Lab 1 – Thought Locker

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1 Introduction

Dementia is a progressive neurological disorder that affects millions of people worldwide. In the United States alone, it is estimated that 1 in 10 individuals will be affected by this debilitating disorder, which presents memory and behavioral issues that directly impact the independence of one's daily life (Alzheimer's Disease International, 2020).

Dementia can be categorized into three main sections: mild, moderate, and severe. 50.4% of diagnosed cases are mild, which present various changes in characteristics such as mood, memory problems, and difficulty thinking things through. Although these issues are present in those with mild dementia, they can usually function without the need for outside support. The 30.3% diagnosed with moderate dementia usually retain a caregiver at least part-time as issues advance. Moderate dementia presents its own set of symptoms, including paranoia, anxiety, depression, and worsening memory issues. 19.3% of cases fall into the severe category. These cases require full-time support and are incapable of living independently (Alzheimer's Disease International, 2020).

As the symptoms of dementia worsen, individuals may require increasing levels of assistance from family members or outside sources. However, patients often prefer to maintain their independence as much as possible, particularly in the earlier stages of the disease. This can be challenging for caregivers, who may struggle to balance the needs of their loved ones with their own needs and responsibilities.

Despite the significant challenges posed by dementia, new technologies such as Thought Locker, a mobile assistant designed to help dementia patients maintain their independence by providing reminders, tracking item locations, monitoring movements, and providing analytics that can be shared with caregivers, are tackling the situation. By using Thought Locker, patients
can enjoy greater independence, and caregivers can have greater peace of mind knowing that their loved ones are being monitored and supported.

2 Product Description

The Thought Locker application is a comprehensive mobile app designed to support patients with dementia and their caregivers. It provides a customizable user experience that helps patients develop a sense of independence while reassuring family members and caregivers of the safety of their loved ones.

2.1 Key Product Features and Capabilities

Thought Locker is a robust application that offers a range of features to support the independence of patients with dementia. The application is compatible with several different mobile operating systems, which leads to a seamless transition between devices owned by the patient and caregiver, making it easier to keep track of patient’s activities across different platforms.

Thought Locker utilizes various native calendar applications to provide a range of scheduling and tasking notifications throughout the day. The app provides daily reminders of programmed task to be completed by the patient. Through this same notification system, the app will display multiple reminders for late tasks and notify the Caregiver so that the patient remains on schedule and safe. A task manager ensures the patient knows exactly what task need to be done. When they are complete, the patient checks off on it and a notification is sent to the caregiver.

In addition to the calendar app Thought Locker has a very convenient feature called Item Finder. Through the use of a cell phone in tandem with Bluetooth tags, Thought Locker helps to locate misplaced items. Also, features such as names, pictures and displaying the last known
location help ensure the correct item is found. Just tap and the items verified as found. If not, notifications are sent to the caregiver to ensure medications and important items are not overlooked.

Patient safety is extremely important to loved ones of those with dementia. Thought locker utilizes a monitoring system to help put family at ease. Connecting to motion sensing devices, the app gives a noninvasive way to monitor the activity in the patient’s home. This useful feature is extremely convenient and helps with the remote monitoring feature caregivers have access to. Caregivers have the ability to access analytics which can be helpful for viewing a patients use and progression through dementia.

The app allows family members or caregivers to customize the app for each patient's needs and severity of dementia. A caregiver can give or take permissions to edit task. This feature ensures that the app is tailored to the unique needs of each patient, providing a personalized experience that gives them the most independence while still having a safety net.

2.2 Major Components (Hardware/Software)

The major components of the application are displayed based on the User base. The functional component diagram utilizes the Caregiver route and the Patient route. Each route displays functions for the respective user (see Figure 1). The major information handling is through a cloud-based database.

Figure 1

Thought Locker Major Functional Component Diagram
The application is mobile based and compatible with any android or apple device with internet access. Limits on certain functions are available when no internet connection is available. Thought locker provides full application access to caregivers who set permissions for patients. This limits the functionality of the app based on the caregiver’s assessment of the severity of the dementia. Thought Locker utilizes various Android OS and iPhone OS API’s in order to conduct the geo tagging of items, reminders and calendar events. Bluetooth is the main interface for communication between the geotag and the mobile device.

Thought Locker incorporates AWS as its backend server. For the database and cloud storage, PostgreSQL and MongoDB are used. The application runs on JavaScript and so requires a server environment that can execute that. As a means of version control, Gitlab is used along with Jest for project management. Analytics are stored in a separate database and are open to caregivers.

3 Identification of Case Study
The main users for Thought Locker are individuals with mild to moderate dementia and their caregivers or family members who would like to maintain their independence. The product aims to provide a solution to maintaining independence through an easy to use application that helps to locate lost or misplaced items, remind patients to take their medication or inform them of upcoming important event or appointments, provide patients with the opportunity to immediately contact a caregiver with an urgent need. Integral features allow caregivers to retain analytics to monitor patient habits and help evaluate patient dementia development.

In addition to individuals with dementia and their caregivers or family members, other potential beneficiaries of Thought Locker could include medical facilities, insurance companies/Medicaid, and Alzheimer's research groups. The analytics portion of Thought Locker can prove to be a valuable resource to research groups and understanding the advancement of dementia.

The six users who will be in prototype testing will be divided into groups consisting of 3 mild dementia patients and 3 moderate. Those patients will be tasked with testing and using the item finding, scheduling, and contacting features, which are designed to help them with their daily routines. In addition, three caregivers will be utilized for testing the caregiver’s role. Analytics, remote monitoring and permissions will be enabled and tested.

The purpose of Thought Locker is to improve the communication and case management for individuals with dementia and their caregivers, provide caregivers with time-saving resources, and allow patients to have more control and input in their daily lives.

As more individuals and caregivers use Thought Locker, their feedback will become essential to improving and expanding the product. Customization of the app for each individual may lead to an optimized product that’s specifically tailored to the individual. Furthermore,
expanding the use of Thought Locker to other stakeholders such as medical facilities, insurance companies/Medicaid, and Alzheimer's research groups could provide additional benefits to a broader audience.

4 Product Prototype Description

- [ TO BE DETERMINED ]

4.1 Prototype Architecture (Hardware/Software)

- [ TO BE DETERMINED ]

4.2 Prototype Features and Capabilities

- [ TO BE DETERMINED ]

4.3 Prototype Development Challenges

- [ TO BE DETERMINED ]
5 Glossary

Analytics: The collection and analysis of data to gain insights and make informed decisions.

Authentication: The process of verifying the identity of a user to prevent unauthorized access.

AWS: Amazon Web Services, a cloud-based computing platform that provides a range of services including computing, storage, and databases.

Backend server: The part of a server that is responsible for processing requests from clients.

Calendar: A feature that allows users to schedule reminders and customize settings for reminders and notifications.

Caregiver: A person who provides care for someone who is ill, disabled, or aged.

CI/CD: Continuous Integration/Continuous Deployment, a software development practice where code changes are automatically built, tested, and deployed to production.

Containerization: The process of packaging an application or service with its dependencies into a container, allowing it to run consistently across different environments.

Customizable settings: The ability to customize the app for each patient's needs to maintain a sense of independence.

Databases: A collection of data that is organized in a way that allows easy access, retrieval, and management.

Dementia: A decline in cognitive function (memory, thinking, reasoning, etc.) severe enough to interfere with daily life.

Issue tracking: The process of identifying, reporting, and resolving issues or bugs in software.

Item finders: A feature that allows users to locate commonly misplaced items by integrating sensors to track item location.

Mild dementia: Early stage of dementia where patients may experience changes in mood, memory problems, and difficulty planning and thinking through things.

Moderate dementia: Middle stage of dementia where patients may experience symptoms like anxiety, depression, and paranoia, requiring some assistance with daily living activities.

Motion sensors: Devices that detect movement and can be used to monitor activity in a home.

Notifications: Alerts that notify users of upcoming events, tasks, or reminders.
**Patient monitoring:** A feature that allows family members or caregivers to monitor patient activities for peace of mind.

**Programming language:** A computer language used to write software.

**Prototype:** A preliminary version of a product or system used for testing.

**Prototype architecture:** The structure or design of the prototype, including its hardware and software components.

**Prototype development challenges:** The issues or difficulties faced during the development of the prototype.

**Prototype features and capabilities:** The functionalities and abilities of the prototype that demonstrate its potential usefulness.

**Repository:** A location where data is stored and managed.

**Sensors:** Devices that detect and respond to some type of input from the physical environment.

**Testing:** The process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not.

**Thought Locker:** A mobile assistant designed to help dementia patients maintain their independence through reminders, item location, monitoring, and analytics that will be provided to the present caregiver.

**Version control:** The management of changes to documents, computer programs, and other collections of information.
6 References


