Thought Locker

“Unlock Your Memories”

CS410 Team Green
Design Presentation

Spring 2023
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The Team

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Dementia: A growing problem

- 1 in 10 Americans ages 65 and older have some form of dementia
- The rate of dementia increases with age:
  - 3% of adults ages 70 to 74
  - 22% of adults aged 85 to 89
  - 33% of adults 90 and up
- Characterized by distinct stages:
  - 50.4 percent of cases are mild
  - 30.3 percent are moderate
  - 19.3 percent are severe
Stages of Dementia

Mild[^4^]
Individually largely independent and only needs some assistance with daily living.

Moderate[^5^]
Symptoms become more noticeable and the person will need more support in managing daily life while still living independently.
The person may now need frequent reminders and some help to wash and dress.

Severe[^6^]
The person will need full-time care and support with daily living and personal care, such as eating, washing and dressing.
Living with Dementia

**Mild**
- Memory problems
- Difficulties in thinking things through and planning
- Language and communication
- Poor orientation
- Visual-perceptual difficulties
- Changes in mood or emotion

**Moderate**
- Memory problems worsen
- Increased speaking and language difficulties
- Orientation becomes more difficult to interpret
- More intense symptoms of anxiety and depression
- Development of paranoia
- Auditory and visual hallucinations
The Problem

Individuals with mild to moderate dementia are frequently unable to remember the locations of personal items, organize their schedules, and recall ways to contact their loved ones.
Caregivers and patients struggle with locating misplaced items.

Difficulties with planning and organizing daily activities causes patients to feel less independent.

Caregivers do not have the resources necessary to effectively care for their patients.

Patients forget how to contact loved-ones in the event of an emergency.
Stakeholders / Customers

Insurance Companies / Medicaid
Alzheimer's Research Groups
Medical Facilities
Family Members
Dementia Patients
User Roles

**Caregivers**
- Responsible for helping patients with dementia manage their daily lives
- May include family members, professional caregivers, or healthcare providers
- Interested in learning how Thought Locker can assist them in supporting their loved ones or patients with dementia

**Patients**
- End-users of the Thought Locker application
- Benefit from learning how the app can help them retain control over their daily lives despite their cognitive challenges
- Interested in seeing a demonstration of the app's features and how they can use them to maintain independence
The Solution

Thought Locker is an application that will enhance the ability for those with dementia to retain control of their daily lives. The application will ensure patients maintain a degree of personal freedom despite the mental challenges they face.
Solution Characteristics

- Keep track of and locate important items
- Provide caregivers with an effective tool to manage patient independence
- Provide caregivers with a mechanism to monitor patient activity
- Provide patients with a simple and effective method to contact loved-ones
Caregiver Solution Flow

- Calling
- Messaging
- Modify Patient Application
- Remote Access
- Add Items
- Schedule Tasks
- Contact Patient
- Caregiver Notes
- Track Dementia Progression
- Doctor Advice
- Monitoring & Analytics
- Chart Task Completion
- Chart Item Finding
- Chart Sensor Data
- Initial Diagnosis
- Caregiver Intervention
- Dementia Patient Self-Care
- Nurture Independence

Caregiver downloads Thought Locker to help dementia patient maintain independence.

Dementia patient unable to care for self.

Caregiver intervention

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Major Functional Components
Work Breakdown Structure

- **User Interfaces**
  - Patient
  - Caregiver / Family Member

- **Algorithms**
  - Login
  - Item Finder

- **Databases**
  - Monitoring Database
  - Analytic Database

- **Testing**
  - Unit Testing
  - Integration Testing
  - User Testing
  - System Testing

- **APIs**
  - React-Native-BLE Manager
  - React-Native-Contacts
  - Google Maps Geolocation API
  - Google / Microsoft Calendar API

**Thought Locker**
Mockups

Calendar

Task Scheduler

Item Finder

Dates to remember

- Dentist Appointment
  April 10, 2023
- Refill Prescription
  April 12, 2023
- Pick-Up Prescription
  April 12, 2023
- Eye Appointment
  April 20, 2023

Today

- Stretch for 10min Details
- Eat Breakfast Details
- Take Vitamins Details

Tomorrow

- Eat Breakfast Details
- Take Medicine Details
- Take a shower Details
- Do laundry Details
Mockups Continued...

- **Contact Center**
  - Carlos, Ward Sen
  - Jane, Fislar Daughter
  - Earl, Turner Son-in-law
  - Rachel, Williamson Daughter-in-law

- **Monitoring**
  - **High Priority**
    - Front door not closed
    - Slave active for 30 min: 9:00 AM - 9:30 AM
    - Porch door active: 2:31 PM - now
  - **Moderate Priority**
    - Bathroom door inactive for 1 day
    - Missed Appointment
    - Backdoor active for 3 min: 2:30 PM - 2:33 PM
  - **Low Priority**
    - Bedroom light active: 2:15 AM - now
    - Fridge active for 3 min: 10:10 AM - 10:12 AM
    - Kitchen light active: 5:05 PM - now

- **Progress**
  - Today's Progress
  - Task Monitoring
  - Board Complete:
    - Percentage of tasks completed: [Progress Bar]
    - Tasks Completed:
      - Mon: 20%
      - Tue: 30%
      - Wed: 40%
      - Thu: 50%
      - Fri: 60%
      - Sat: 70%
      - Sun: 80%

- **Settings**
  - Manage Accounts
  - Patient Permissions
    - Add & Delete Items to Item Finder
    - Add & Delete Contacts to Contact Center
    - Add & Delete Tasks to Task Scheduler
    - Add & Delete Appointments to Calendar
  - Notifications

- **Sign Out**
Item Finder Algorithm
Task Manager Algorithm

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Monitoring Algorithm

1. Monitoring Feature Activated
2. Caregiver defines notification and priority conditions
3. Patient Triggers Sensor
4. Notification Condition Met?
   - YES: Caregiver Alert Sent
   - NO: Continue Monitoring
5. Sensor activation appears on monitoring feature based on priority set
6. Log sensor activation to database
7. Continue monitoring until another sensor activates
Database Schema
Data Management

- **Data Sources:**
  - Patient Input
  - Caregiver/Family Member Input

- **Data Collected:**
  - User Account information
  - Low Energy Bluetooth information
  - Task Information

- **Data Outputs:**
  - Location of lost item
  - Reminder notifications
  - Call alert for caregivers

- **Data Storage**
  - AWS utilizing MongoDB and PostgreSQL

- **Availability:**
  - Cache available for Contact List (for emergencies)
  - Cloud access to the database for the rest

- **Authentication:**
  - Option of standard login with password or face recognition for caregiver and patient

- **Encryption**
  - SHA-256
# Development Tools

<table>
<thead>
<tr>
<th>Platforms</th>
<th></th>
<th>Android / iOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages</td>
<td><img src="image" alt="JS" /></td>
<td>JavaScript (React / Node.js)</td>
</tr>
<tr>
<td>Databases</td>
<td><img src="image" alt="DB" /></td>
<td>PostgreSQL / MongoDB</td>
</tr>
<tr>
<td>Back-End Server</td>
<td><img src="image" alt="AWS" /></td>
<td>Amazon Web Services</td>
</tr>
</tbody>
</table>
| APIs        | ![API](image) | React-native (Contacts, BLE Manager)  
               Google Maps Geolocation API |
| Testing     | ![Test](image) | Jest |
| Containerization | ![Docker](image) | Docker |
| Version Control | ![GitHub](image) | GitHub |
| Issue Tracking | ![GitHub](image) | GitHub |
| Continuous Integration | ![GitHub](image) | GitHub |
Sprint Structure

Thought Locker development approach:

**Agile Sprints**
- Sprint will last 3 Weeks
- 5 Sprints Overall
- Twice per week

**15-30 minute scrums**
- Individual GitHub contributions will be viewed
- Conducted on Discord

**Sprint 0**
- Setup and configure databases
- Setup and configure APIs
- Setup development environment

**Sprint 1**
- Implement UI Features
- Implement Account Management
- Test Database Setup and Configuration
- Unit Testing

**Sprint 2**
- Connect Front-end to Back-end
- Implement Item Finder Algorithm
- Implement Contact Center Algorithm
- Unit and Integration Testing

**Sprint 3**
- Implement Customer Feedback Features
- Implement Task Manager Algorithm
- Ensure all data is being logged in the databases
- Continuation of Integration testing

**Sprint 4**
- Implement system testing
- Implement Patient Assistance algorithm
- Establish monitoring features
What Thought Locker will NOT do

Replace the role of a caregiver
  ● Intended to foster the relationship between the two users
Support phone calls and messages to all contacts
  ● Thought Locker can only call individuals that are added by the caregiver
Assist patients with severe dementia
  ● Thought Locker is intended for patients with mild to moderate dementia
Integrate appointment reminders with other health applications
  ● The caregiver must create each reminder for the patient
Risk Matrix

Customer Risk
- E1: Patient no longer engaged in the application
- E2: Patient unable to utilize application’s functions
- E3: Patient unable to remember their login information

Customer Risk Mitigation
- E1: Send reminders to patient’s phone to utilize the installed software
- E2: Hints will be provided after user input has not been received in a timely manner
- E3: Biometric sign in feature and forget password capability
Risk Matrix

Security Risk
- S1: User information breach
- S2: HIPAA violations due to storing information about medical condition
- S3: Anyone can access customer’s account because password has to be set

Security Risk Mitigation
- S1: Modern Security Protocols, encryption based technology
- S2: User License Agreement that information will only be shared with organizations that have the need to know
- S3: Biometric Two-Factor Authentication, only the customer, family member, or caregiver can access
Risk Matrix

Technical Risk
- T1: Server is unable to authenticate that the item has been found
- T2: Loses connection to calendar for appointments
- T3: Item that has been queried cannot be located

Technical Risk Mitigation
- T1: Bypass photo identification by tapping geolocation device to phone
- T2: Cache important calendar information, locally store data on phone or tablet
- T3: Report item cannot be found to caregiver/family member option
# Competition Matrix

<table>
<thead>
<tr>
<th>Features</th>
<th>Thought Locker</th>
<th>Direct Competition</th>
<th>Indirect Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MapHabit</td>
<td>MOJO</td>
</tr>
<tr>
<td>Patient</td>
<td>Calendar</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Task Scheduling</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Notifications</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>(Audio/Visual/Haptic)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Important Item Images</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td></td>
<td>Item Locator</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td></td>
<td>Family/Caregiver Contact Assistance</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Emergency Contact Assistance</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Family/Caregiver</td>
<td>Family/Caregiver Patient Assistance</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Family/Caregiver Monitoring &amp; Analytics</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td></td>
<td>Family/Caregiver Notes Log</td>
<td>✓</td>
<td>❌</td>
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</table>
# Features Table

<table>
<thead>
<tr>
<th>ACCOUNT MANAGEMENT</th>
<th>Patient</th>
<th>Caregiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account Creation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Account Deletion Verification</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Login / Authentication</td>
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<td>✓</td>
</tr>
<tr>
<td>User Profile Management</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>User Location Information</td>
<td></td>
<td>✓</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>USER INTERFACE</th>
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</tr>
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<tbody>
<tr>
<td>Task Scheduling</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Task Completion</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Task Deletion Verification</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Item Locator</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Item Registration</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Item Deletion Verification</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Event Viewer</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Calendar</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sensor Monitoring</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Contact Center</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Emergency Contacts</td>
<td>✓</td>
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<tr>
<td>Notifications</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Remote Access</td>
<td></td>
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<table>
<thead>
<tr>
<th>DATA MANAGEMENT</th>
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<tbody>
<tr>
<td>User Analytics</td>
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</tr>
<tr>
<td>Reports</td>
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<td>✓</td>
</tr>
<tr>
<td>Item Tagging</td>
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</tr>
<tr>
<td>Images</td>
<td>✓</td>
<td>✓</td>
</tr>
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</table>
User Stories for the Patient

1. As a patient, I want to be able to manage my user profile and determine what features are useful to me, so that I can customize my experience on the platform.
2. As a patient, I want to be able to clarify if I have completed a task or not, so that my caregiver can track my progress.
3. As a patient, I want to be able to view events on the platform, so that I can stay up-to-date on my care and support.
As a caregiver, I want to verify account deletion with the patient to prevent frustration or misunderstanding.

As a caregiver, I want to be able to manage the patient’s user profile, so that I can set up the necessary features for them.

As a caregiver, I want to be able to track the patient’s location based on the severity of their condition, so that I can provide assistance when needed.

As a caregiver, I want to determine if a task is necessary to delete or not, so that the patient’s care and support is not compromised.

As a caregiver, I want to be able to view events on the platform, so that I can stay informed about the patient’s care and support.

As a caregiver, I want to be able to set up emergency contacts for the patient, so that they can get help when needed.

As a caregiver, I want to be able to access the platform remotely, so that I can manage the patient’s care and support from anywhere.
User Stories for the Patient and Caregiver

1. As a patient or caregiver, I want to be able to receive notifications on the platform, so that I can stay informed about the patient’s care and support.
2. As a patient or caregiver, I want to be able to view user analytics and reports on the platform, so that I can track the patient’s progress and identify areas where they may need additional support.
3. As a patient or caregiver, I want to be able to tag items on the platform, so that they can be easily identified and located when needed.
4. As a patient or caregiver, I want to be able to upload and view images on the platform, so that I can provide visual information and context for the patient’s care and support.
5. As a patient or caregiver, I want to be able to view the location of an item, so that it can be retrieved easily when needed.
6. As a patient or caregiver, I want to be able to register items on the platform, so that their location can be tracked.
7. As a patient or caregiver, I want to be able to verify if an item needs to be deleted or not, so that the information on the platform is accurate.
8. As a patient or caregiver I want to be able to view a calendar on the platform, so that I can manage the patient’s care and support.
9. As a patient or caregiver, I want to be able to monitor sensors on the platform, so that I can track the patient’s health and wellbeing.
10. As a patient or caregiver, I want to be able to contact the center for assistance or support, so that I can get help when needed.
11. As a patient or caregiver, I want to be able to create an account, so that I can access the features of the platform.
12. As a patient or caregiver, I want to be able to log in to the platform using my account credentials, so that I can access the features of the platform.
13. As a patient or caregiver, I want to be able to assign tasks to be completed, so that we can manage the patient’s care and support.
References