Florence)

When designing the application, focus was kept on a simple, easy-to-use application to ensure users with Alzheimer's can understand and be reminded of how to use the app for adding profile data and playing the quizzes and games. We also added safety restrictions so that they may need a caretaker to enter a PIN code to handle data manipulation.

The app consists of a main profile database that is fully populated by the user, filled with information about their loved ones to provide a completely personalized playing experience. Each profile stores a picture and information such as their name, relationship, birthday, and any other information the user wants to include. These profile cards display on the screen with faces of their loved ones. The user can then choose to play a multiple choice game or a memory matching card game. The constant reinforcement of the information with playing games will help remind the user of their loved ones. We hope this will allow them to lead more fulfilling and engaging interactions with them.

Technology Stack (Florence)

The app is developed entirely using the cross-platform framework React Native supported by Facebook so it can be available on both iOS and Android app stores based on a single codebase. We want as many users as possible to have access to this mobile app without doubling the amount of work required for native app development. We used Firebase supported by Google as our cloud storage to allow users to keep their data safe and backed up. We chose

Firebase because React Native has seamless integration with npm package support, which made implementation fast and efficient. As we only had a semester to build our project, we needed to keep a swift development process.

User Login and Profile Database (Florence)

The user signs up and logs in with Firebase authentication using email address and password. On the Data page, The user makes profiles of loved ones which are stored locally and on the cloud as a Firestore document which is ideal for the JSON object data structure we use. The profile consists of a two-level nested object containing name (string), media (object containing base64 and uri), relationship (string), dob (string), and other optional information the user wants to add about their loved one. The profiles are displayed as small cards on the Data page as a grid of two columns, with the key information displayed on the card: profile picture, name, relationship, and birthday. The user can tap on each card to display just that one profile card in full detail. If the user is allowed to modify the data, there are buttons to edit and remove the profile. Otherwise, the buttons do not appear. The editing feature changes the card in view to have input fields instead of static text. The deletion feature prompts a warning alert for the user to choose to cancel their action or proceed with caution of permanently deleting the profile. Because we use React, any modified state of profile data immediately updates and reflects changes on the profile page upon return.

Multiple Choice Game (Chris)

The multiple choice game generates questions and answers from what is in the users data profiles. The user will first select the person they want to take a quiz on. Afterwards it will generate questions based on certain parameters filled in the person's profiles. They will go

through questions about their name, birthdate, and what their relationship to them is. The UI for the selection screen is very similar to the profile page. On this page the user clicks on "choose me" and is notified of their selection. Then they will be able to click on "Start Quiz" to begin their quiz.

Memory Card Game (Hanssel)

The memory card game takes the data from what is in the users data profiles. Only images are needed from the data profiles and 4 are randomly chosen from it. The memory card will stop the user from playing the game if there are not at least 4 profiles in the user profiles. The reason for this is due to having a nice balance of being not too difficult but having a memory game to solve. The UI is fairly simple and the Data logo is displayed to let the user know they are in the quiz section of the app. Once the user finishes the memory game then they can play again which will be a new random set of cards. They can also choose to go back out of the memory card game. The memory card game is personalized as we believe this can help remind the user what their loved ones look like. It can also be an exciting interactive game that can be played by the user by themselves or with others alongside them.

Settings and Customizing Theme (Hanssel)

The settings page allows the user to change certain attributes about the app like the font and font size. From our survey many fonts were seen as being popular so those were chosen to be a part of what the user can use them to. This can allow users to have more readability as the default font can be more difficult to read depending on the user. The font size is also changeable due to this reason as some users may like a smaller font size, while others may like a larger one

to be able to increase readability. They can also check their account information and log out. They can also replay the tutorial if they are having trouble navigating through the app.

Caregiver mode is enabled and disabled in the settings screen. The function of the caregiver mode is that it acts as a lock with a pin that is only known to the caregiver of the user. This is done so the user does not accidentally erase any data from the profile data screen. The reason for this function is that Alzheimer's patients can be in different stages of the disease and those that are in the later stages can make mistakes by deleting their data. So that is why they should let the person who controls the pin to their caretaker.

Tutorial (Hanssel)

The tutorial is a simple pop up that highlights over the button so that the user can see what button they should press on next. The tutorial is important because it shows the user what the app can do and how they can use it. It also explains to them what the button does. The tutorial gives them a walkthrough first to input their first loved one profile and then leads them into the quiz section where they can play the quiz games. Lastly the tutorial teaches them about the settings screen and how they can replay the tutorial if they wish.

Evaluation with Users and Partners (Hanssel)

There were surveys sent out early on before development and during to get feedback on various features and the UI. We received positive responses about our UI being very user friendly, so we decided to keep the same design as we developed our app. Our survey was sent out to a random select group of people that were of different ages.

Do these mockups look user-friendly for someone with Alzheimer's?
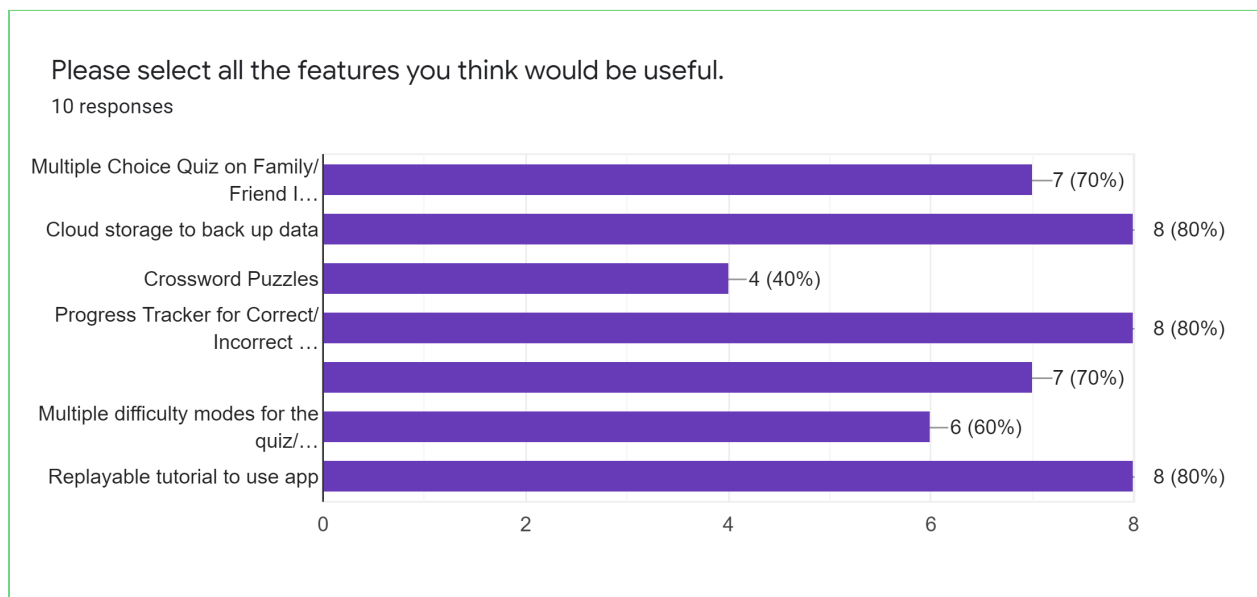14 responses
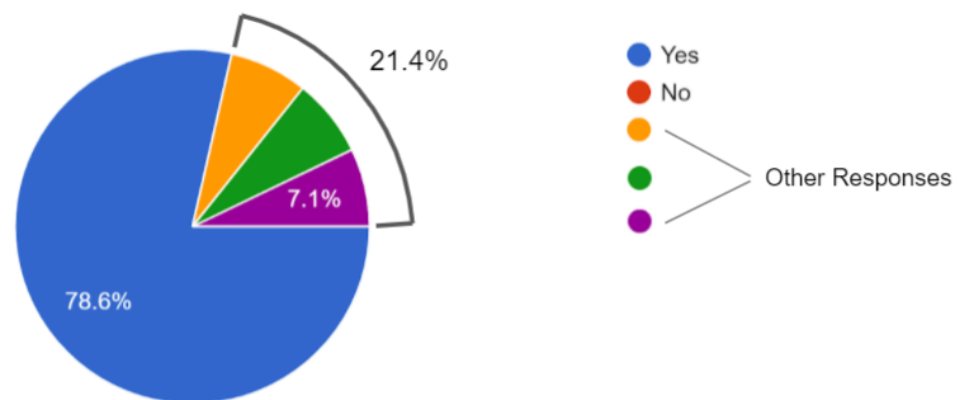
We wanted to make our UI more readable and a bit more user customizable, so we decided to allow the users to change the font on what they believed was more readable. We then conducted a survey to decide which fonts were more readable to choose what would be the default font and what should not be in the final version. We found that option 1 and option 6 were the most popular and show that in the figure below along with how the fonts look like.

Which fonts do you believe looks easier to read
10 responses
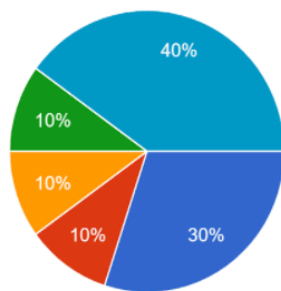
- Option 1 —— **Cherished Memory**
- Option 2
- Option 3
- Option 4
- Option 5
- Option 6 —— **Cherished Memory**
- Option 7
- Doesn't matter

Another question from the survey we conducted was to ask which potential features would seem useful. Many of these features were popular and they gave us more ideas to implement to our app. It also showed us which features were not as popular as the crossword puzzle so we decided to not implement that feature. We decided to implement a replayable tutorial as that was seen being very popular and also made sense given the users we are targeting. However, for other features that were relatively popular we decided not to implement after discussion that it may not be the best for our target users.

Please select all the features you think would be useful.
10 responses

Feature	Responses
Multiple Choice Quiz on Family/Friend I…	7 (70%)
Cloud storage to back up data	8 (80%)
Crossword Puzzles	4 (40%)
Progress Tracker for Correct/Incorrect …	8 (80%)
	7 (70%)
Multiple difficulty modes for the quiz/…	6 (60%)
Replayable tutorial to use app	8 (80%)

We decided to conduct another survey that focuses on questioning our branding, cloud storage cost, and thoughts on caregiver mode features. The group was discussing what source of revenue our app would have since we decided we did not want advertisements on our app. We initially believed that cloud storage should be our income source and if users wanted cloud storage they would need to pay a monthly subscription. However, after looking at the survey results we saw that this was received very negatively. So our next step would be that there would be free limited cloud storage and there would be tiers in order to get more space.

While we believed that our logo aims to promote family friendliness with wisdom and health, we wanted to make sure others felt the same. From the survey we saw that most agreed that our logo aligned with our values.

Our logo aims to promote family friendliness along with wisdom and health. Do you feel our logo achieves this?

13 responses

- Yes
- No

92.3%

7.7%
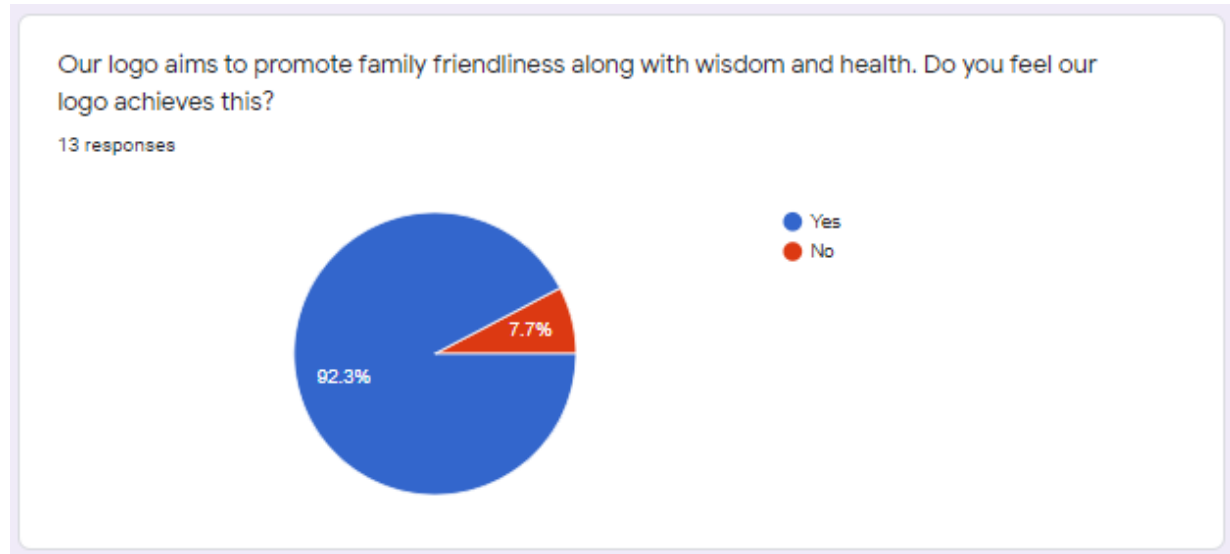
Overall we got a lot of valuable and informative feedback from our survey. This ranged from confirming that our app's UI was looking very user friendly to what other features should be added. It also made us look at what we should avoid to add to the app as well since it might not be very useful. We changed some ideas for revenue and got more insight on how to move forward with our app.

Discussion of Potential Markets and Future Work (Florence)

The app is free to download with planned work for implementing three tiers of plans: basic (free), premium ($3), and business ($15). We chose from the beginning not to add advertisements inside the application because they would create a negative user experience and be more detrimental to those who have Alzheimer's. The free plan will have basic quiz mode and limited cloud storage of 500MB. If the data cannot be backed up because of the limit, it will remain in local storage. This plan is good for people who want to try out the app's main features before upgrading, or if they only want to use the app personally for basic needs. The premium plan will allow for more features like custom quiz creation and more cloud storage space of 5GB. This plan is garnered toward those who are using

the application more consistently and want to have more features available, and may have family to use the app with for the quiz creation. The business plan allows for cloud storage space of 30GB.

The business model allows for more data space to accommodate for different users. Our customer segment consists of all people impacted by Alzheimer's, whether they have the disease themselves or they are the family, caretakers, and even nursing homes for the patients. We will still need to add more features and quizzes to create these paid subscription tiers, as our prototype is only the free version for now. We also plan to add a scrapbook feature for our application to allow for memories to be stored in the app.

Branding (Chris)

We named ourselves Cherished Memory for the sentimental feelings the phrase evokes and for the purpose of the application: to cherish the memory of loved ones. Our app is designed to promote health and wisdom for our users, thus the colors purple and green were carefully chosen to represent this. We also aim to support Alzheimer's patients to live more fulfilling social lives with their loved ones shown, as depicted with the people in our logo surrounded by a heart. Because of our deliberate and true intentions from the very beginning, we have kept our logo and name throughout the entire project. We are proud of the vision our branding successfully evokes which aligns perfectly with our application.

References Cited

- [1] Alzheimer's Association, What is Alzheimer's Disease? https://www.alz.org/alzheimers-dementia/what-is-alzheimers

- [2] Lindsay, Christopher T. "Ten Apps (and Other Activities) For People With Dementia and Alzheimer's: Michigan Estate Planning & Elder Law." Estate Planning & Elder Law Services, P.C., Estate Planning & Elder Law Services, P.C., 26 Feb. 2020, www.formyplan.com/elder-law/alzheimers-dementia/2020/02/26/ten-apps-and-other-activities-for-people-with-dementia-and-alzheimers/.

- [3] Unknown, Developing dementia-friendly phone app with How Do I?, Alzheimer's Society, https://www.alzheimers.org.uk/dementia-professionals/dementia-experience-toolkit/real-life-examples/supporting-inclusion/developing-dementia-friendly-phone-app-how-do-i

- [4] George Savulich, Cognitive Training Using a Novel Memory Game on an iPad in Patients with Amnestic Mild Cognitive Impairment (aMCI), International Journal of Neuropsychopharmacology, Volume 20, Issue 8, August 2017, Pages 624–633, https://academic.oup.com/ijnp/article/20/8/624/3868827

Acknowledgements (Chris)