Executive Summary
Mr.Pill

Introduction

Every person consumes medication in one way or another, and in many cases, the management of medicine consumption is done by simply remembering which types of medications you have, where they are stored, at what time of the day to consume them, and more. Or, alternatively, having to constantly look through medicine cabinets, reading from small prescription texts and so on. This is a problem also caregivers face when administering medication to their patients or loved ones.

This is especially true for non-Hebrew speakers living in Israel, which do not always have accessibility to translations, creating a language-barrier for basic needs.

In order to make this process of handling medicine on a personal or family basis simpler the app **Mr.Pill** introduces easy and simple solutions to each of the said difficulties.

Problems

- **Organization –** Unorganized cabinets and similar-looking medicine containers having to search through them to find things that may or may not actually be stored there anymore. Furthermore, details like expiration-dates and the quantities of each item in the drawer are almost impossible to remember.

- **Management –** Handling a high number of prescriptions can be confusing, especially to the elderly, and is detrimental to never be missing medication or taking it when it is not required.

- **Connectivity –** In the cases where medication is not self-administered it could be even harder to keep track of the medications.

- **Accessibility –** Most applications, websites, and other digital services today are widely available in English, but not many of them support Hebrew, nor do they attempt to incorporate accessibility measures for people in need of them. Navigating through apps, finding data online, reading fine prints on papers, could be challenging tasks for certain populations such as elderly or people with bad eyesight.

Solution

The **Mr.Pill** application does the following:

1. Creates a personal digital **Cabinet** (or inventory) for the user to add all their existing medications and any future medication, and automatically:

- provides general information about the medicine
- manages stock levels depending on daily consumption setting

while also enabling the user to provide notes for each medication such as the physical location or consumption details. Users would no longer have to remember exactly where their pills are, how many of them are left, and when they are about to expire.

2. Allows the user to set **Reminders** for any of the medications they have in their digital cabinets, triggering an alarm to help prevent the user from ever forgetting to consume or administer their medicine.

3. Provides connectivity between users using **Shared Cabinets** which allow users to add other users to view or manage, creating a shared space similar to how a real medicine cabinet would be in a family household. This way, users can set reminders for medicines that exist in other users' cabinets, and effectively manage their medication as if they have access to the cabinet right in their pocket, even when visiting the pharmacy.

4. Ensures that navigation through the application and accessing the important information is fast and simplified, for instance by using large buttons that are hard to miss, and simple layouts.

Main Features

Medicine Inventory

Our app provides users with real-time updates on their medication inventory, ensuring they have an accurate and up-to-date overview of their current stock levels. Users can easily check which medications they have on hand, how much of each medication is left, and when they are set to expire. This feature includes detailed medicine information, helping users to manage their medications more effectively.

For households with multiple members taking different medications, managing everyone's prescriptions can be challenging. Our app simplifies this process by allowing efficient management of all household members' medications in one centralized place.

Barcode Scanning

By simply scanning the barcode on the medication packaging, users can instantly add the medication to their profiles. This process is fast and straightforward, eliminating the tedious task of manually entering medication details one by one. With just a quick scan, users can update their inventory efficiently, saving time and reducing the hassle.

Our barcode scanning service is integrated with the Israeli Health Ministry's database, ensuring that all medication details are recorded accurately. This integration provides users with comprehensive and reliable data about their medications, including dosage instructions, potential side effects, and other important information. By connecting to the Health Ministry, our app ensures that users receive the most accurate and up-to-date information about their medications, enhancing their ability to manage their health effectively and safely.

Full Hebrew Support

Our application offers full Hebrew support, making it fully accessible to the Israeli elderly population. Recognizing that many older adults may have limited proficiency in English, we have designed our app to cater specifically to their needs by providing all functionalities and interfaces in Hebrew. This language support ensures that users can easily navigate the app, understand medication information, and manage their prescriptions without any language barriers.

Alerts - Customizable Medicine Alerts

Our app ensures that users never miss a dose by providing timely alerts directly to their phones. These reminders are crucial for maintaining a consistent medication schedule, which is essential for effective treatment and better health outcomes. Whether it's a daily prescription or a one-time medication, the app sends alerts to ensure users take their medications as prescribed, reducing the risk of missed doses.

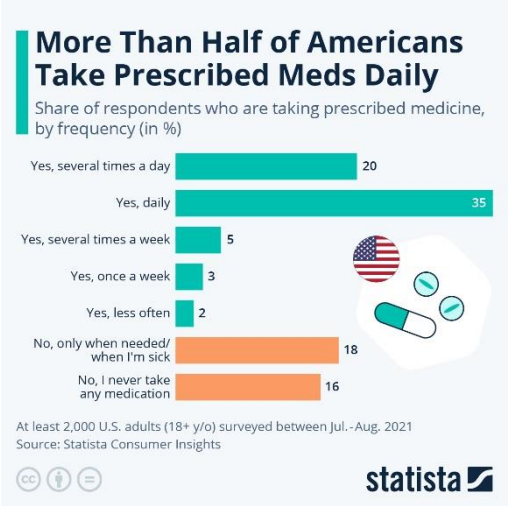
Market Analysis

Market Capacity

The need for effective medication management is a critical issue faced by millions of people worldwide. In Israel alone, approximately 3,217,500 individuals, or 33% of the population, rely on medication daily. This diverse audience includes people managing chronic conditions, those undergoing short-term treatments, and caregivers responsible for the medications of others.

Globally, the market for medication management solutions is vast and continually expanding, driven by factors such as an aging population, increasing prevalence of chronic diseases, and a growing emphasis on personal health management. These factors create a significant demand for user-friendly platforms that can help individuals organize, track, and adhere to their medication regimens effectively.

"More than half of adults were regularly taking prescribed drugs in the United States in 2021, according to data from a Statista Consumer Insights survey."



Our application is designed to meet this demand by offering a comprehensive, accessible, and user-friendly solution. By leveraging a microservice architecture, we ensure scalability and flexibility to accommodate a wide range of user needs. The application's features, such as real-time inventory updates, low stock alerts, barcode scanning, and customizable reminders, cater to the diverse requirements of our users.

Our Customers

Mr.Pill caters to any individual and family seeking a solution for medication management with a focus the on the Hebrew speaking Israeli market.

Our diverse audience includes:

- Individuals managing their own medications, whether for chronic conditions or occasional treatments, by for instance managing your inventory of non-prescription medical supplies such as bandages and Advil, up to monitoring sensitive prescription that must be a tracked closely.
- Families looking to streamline medication management for multiple members, from parents managing children's medications to caregivers overseeing the health of elderly relatives, who seek a user-friendly platform to organize and track medical supplies.

With millions of potential users both in Israel and globally, the market for our medication management application presents a substantial opportunity for growth and impact. By addressing the specific challenges faced by those managing medications, we aim to capture a significant share of this burgeoning market.

Application Architecture and Technologies

Mr. Pill is a medication storage management application designed to help users organize and track their medications within their homes. The application is built using a microservices architecture for the backend, utilizing .NET with ASP.NET. The frontend is developed using React Native.

Backend Architecture

The backend of Mr. Pill is designed with a microservices architecture, allowing for scalability and flexibility. The services are independent, communicating through RabbitMQ for messaging queue and HTTP for synchronous communication. The main services include:

1. **Login/Register Service**: Responsible for user authentication, login, and registration. It generates a JWT token for authenticated users and manages requests for joining a new house. It also sends a request to the house manager to ask to join their house. When the manager enters the application, they receive an alert that someone has requested to join their house. It communicates with the UserManager Service using RabbitMQ.
2. **UserManager Service**: Handles user management operations such as adding, updating, and retrieving medications. It communicates with other services to fulfill user requests. It also communicates with the Medication Details Service using HTTP. The UserManager Service is responsible for implementing the database schema using Entity Framework Core migrations and implementing additional features such as medication reminders.
3. **Medication Details Service**: Communicates with an external API provided by the Ministry of Health to fetch detailed information about medications.
4. Push Notification Service**:** Manages the sending of push notifications to users using Firebase. It shows notifications for all the reminders that the user defines.
5. **ApiGate Service**: Acts as a centralized gateway for client requests. Clients communicate only with the ApiGate Service, which then directs the requests to the appropriate services.

Each service is deployed as a separate microservice, allowing for independent scaling and maintenance. The application is planned to be deployed using Docker containers for easy management and deployment.

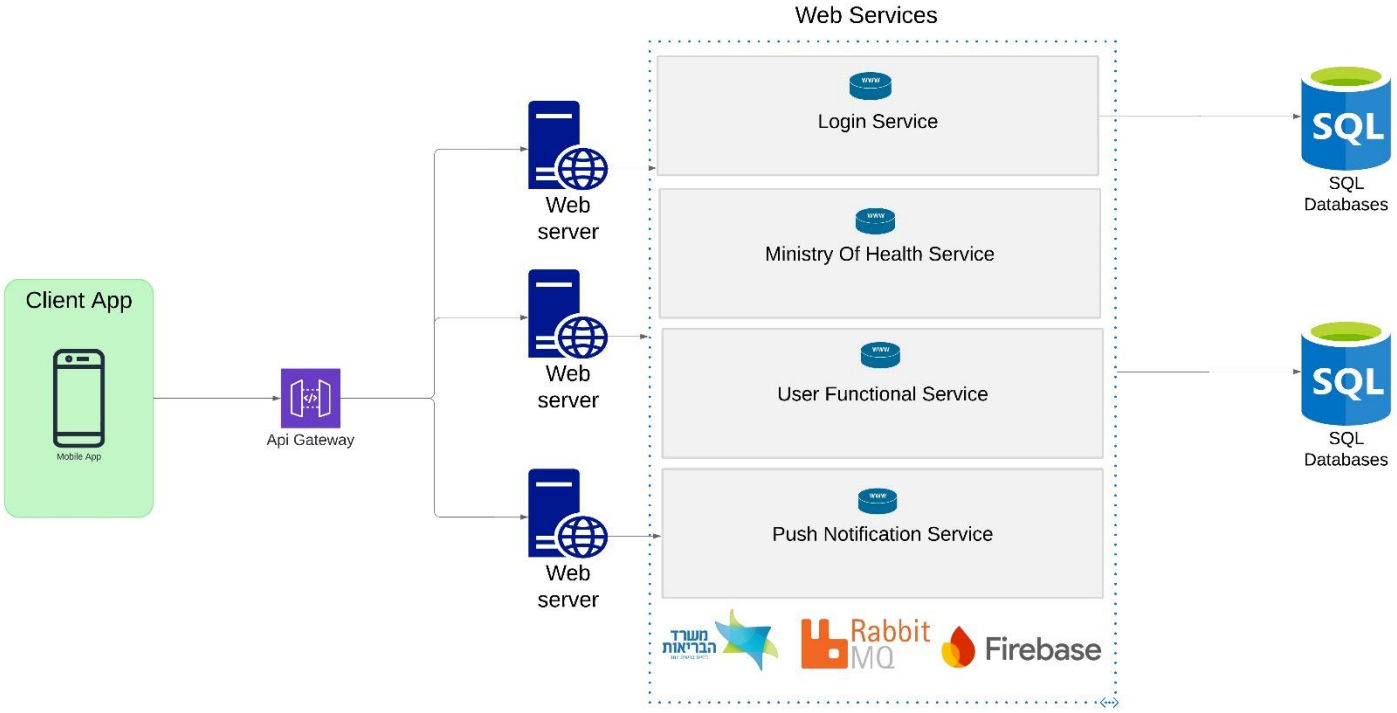
Frontend Architecture

The frontend of Mr. Pill is built using React-Native and Expo running on Node.JS, providing an environment for the cross-platform mobile application interface development, and aims at providing as simple interface as possible to be inclusive to all users regardless of age or physicality, with a focus on accessibility in Hebrew. Using React-Native allows to write code once and run it on almost all mobile platforms, providing future flexibility and making sure no users are excluded.

- Application logic and individual pages are written in TypeScript XML.
- Using Axios to fetch data over HTTP from the backend WebServices.
- Handling local data with the 'expo-file-system' module.

Technologies Used

- **Backend**: .NET with ASP.NET for the microservices architecture. JWT is used to secure the endpoints.
- **Communication**: RabbitMQ for asynchronous messaging and HTTP for synchronous communication.
- **Database**: SQL Server for storing medication, user, and request data.
- **Frontend**: React Native for building the mobile application interface.
- **External APIs**: Utilizes an external API provided by the Ministry of Health for fetching detailed medication information.
- **Push Notifications**: Firebase for sending push notifications to users.
- **Containerization**: Docker for containerizing the application for deployment.



Database Design

The database design of Mr. Pill includes the following tables:

House Table

- Represents a house in the application.
- Contains a `ManagerUserId` field indicating the user ID of the manager who can add new users.
- Has a one-to-many relationship with the `User` table.

User Table

- Represents a tenant (user) in a house.
- Each user can have a list of medications.
- Has a many-to-one relationship with the `House` table.

Medication Table

- Represents medications in the application.
- Contains an `IsPublic` field indicating if the medication is public (visible and usable by anyone) or private.
- Has a many-to-one relationship with the `User` table.

Repository Table

- Contains metadata for medications, such as name, description, and picture path.
- Has a one-to-many relationship with the `Medication` table.

Request Table

- Stores messages received from RabbitMQ, ensuring they are inserted into the database.
- This addition allows the application to track and manage requests and changes made to houses, enhancing the overall functionality and data management capabilities.

This database design allows for the management of houses, tenants, medications, and medication repositories in the Mr. Pill application. The relationships between tables ensure that data is organized efficiently and can be queried effectively to provide users with the necessary information.

Roles And Responsibilities

We collaborate closely on the Mr. Pill application, each contributing their expertise to different aspects of the project:

- **Asaf:** Works on the Login/Register Service, User Functional Service, and Api Gate Service. Asaf also collaborates with the team on designing the architecture and database schema.
- **Amit:** Focuses on the Medication Details Service with integration to Israeli Health Ministry API and the Push Notification Service for alerts. Amit contributes to the overall architecture and database design discussions.
- **Oren:** Takes charge of the client-side development, building and designing all the screens to create a user-friendly interface for the application. Oren also participates in the architectural and database design discussions with the team.