Senior Design Project

SurePa

Final Report

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Table of Contents

1. Introduction

Forgetfulness is a crucial problem when it starts to occur often in daily lives. Forgetting something unnecessary is good for your health and helps you learn and remember new and vital things. However, forgetting things like taking medicines, drinking water, walking, and any other daily routines complicates and adversely affects the lives of those particular people.

Forgetfulness targets elders primarily. Occasional lapses in short-term memory are a normal part of the aging process, such as forgetting which medicine to take and their daily doses. So, many older adults need new ways to remember to take their medications and know which medicine to take.

People with certain diseases, for instance, tumors, blood clots, and thyroid, also suffer from forgetting in their daily lives. While having a disease, daily routines like not forgetting to take medicines, and drinking water becomes more critical than usual. In the search for finding a solution to these problems, we came up with SurePa. It is an application for mainly offering solutions to not taking medicine problems resulting from forgetfulness targeting primarily older adults, diabetic people, and other people. In addition, SurePa provides caregiver functionality to its users which enables them to connect with their caregivers in various ways. SurePa consists of convenient tools for anyone who carries a mobile phone to help its users undergo a smooth recovery process.
In this report, an analysis of the finalized version of the SurePa application will be provided. This final report firstly includes the requirements details, final architecture, and design details. Then development/implementation and test details are provided. Afterward, maintenance plan details and other project elements are given. Lastly, the conclusion and future work is discussed and words for sustainability year is the closing chapter.

2. Requirements Details

2.1. Functional Requirements

2.1.1. Caregiver Functionalities

- Users will take notification to be a caregiver and if they accept they can be a caregiver.

2.1.2. Patient Functionalities

- Users can add a caregiver to notify them automatically. Caregivers can be anyone who can care for the patient or elder.
- Patients can send emergency messages to their caregivers with their locations easily.
- Patients could add a daily workout routine.
- Patients will get notified to take the medicine.
- Patients can monitor their medicine usage history.
- The patient will be able to save their blood sugar.
- Patients will be able to see a detailed tracking system of the patient's blood test results.
- Patients are able to monitor their statistics of taking medicines in time.
- Patients will get notified when they are close to running out of medicine to buy a new one.
- Patients are able to add their doctor appointments to their calendars.

2.1.3. Common Functionalities

- The patient and caregiver will be able to see their medication schedule.

2.2. Nonfunctional Requirements,

2.2.1. Reliability

Whether the medicine is taken by the patient should be accurate. Taking medications multiple times or forgetting to take them could cause serious health problems. SurePa pays attention to storing data correctly and orienting its users to provide correct information.

2.2.2. Usability

The application appeals to a wide range of audiences, and not everyone has to have a good understanding of technology. Therefore, interfaces are easy and understandable to use.

2.2.3. Accessibility

W3C [1] rules are considered for accessibility issues, and the application supports complementary image directives and it uses simple color palettes for sensitive people.
The program is suitable for different operating systems and different smartphones because of the variety of phones used by the users.

2.2.4. Efficiency

Since our main users are elders and most of them will be using SurePa using old devices, the efficiency of our application is essential. So services chosen to be used in the application are fast enough to operate on such devices.

2.2.5. Scalability

Since our user base is people who take medicines, the project should be scalable to handle many users. The server and database are able to process a large amount of data.

2.2.6. Security and Privacy

The user's private information such as contact, health, or medical history will be sent and stored encrypted. Also, sensitive information such as passwords and emails are secured.

3. Final Architecture and Design Details

3.1. Overview

SurePa has 3 main layers. The first layer is a mobile phone application, the second layer is a backend service, and the third layer is data storage. Since we use React Native, there is one code base for both platforms. For backend server and data storage, Firebase and its components are used. Cloud Firestore is used as the main data storage. In order to make connections between mobile applications and Firestore, Firebase is used.

3.2. Subsystem decomposition

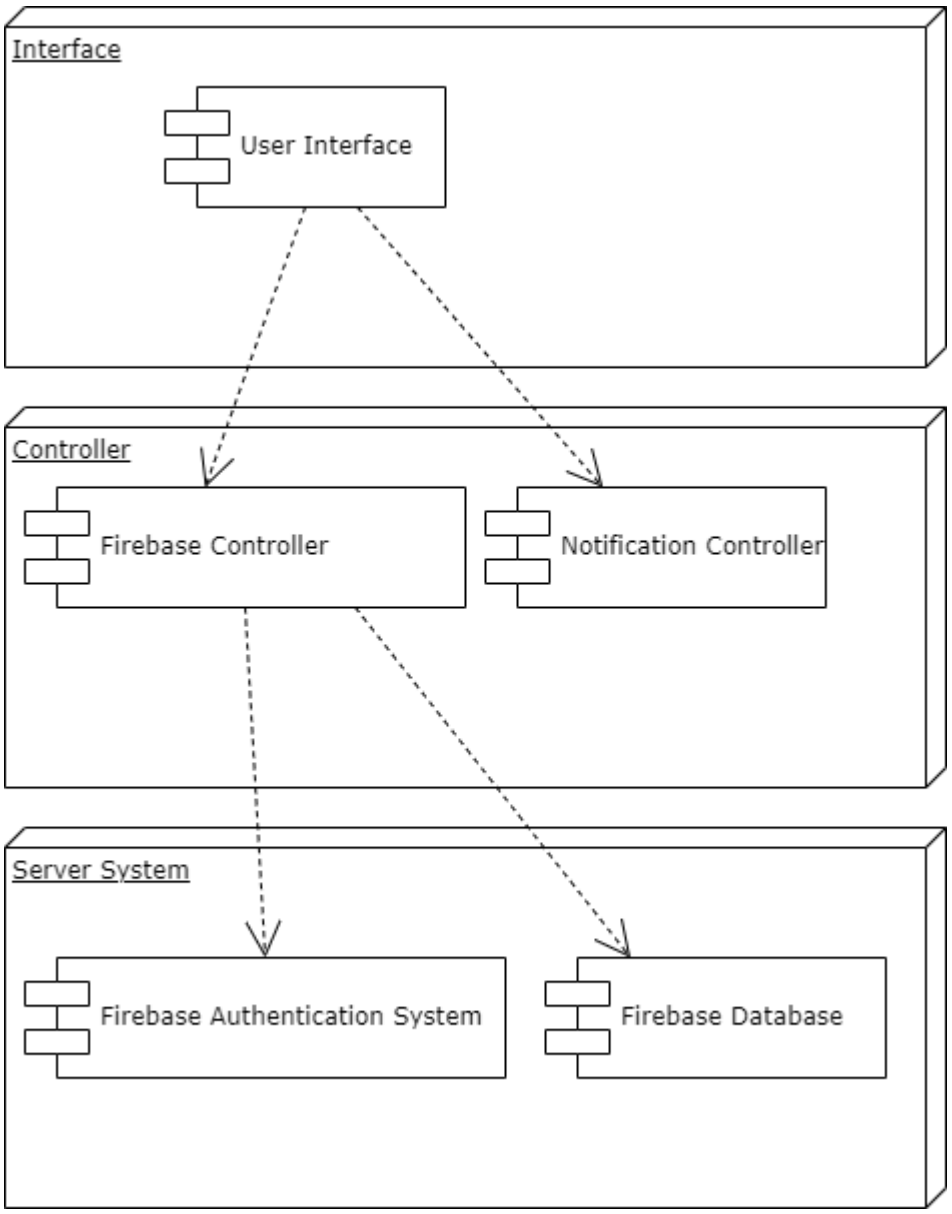

Figure 1: Subsystem decomposition

3.3. Hardware/software mapping

SurePa is an Android mobile application. Patients' medicine schedules, the number of remaining medicines, and health records are stored in the Firebase Database. The application uses the application's current machines' local time for notification times and keeping track of the medicines' current situations. In addition, the application uses the current device's current location to be able to send the location to the caregiver in emergency situations.

3.4. Persistent data management

Persistent and accurate data is essential as the SurePa provides reporting features for medicine usage records and blood sugar records. In addition, the application can be a part of treatment, wrong data can cause misled or wrong treatment plans which can harm patient health. Therefore patient data is persistently kept in Cloud Firestore. Cloud Firestore is a cloud-hosted, no-SQL data storage for mobile devices[2]. Firestore provides data synchronization which means when the database is updated in the database it will update the data in any collected devices. As a result, the users are able to see the same data at any time. In addition to that, Firestore offers security methods for securing the data which is used for keeping the data safe in the case of cyberattacks.

3.5. Access control and security

SurePa has mainly two different users: patient and caregiver which means the access permissions of these users should be separated. The administrator cannot access sensitive information about the users. Passwords and sensitive information are hashed.

Caregivers can have multiple patients, which they can view, but they cannot access the data of other caregivers' patients. As SurePa keeps sensitive information about health, access control is carefully handled by the application.

3.6. Global software control

SurePa has both time-driven and event-driven events. Therefore it follows both time-driven and event-driven principles. In an event-driven system, user actions shape the program's behaviors without the user input system staying stationary. For instance, patients' input in taking medicines triggers other events in the system. On the other hand, the reminders are triggered by time. Therefore, they are time-driven. Until the time triggers an event the system will stay stable and will continue to wait for a time signal.

3.7. Boundary conditions

From the user's perspective, SurePa has 3 boundary conditions. The first one is an initialization, the second one is termination and the last one is a failure.

3.7.1. Initialization

Both types of users(caregiver and patient) should have the SurePa app on their mobile phones. In the sign-in process, they should agree with the terms of use. Both phones should have access to the internet.

3.7.2. Termination

When the user closes the SurePa app, it doesn't listen or collect any type of data. Notifications are not active outside the application.

3.7.3. Failure

When an unexpected crash occurs only the current operations of the customers will be suspended. SurePa has a storage unit that keeps the data. Therefore, when the app is restarted no data will be lost. However, in a crash scenario, the application might not be able to collect data. Therefore, The application can not be sure about whether the pill is taken or not in this case.

3.8. Subsystem services

3.8.1. Interface

3.8.1.1. User Interface

There are two types of users. The first user type is the patient. Patients' UI is for taking information about medicines that they are using at that current time, showing the current situations of the medicines. UI enables them to input their information such as medicines they are using, and blood sugar levels with time. They are also provided with an interface to input their meetings into their calendar easily.
The second user type is a caregiver and everybody can become a caregiver by accepting an invitation to be a caregiver. So every user type has an invitations page UI.

3.8.2. Controller

3.8.2.1. Notification Controller

The notification controller subsystem handles user requests and actions by managing notifications. It is responsible for sending and receiving notifications from users. Each user receives different notifications corresponding to their roles and inputs. Patients receive filtered notifications about their health such as taking medicines on time. However, notifications are active only inside the application.

3.8.2.2. Firebase Controller

Firebase controller is responsible for writing data to Firestore and retrieving data from Firestore when asked.

3.8.3. Server System

3.8.3.1. Firebase Authentication System

It provides backend services to authenticate users to the application. Firebase Authentication supports authentication using passwords.

3.8.3.2. Firebase Database

It provides a database service to store user data and retrieve it when creating UI for reports.

3.8.4. Storage

Firestore is a persistent data store unit of SurePa. It keeps the data secure and consistent. It communicates with the Firebase database controller to write new data to the database and retrieve data. As Firestore is no-SQL data storage we don't have any tables. Instead, we have collections and documents. Collections have documents and documents have data in them. The document is in the form of JSON [4].

4. Development/Implementation Details

SurePa is a cross-platform mobile application. We used Visual Studio Code as IDE and Android emulator of the Android Studio. As a framework, we used React Native since it let us write cross-platform mobile applications.
For authentication, we used the Firebase Authentication service with an email and password option.
To store user data and necessary medicine information we used Google Firebase service. As a database, we chose Firebase Firestore instead of Firebase Realtime Database since it provides no SQL database structure to us.
To give users better usage, we used many npm packages in SurePa.

5. Testing Details

Testing is one of the crucial parts of the development of SurePa. Since it is a health-related application error would affect the user in a dangerous way.

5.1. UI testing

SurePa is an Android application in which the user interface means everything. Since our first aim was to create an easy-to-use, understandable, and bug-free user interface we have done a lot of UI testing. Whenever we add a new feature we test our UI according to that new feature and the features that are affected by that new feature. We also did UI tests regularly to see whether we missed any part beforehand or if any bug arose and we did not consider it at first.

5.2. User test

Our target users are everybody who needs to take pills and specifically people with diabetes. Since the application aims to develop the patient's behavior of taking care of themselves and increase the caregiver’s awareness of their related patient’s health status, user feedback becomes more important than other things. Thus, we did user tests to collect feedback and add or remove functionalities and it also helped us to find bugs that we did not recognize before. We did user tests by showing our application and observing user behaviors while using SurePa. We also tried to understand in which parts they do not fully understand how to use the functionality and we tried to make these functionalities clearer and user-friendly.

6. Maintenance Plan and Details

SurePa uses remote servers for storage and controlling databases. So maintenance of the database is required for the operation of our application. We have designed and implemented the project for several months. Therefore, we don’t expect to encounter huge fatal errors that force us to create a downfall in the application. Consequently, the usual maintenance process might occur once in a month, where the upgrade in the plans and minor errors might be checked and fixed accordingly. At this stage, we are aiming to launch the application for the Google Play Store. After getting the reflection and comments for the application from users, we will improve our final product.

7. Other Project Elements

7.1. Consideration of Various Factors in Engineering Design

Public Health: Improving the medication process of the patients is the motivation of our project, which focuses on strengthening the communication between the patient and caregivers and providing patients with helpful features, easing keeping track of their medicines' doses and schedules. Therefore, it is expected to enhance public health.

Public Safety: Taking into consideration the ongoing pandemic, it is essential to stay isolated and keep a distance from others. Since SurePa is targeted at establishing contact between the patients and caregivers about the medication process of the patient, it is projected to have a positive effect on public safety.

Public Welfare: SurePa aims to provide a medical service for the elderly worldwide without requiring any payment. Since SurePa is free to use and accessible, it is expected to have a positive contribution to public welfare.

Technological Factors: Management of rapid technological development for sustainable development is an important issue to be considered in the implementation of SurePa. In order not to have SurePa obsolete in a few years, the development of new technologies should be tracked, and such technologies should be easily applicable to SurePa. For this purpose, SurePa is implemented considering the maintainability issues.

Cultural Factors: Concerns and practices regarding privacy issues differ from culture to culture. For example, the European Union implements strict regulations about data protection, whereas Turkey does not enforce that authoritarian rule about privacy. Therefore, in the implementation of SurePa, the privacy boundaries of different cultures are taken into consideration.

Social Factors: The potential users of SurePa are the elderly, which could have different deficiencies. So, SurePa is expected to provide visual directives to meet the needs of the elderly and make their lives easier.

Global Factors: SurePa aims to provide a medical service to be used by people worldwide. For this purpose, considering that potential application users should have enough English proficiency to use such an application, SurePa supports English as its language. No additional language support is provided.

Table 1: Factors that can affect analysis and design

	Effect level	Effect
Public Health	10	The motivation of our Project
Public Safety	10	The motivation of our Project
Public Welfare	5	Accessibility and Purchasing Power
Technological Factors	10	Maintainability of the system Design and Implementation
Cultural Factors	4	Privacy and Data Protection
Social Factors	7	Availability of Visual and Auditory Directives
Global Factors	5	English Language Support

7.2. Ethics and Professional Responsibilities

The SurePa's first main goal is to provide solutions for forgetfulness, targeting primarily elders in the medical field. Therefore, SurePa can be used for all people worldwide, regardless of country or religion, who suffer from forgetfulness and forget to take pills, but it mainly targets the elders. In addition to that, SurePa is accessible on Android platforms. When the SurePa mobile app is released, We expect the elders' treatment process to be smoother, more convenient, and more reliable.

We believe that taking proper medicine at the appropriate time is essential in the treatment process. It can harden the treatment process or even create unwanted side effects. Therefore, SurePa is a free platform accessible to all people from all income levels.

SurePa creates more reliable healthcare for people all around the world. However, this raises security concerns about data privacy. SurePa doesn’t share any data with any of the third parties. The data of the customer is only shared with them. In

addition, the data application's security level is kept as high as possible to keep user data safe.

7.3. Judgements and Impacts to Various Contexts

Table 2: Impacts of SurePa to various contexts

	Impact level	Impact
Public Health	10	Great application to accommodate target people in the medical field.
Public Safety	10	Great application to provide services remotely among patients and caregivers, eliminating the physical contact and potential risks.
Public Welfare	8	Equally accessible for everyone independent of their purchasing power.
Cultural Factors	6	Mediocre security and privacy mechanisms are applied.
Social Factors	4	Visual directives are available but auditory directives are not available, not tailored according to the needs of the disabled.
Global Factors	4	Other than English, no language support is provided, putting a language barrier for some users.

7.4. Teamwork Details

7.4.1. Contributing and functioning effectively on the team

To ensure healthy and proper communication we have met systematically twice a week and discuss our progress as a team. In these meetings completed work so far is revised and new tasks are assigned to team members. Features to be added are discussed and evaluated as a team, hence features with priority are given more importance. After effort, whenever a feature is turned out to be time-consuming or could not be possibly implemented within the planned time due to complexity, the project schedule is revised. Either more time is allocated to the task or the task is discarded and alternative features are considered by team members. We pay attention to complying with the project plan and deadlines. We divided the work in a fair manner among teammates. Individuals started with small tasks and since these tasks were mostly dependent on one another, they required us to frequently come back together to combine. This process provided us the chance of reviewing and discussing the mini tasks. Hence the final work was consistent and we faced not much difficulty integrating. Through this approach everyone was able to participate in and understand other members' work, hence improving their skills of collaborating, communicating, and project management.

7.4.2. Helping creating a collaborative and inclusive environment

Team members were responsible for reporting their progress, so everyone was able to catch up with the information: what has been done so far and what needs to be done after this point. Everyone is given the chance to choose his/her task according to their strengths, weaknesses, and working habits. Generally, more than one member is assigned to any task, and at some point, each task is revised and evaluated as a team, so the result is the creativity and efforts of all members of the team. Team members were understanding and eager to help others.

7.4.3. Taking lead role and sharing leadership on the team

In order to make sure all group members are part of the development process, first, we chose a group leader for each work package. The group leader was responsible for distributing the tasks in the work package and checking whether it has been done on time or not in addition to their development work. They were also in account for ensuring that each member contributed sufficiently and the workload was equally

distributed among group members. Everyone was given the chance to lead a work package, hence letting them both be a leader and a team member alternately.

Table 3: List of work packages

WP#	Work package title	Leader	Members involved
WP1	Project Specification Report	Kerem Alemdar	All Members
WP2	Project Webpage	Kaan Ateşel	Emine Ezgi Saygılı
WP3	Innovation Expert Interview	Eylül Çağlar	Kaan Ateşel, Kerem Alemdar, İsmet Alp Eren
WP4	Analysis Report	İsmet Alp Eren	All Members
WP5	Front-end Implementation	İsmet Alp Eren	All Members
WP6	Rest API Service and Database	Kaan Ateşel	Kerem Alemdar, İsmet Alp Eren
WP7	High-Level Design Report	Emine Ezgi Saygılı	All Members
WP8	First Prototype and Testing	Kerem Alemdar	All Members
WP9	Mid-Presentation and Demo	Eylül Çağlar	All Members
WP10	Low-Level Design Report	Kerem Alemdar	All Members
WP11	Final Implementation	Emine Ezgi Saygılı	All Members
WP12	Testing	İsmet Alp Eren	All Members
WP13	Final Report	Kaan Ateşel	All Members
WP14	Final Presentation and Demo	Emine Ezgi Saygılı	All Members

WP 1: *Project Specification Report (Done)*			
Start date: *07.10.2021* **End date:** *10.10.2021*			
Leader:	*Kerem Alemdar*	**Members involved:**	*Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *Describe the project goals and explain the constraints, ethical and professional issues, and functional and non-functional requirements.*			
Tasks: ***Task 1.1 Goals:*** *Determining the primary goal of the project.* ***Task 1.2 Requirements:*** *Determining the functional and non-functional requirements.* ***Task 1.3 Constraints:*** *Determining the constraints.*			
Deliverables ***D1.1:*** *Project Specification Report*			
WP 2*:* *Project Webpage (Done)*			
Start date: *09.10.2021* **End date:** *10.10.2021*			
Leader:	*Kaan Ateşel*	**Members involved:**	*Emine Ezgi Saygılı*
Objectives: *Creating a webpage that will include reports of the project.*			
Tasks: ***Task 2.1 Creation Of Github pages:*** *Github page will be created, and a template will be downloaded.* ***Task 2.2 Configuration of GitHub pages:*** *Page will be configured according to the project web page's needs. The page where the documents will be displayed will be made ready.*			

Task 2.3 Uploading reports to the web page: *A folder will be created in the project, and the reports will be uploaded there.*			
Deliverables ***D2.1:*** *Project Webpage*			
WP 3: *Innovation Expert Interview (Done)*			
Start date: *12.10.2021* **End date:** *12.10.2021*			
Leader:	*Eylül Çağlar*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, İsmet Alp Eren*
Objectives: *Explaining the project goals to an expert and taking feedback to develop project qualities.*			
Tasks: ***Task 3.1 Presentation:*** *Preparing a presentation that involves ideas and goals about the senior design project.*			
Deliverables ***D3.1:*** *Brief presentation for an innovation expert*			
WP 4: *Analysis Report*			
Start date: *31.10.2021* **End date:** *07.11.2021*			
Leader:	*İsmet Alp Eren*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *Making a detailed analysis of the project.*			

Tasks:

Task 4.1 Current System Analysis: *Finding systems that are similar to the project and explaining these systems.*

Task 4.2 Requirements Analysis: *Review aforementioned functional, non-functional, and pseudo requirements.*

Task 4.3 System Models Analysis: *Creating scenarios, use case model, object and class models, dynamic models, and expected user interface draft.*

Deliverables

D4.1: *Analysis Report*

WP 5: *Front-end Implementation*

Start date: *15.11.2021* **End date:** *14.03.2022*

Leader:	*İsmet Alp Eren*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*

Objectives: *Creating the front end of the project and further implementations.*

Tasks:

Task 5.1 Setting up the environment: *Required programs will be downloaded, and projects will be created and uploaded to GitHub.*

Task 5.2 Outline of front-end: *Creating a base of the front end by implementing basic pages.*

Task 5.3 Development: *Further development of the project, a step towards a visible end product. Caregiver and patient pages will be implemented simultaneously.*

Task 5.4 Issue and bug fixes: *Bugs and issues focused step, aiming to reach bug-free front-end.*

Deliverables

D5.1: *An easy-to-use interface, especially for older users.*

WP 6: *Rest API Service and Database*

Start date: *15.11.2021* **End date:** *14.03.2022*

Leader:	*Kaan Ateşel*	**Members involved:**	*Kerem Alemdar, İsmet Alp Eren*

Objectives: *Integrating Rest API Service to the project and establishing a connection to a database.*

Tasks*:*

Task 6.1 Setting Up A Firebase Project: *A Firebase account will be created besides the new project. Primary functionalities of a rest API will be implemented.*
Task 6.2 Developing Authentication Endpoints: *Login, and registration functionalities of both caregiver and patient will be implemented.*
Task 6.3 Developing Object Storage System: *Integration of an object storage system.*
Task 6.4 Developing Patient Functionalities: *Patient-specific functionality implementation.*
Test 6.5 Developing Caregiver Functionalities: *Caregiver-specific functionality implementation.*

Deliverables

D6.1: *An object storage system*

D6.2: *A Firebase application and data storage ready to use for both caregiver and patient functionalities.*

WP 7: *High-Level Design Report*

Start date: *24.11.2021* **End date:** *24.12.2021*

Leader:	*Emine Ezgi Saygılı*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren*
Objectives: *Having a comprehensive design of the project by analyzing the high-level system structures, subsystems, and data handling and considerations of various factors in engineering design.*			
Tasks: ***Task 7.1 Subsystem Decomposition:*** Decomposing the system into cohesive, well-defined subsystems that are easier to understand, program, and maintain. ***Task 7.2 Data Management:*** Determining separate layers for the data management and how each system will process the data. ***Task 7.3 System Architecture:*** Describing the structure and behavior of subsystems and other components. ***Task 7.4 System Model:*** Developing abstract models of the system and representing the system using UML.			
Deliverables **D7.1:** *High-Level Design Report*			
WP 8: *First Prototype and Testing*			
Start date: *25.11.2021* **End date:** *7.01.2022*			
Leader:	*Kerem Alemdar*	**Members involved:**	*Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *Although the magic of the UI has not come to an end, the purpose is to create a product that will perform basic functionality.*			
Tasks: ***Task 8.1 Assessment of the current situation:*** *All of the program components will be controlled and combined to form a product.* ***Task 8.2 Tests:*** *Functionality and bug testing will be done.*			

Deliverables ***D8.1****: First prototype*			
WP 9: *Mid-Presentation and Demo*			
Start date: *15.12.2021* **End date:** *End of the Fall Semester*			
Leader:	*Eylül Çağlar*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *Presenting commercial and technical sides of the first prototype.*			
Tasks: ***Task 9.1 Demo:*** *Commercial demo will be recorded.* ***Task 9.2 Presentation:*** *Preparing prototype presentation.*			
Deliverables ***D9.1:*** *Presentation and demo*			
WP 10: *Low-Level Design Report*			
Start date: *31.01.2022* **End date:** *21.02.2022*			
Leader:	*Kerem Alemdar*	**Members involved:**	*Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *Detailing the high level design to component level design.*			
Tasks: ***Task 10.1 Module Specifications:*** Describing the logic for every system component and further specifying each module. ***Task 10.2 Design Choices:*** Evaluating design trade-offs. ***Task 10.3 Packages:*** Specifying packages used in subsystems. ***Task 10.4 Identifying classes:*** Identifying class methods and properties.			
Deliverables			

D10.1: *Low-Level Design Report*			
WP 11: *Final Implementation*			
Start date: *7.01.2022* **End date:** *14.03.2022*			
Leader:	*Emine Ezgi Saygılı*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren*
Objectives: *Finalizing the project implementation.*			
Tasks*:* ***Task 11.1 Perfection Of The Project:*** Finalizing the project and solving the last bugs accounting for the prototype testing results.			
Deliverables ***D11.1:*** *Final version of the application SurePa.*			
WP 12: *Testing*			
Start date: *20.12.2021* **End date:** *14.03.2022*			
Leader:	*İsmet Alp Eren*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, Emine Ezgi Saygılı*
Objectives: *Testing the system's efficiency, UI usability, and searching for bugs.*			
Tasks: ***Task 12.1 Re-evaluation:*** UI's usability will be examined and will be updated if needed. ***Task 12.2 Searching for bugs:*** Bugs will be found and eliminated.			
Deliverables ***D12.1:*** *Improved UI and bug-free product.*			
WP 13: *Final Report*			
Start date: *18.04.2022* **End date:** *01.05.2022*			

Leader:	*Kaan Ateşel*	**Members involved:**	*Kerem Alemdar, Eylül Çağlar, İsmet Alp Eren, Emine Ezgi Saygılı*
Objectives: *A comprehensive overview and analysis of the project with the latest updates.*			
Tasks: ***Task 13.1 Requirements:*** Last requirement updates and finalize the project requirements. ***Task 13.2 Architecture:*** Last minor changes in the architecture analysis. ***Task 13.3 Process Analysis:*** Details of the development and implementation will be analyzed and given. ***Task 13.4 Testing:*** Results of the application tests will be recorded and analyzed.			
Deliverables ***D13.1:*** *Final Report*			
WP 14: *Final Presentation and Demo*			
Start date: *14.03.2022* **End date:** *End of the spring semester.*			
Leader:	*Emine Ezgi Saygılı*	**Members involved:**	*Kerem Alemdar, Kaan Ateşel, Eylül Çağlar, İsmet Alp Eren*
Objectives*:* *Presenting commercial and technical sides of the project.*			
Tasks: ***Task 14.1 Demo:*** *Commercial demo will be recorded.* ***Task 14.2 Presentation:*** *Preparing product presentation.*			
Deliverables ***D14.1***: *Presentation and demo*			

7.4.4. Meeting objectives

The final product met most of the expectations, only minor changes to the analysis report have been made. SurePa is now a successfully working android application that provides its target audience an easy-to-use interface accommodating their basic medical needs. Promised patience functionalities are mostly implemented such as a notification system, daily and weekly graph summaries, connecting with caregivers, emergency shortcuts, and recording physical measurements and blood test results as well as recording medicine dosage and tracking system for the remaining amount. What was not promised was not implemented is the camera feature to recognize medicine by processing the barcode from the captured image. On the other hand, caregivers are able to connect with patients but they have limited features available for use. The patient's functionalities were prioritized.

7.5. New Knowledge Acquired and Applied

SurePa is implemented by using React-Native, Android Studio, and Firebase. Some of our members have never used React-Native and Firebase, so, for them, they became familiar with new platforms. To make the implementation process easier, everybody tried to implement the parts which they were familiar with or which every individual member thinks that the part's learning objectives fit them and make them interested. A lot of websites are used for this learning process such as Youtube, Stackoverflow, React-Native web page, and Firebase web page.

8. Conclusion and Future Work

In the end we succeed in developing a helpful medical application tailored to the needs of the target audience. It focuses on eliminating the crucial negative consequences of forgetfulness. It provides features to prevent forgetting to take medicines The habits and possible reactions of the elderly are elaborately analyzed and the optimum solutions are provided in the application. For diabetic people, an easy-to-use environment is provided to keep track of their blood sugar process. It strengthens the behavior of patients in keeping track of their health-related habits by helping them recognize and follow their medication plan consistently. We are happy with what we created and learned a lot in the process.

As a team of SurePa, we were planning to integrate an image recognition system into our application but in the light of our research, we decided that integrating it into our

system will not make our application any better. But we are still thinking about it and by adding some image recognition maybe we can provide a more motivating application to our users. We would be very happy with any suggestions. We added some specific features for diabetic people. For future work, the application may include a selection interface for the diseases to provide all types of diseases with a good tracking system for every individual patient with individual needs. However, we are still very open to new ideas and feedback. The user experience and evaluation will be crucial and valuable in improving the application to better accommodate the target audience and make their lives easier. In the future, we are eager to publicly release the project where all the functional requirements are met and necessary changes are made according to the user feedback.

9. Words for Sustainability Year

In Bilkent University, 2021-2022 semesters were Sustainability Year and firstly we tried to find an application that has the main purpose of creating a sustainable environment. It was also about medicine usage and not wasting medicines but since medicine usage is a sensitive issue that needs attention we decided that creating such an application may cause dangerous issues we tried to be in a safe zone and still created a medicine usage application with no such risks. But if we think of creating a sustainable environment our application still has issues with that. The main goal of the application is to promote the effective and proper consumption of medicine. It aims to overcome the misuse of medicine and the waste attached to it. By promoting its users to follow their medication plan on time and to take medicine as prescribed, it still aims to achieve sustainability of medical sources/medicines.

10. Glossary

1. **Medication Schedule:** A schedule that shows which pill will be taken and when it will be taken.

11. References

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