Bilkent University

Department of Computer Engineering

Senior Design Project

Analysis Report

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1. Introduction

With the decrease in agricultural production and the increase in industrial production, people started to meet their nutritional needs by consuming more packaged products. Users find it difficult to read because the contents of the products are written very small. In addition, they may not understand because it contains foreign words. Reading the ingredients section can be a waste of time. This difficulty causes users to be hesitant when consuming products. One of the reasons for this is that the allergenic substances in the contents of packaged foods can negatively affect people. The prevalence rates of food allergies with people vary between 6–10.5%, however current data suggest that the prevalence of this rate is increasing worldwide [1]. Considering this condition all over the world, the number of people allergic to certain substances is quite high. People who have adopted vegan and vegetarian lifestyles are also hesitant when purchasing packaged products. In order to understand whether the product complies with that life requirement, it is necessary to examine the ingredients in detail, and at this stage, users have difficulties. In addition, some users do not want to waste time by examining the product and trying to read small texts to learn the calorie of the product, the national stamps, the place of production and the price. In addition to that, the increase in the consumption of packaged products encouraged people to use the market. It is seen that the same product is sold at different prices in different markets [2]. Users have to visit all the markets one by one and keep in mind the prices of the products in order to be able to shop more economically, and this causes both physical and mental fatigue. The GoodBuy application which we will create allows people to protect their health, save time and make shopping more economical.

This report will contain information about the current systems that are similar to the GoodBuy application. Proposed system which we will implement and overview of the project. Functional requirements, nonfunctional requirements, pseudo requirements and system models are given in this report. As a system models, scenarios, use case model, object and class model, dynamic models and user interfaces will be shown. The report also contains the other analysis elements that are consideration of various factors in engineering design, risks and alternatives, project plan, ensuring proper teamwork, ethics and professional responsibilities and planning for new knowledge and learning strategies.

2. Current System

There are applications to facilitate the use of supermarkets. Examples of these are Migros Online Shopping, Barket and Zingo. Thanks to the Migros Online Shopping application, users can create their own shopping lists, see the price list in that market and access discounts [3]. They can access detailed information about the products by searching for the name of the product. Thanks to Barket and Zingo, the prices of market products can be compared by scanning their barcodes [4,5]. Only price comparison is available in the Zingo and Barket app. According to the location of the person, there is no order in which both the cheapest and the closest market can be found over the location of the markets. At the same time, these applications can be a waste of time for the user because entering the product name to access information about the product is a time-consuming process. Scanning barcodes to see the prices of the product in other markets is also time-consuming and not hygienic. It requires the user to spend time to find the barcode of the product and to take the product in his hand and touch many parts of it.

3. Proposed System

3.1 Overview

GoodBuy is a mobile application. Users who want to buy packaged products take care of their health and save time and money thanks to GoodBuy. A feature of this application is that the application can recognize the packaged products from the camera of the application, thanks to the augmented reality technology. In this way, information about the product can be accessed by the customers in the market, without touching the product, by simply holding the application camera towards the product. This information is intended to facilitate the life of the user.

Users who are members of the system register the substances that their bodies have allergic reactions to the system. Then, if this allergen is found in the product that the user shows into the system, the system informs the user by giving an alert. In this way, users buy the product after they are sure that the product will not cause an allergic reaction, and the possibility of experiencing product-related health problems is reduced. Users also specify their lifestyles when registering to the system (such as vegan or vegetarian). When the user shows the product in the market to the system, he can easily understand whether the content of the product fits his lifestyle or not. For example, when a user registered to the system as a vegan shows a non-vegan product to the application's camera, the application

alerts the user and notifies the user. Thus, users can shop without hesitation, making sure that they buy products suitable for their lifestyle. At the same time, when the user points the camera of this application to a packaged product, he can easily access the calorie, the national stamps, the place of production and the price information about the product. Thus, he does not waste time by taking the product in his hands and examining it.

The same products can be sold at different prices in the markets. GoodBuy also helps users spend less money on their market shopping. This convenience is provided in two ways. First, when the user reads the product to the camera of the application, the system shows the price of that product in other markets to the user, indicating that the user can reach the product at a more affordable price. The second is to create a shopping list before the user goes to the market through the system. The system shows the total price of the products in this shopping list for each market. At the same time, these markets are ranked according to the proximity of the person's location. The person can also access the locations of the markets through the system. In this way, the user decides where to do his shopping in the most economical way and goes to that market.

There will also be an admin website for managing the application. In addition, the GoodBuy application will have a section where users report changing or not found product packaging to the admin.

3.2 Functional Requirements

The system should perform following tasks:

- Displaying the menu
- Listing user-specialized suggestions if any
- Listing products to be selected
- Receiving finalized basket
- Receiving camera input
- Communicating with the cloud & receiving related data
- Informing the user for the best options of markets
- Redirecting to a map application to show closest market
- Displaying AR models and outputs on the live camera
- Showing advertisements

The user can/should perform following tasks:

- Scanning the product via device camera
- Choosing the products s/he wants among the product list & adding to the basket

- Learning the ingredients of the products
- Entering the ingredients which s/he does not want and s/he allergic to
- Getting suggestion feedbacks according to her/his past selections
- Being informed about the best and closest market
- Observe any advertisements that are showed

3.3 Nonfunctional Requirements

3.3.1 Scalability

Scalability is an essential component of enterprise software. Prioritizing it from the start leads to lower maintenance costs, better user experience, and higher agility[5]. Since our software is used in markets (somewhere people are in there in their daily life) it is crucial for our project to be scalable as much as possible. In other words, our application has to have the ability to respond to a large number of consumers' requests in the minimum amount of time in order to encourage people to use our app in their daily life. To achieve this, we will be using cloud services that can handle possible large scales of data in the future.

3.3.2 Reliability

Application reliability is the probability of a piece of software operating without failure while in a specified environment over a set duration of time. In a perfect world, a reliable piece of software is completely defect free, does not create downtime, and performs correctly in every scenario[6]. Since our project's goal is to be used in one of the most important activities in people's daily life, it is urgent for our project that all functionality and features run smoothly and accurately. Unity and cloud servers give us enough opportunities for achieving a high reliability in our project.

3.3.3 Availability

Application availability is a measure used to evaluate whether an application is functioning properly and usable to meet the requirements of an individual or business[7]. We are not designing or developing this project for a company or business. However, Bilkent University is asking about a requirement report in which we should specify all functionalities.. Therefore, we are doing our best to design and develop all functionality with high accuracy and lowest fault.

3.3.4 Maintainability

Understanding software maintainability allows organizations to identify improvement areas as well as determine the value supplied by current applications or during development changes[8]. Since we want to be nominated for at least one of the prizes in the CS Fair, we have to design and implement our project as maintainable as possible. Therefore, high maintainability of the project helps us to make changes and add features easily in order to make our app more and more powerful. We can achieve high maintainability by having a perfect software architecture. Hence, we are planning to have meetings with software architecture experts for deciding our software architecture in different parts of the project.

3.3.5 Security

Since we are storing images, users' information and their medical information, security is one of the most important non-functional requirements for our project. Therefore, we decided to use Firebase which is reliable and highly secure for storing this information. Furthermore, for storing images we are using Vuforia's cloud servers hence, our data will be highly secured there by Vuforia.

3.3.6 Usability

The interface of the application will provide necessary and sufficient features to give the best user-friendly experience to the users. It will consist of accurate images of the products, different language options and simplistic design.

3.4 Pseudo Requirements

3.4.1 Project Management & System Version Control

- For reports of application we are using Google doc which helps all members of the group working on the same documents and they are able to read and check the information which is provided throughout the report. Therefore, by getting help from Google doc we can easily manage our information which is provided in the report.
- For managing the different versions of the system and updating the application we are using GitHub.

3.4.2 Testing

- Each member has to create a couple of test cases in order to test and make sure of the accuracy of the assigned part to them.

- Alpha and Beta environments are considered for testing and controlling the accuracy of the whole application. For this reason different groups of people with different backgrounds are chosen for testing the application.

3.4.2 Target Platform & User Experience (UX)

- For the administrator part in order to control some information through the application we are planning to run it on the web.
- Clients can run our application on IOS and Android.

3.4.2 External Tools and Technologies

- For chatting and sharing the information among the members Whatsapp is used.
- For online meetings, the Zoom application is used.
- For designing the UML diagrams, Lucidchart and Visual Paradigm are used.
- For designing the user interface, Uizard website[6] is used.

3.5 System Models

3.5.1 Scenarios

Scenario 1	
Use Case Name	Application Credits
Participating Actors	Users
Entry Conditions	By opening the application and choosing the credits in the first page, users are able to access the information about the application.

Exit Conditions	Users by pressing the back button are going to the home page.
Main Flow Events	Users: 1. Open the application. 2. Click on the Credits button. 3. Can read the information about the application. 4. Press the back button and navigate to the first page.

Scenario 2	
Use Case Name	Register
Participating Actors	Users & Authentication Service
Entry Conditions	If users have not registered by pressing the register button are able to fill in the required information and register to the application.
Exit Conditions	Users either fill in the required information for registration and press the save button that they are navigated to the user's home page or by pressing the back button navigate to the first page.
Main Flow Events	Users: 1. Open the application. 2. Click on the Register button. 3. Fill in the required information. 4. Either fill in all required information and press the save button in order to go to the user’s home page or press the back button and they are navigated to the first page .

Scenario 3	

Use Case Name	Login
Participating Actors	User & Authentication Service
Entry Conditions	If users have registered before, they are able to login to the application by providing the username and password that they chose in the register part.
Exit Conditions	Users either provide their username and password and by pressing the sign in button they are navigated to the home page or press the back button and they are navigated to the first page.
Main Flow Events	Users: 1. Opens the application. 2. Click on the Login button. 3. provide their username and password that they chose in the register part.. 4. Either press the sign in button and they are navigated to the home page or press the back button and come back to the first page.

Scenario 5	
Use Case Name	Edit Profile
Participating Actors	Users & Authentication Service
Entry Conditions	After login, users are able to edit their information about health conditions by pressing the Edit Profile button in the home page.
Exit Conditions	The back button which is located in the Edit Profile page will navigate users to the home page.

Main Flow Events	Users: 1. Login to the application or register. 2. Pressing the Edit Profile button. 3. Pressing the back button and they will be navigated to the home page. .

Scenario 4	
Use Case Name	Setting Prohibited Ingredients
Participating Actors	User & Authentication Service
Entry Conditions	In the Edit Profile page users are provided with the Setting Prohibited Ingredients which by dressing its button they are able to set prohibited ingredients.
Exit Conditions	The back button which is located in the Setting Prohibited Ingredients page will navigate users to the Edit Page.
Main Flow Events	Users: 1. Press the Setting Prohibited Ingredients button from the Edit Profile page. 2. Are able to edit their information about Prohibited Ingredients on this page. 3. Press the back button and they will be navigated to the Edit profile page.

Scenario 5	
Use Case Name	Setting Lifestyle
Participating Actors	User & Authentication Service

Entry Conditions	In the Edit Profile page users are provided with the Setting Lifestyle which by dressing its button they are able to set their lifestyle.
Exit Conditions	The back button which is located in the Setting Lifestyle page will navigate users to the Edit Page.
Main Flow Events	Users: 1. Press the Setting Lifestyle button from the Edit Profile page. 2. Are able to edit their information about their lifestyle on this page. 3. Press the back button and they will be navigated to the Edit profile page.

Scenario 6	
Use Case Name	Setting Allergies
Participating Actors	User & Authentication Service
Entry Conditions	In the Edit Profile page users are provided with the Setting Allergies which by dressing its button they are able to set allergy trigger ingredients.
Exit Conditions	The back button which is located in the Setting Allergies page will navigate users to the Edit Page.
Main Flow Events	Users: 4. Press the Setting Allergies button from the Edit Profile page. 5. Are able to edit their information about their allergy trigger ingredients. 6. Press the back button and they will be navigated to the Edit profile page.

Scenario 7	
Use Case Name	Scan a Product
Participating Actors	User
Entry Conditions	In the users' home page which appears after sign in or register, by pressing the scan product their mobile phones' camera will be opened and they are able to scan the products, Moreover they can scan the product without being registered. it is accessible from the guest login in the first page of the application.
Exit Conditions	Back button in both ways of access of the scan product allows the users to exit from that.
Main Flow Events	Users who are already registered: 1. Open the application. 2. Sign in the application. 3. Click on the Scan Product button from the home page. 4. Scan the desired product. 5. Read the information about the product. 6. Find out it is compatible with your allergies, lifestyle and prohibited ingredients. 7. Find out the price in other markets and how far those markets are. 8. Click on the back button and come to the home page. Guest Users: 1. Open the application. 2. Click on the Guest Login button. 3. Click on the Scan Product button. 4. Scan the product with their mobile phones' camera. 5. By pressing the back button they will be navigated to the Guest Login page.

Scenario 8	
Use Case Name	Information of Product
Participating Actors	User
Entry Conditions	After scanning a product if the product's information including ingredients, expired date, produced date and ext. was available in the database it would be demonstrated.
Exit Conditions	The back button will relocate the user in the Scan Product page.
Main Flow Events	Users: 1. Scan the product. 2. If the product was available in the system its details will be shown, otherwise the user will be faced with error. 3. Read the product information. 4. Click on the back button and they will be relocated to the scan product page.

Scenario 9	
Use Case Name	Listing Optional Markets for the Product
Participating Actors	User
Entry Conditions	This scenario happens after scanning the desired product and pressing the Show Supermarkets button. Hence, if that product exists in our system, information including which markets have this product, how much they are selling and how far they are would be demonstrated .

Exit Conditions	The back Button would relocate users to the Scan Product page.
Main Flow Events	Users: 1. Scan the desired product. 2. Press the Show Supermarkets button. 3. If the related information about the product was available in the system it would be demonstrated. 4. Read the information about the optional markets and product's price in those markets. 5. Click the back button and come back to the Scan Product page.

Scenario 10	
Use Case Name	Alerting Prohibited Ingredients to Users
Participating Actors	User & Authentication Service
Entry Conditions	After scanning the desired product, if the information of that product exists in the system and the user was registered, based on the health information which the user provides, an alert would be shown. This alert indicates whether this product is compatible with your health criteria or not..
Exit Conditions	The back Button would relocate users to the Scan Product page.

Main Flow Events	Users: 1. Scan the desired product. 2. If the related information about the product was available in the system, and the user was registered before, an alert would be demonstrated. 3. Are able to find out whether the product is compatible with their health criteria or not. 4. Click the back button and come back to the Scan Product page.

Scenario 11	
Use Case Name	Making Shopping List
Participating Actors	User
Entry Conditions	There are two ways for accessing The Making Shopping List page. Firstly from the Guest Login page and secondly from the home page after users are Logged in.
Exit Conditions	The back button in both ways of accessing will relocate users to the previous pages which are home page or login and register page.
Main Flow Events	Users who have registered already: 1. After login to the application by pressing the Making Shopping List button they are navigated to this page. 2. They are able to search the products, add the products and delete the products from their list. 3. Click the back button and come back to the home page. Users are not registered: 1. From the Guest Login page users are provided with the Making Shopping

	List option which by pressing it they are able to make their shopping list. 2. They are able to search the products, add the products and delete the products from their list. 3. Click the back button and come back to the login and register page.

Scenario 12	
Use Case Name	Search a Product
Participating Actors	User
Entry Conditions	From the Making Shopping List, users are able to search their desired product by the search barch is created in this page.
Exit Conditions	The back Button would relocate users to the Register and Login page or the home page depending on the way that users access the Making Shopping List.
Main Flow Events	Users: 1. By typing their desired products on the search bar which is located in the Making Shopping List, they are able to search their desired product. 2. Click the back button and come back to the login and register page or home page.

Scenario 13	
Use Case Name	Listing Optional Markets for the List
Participating Actors	Users

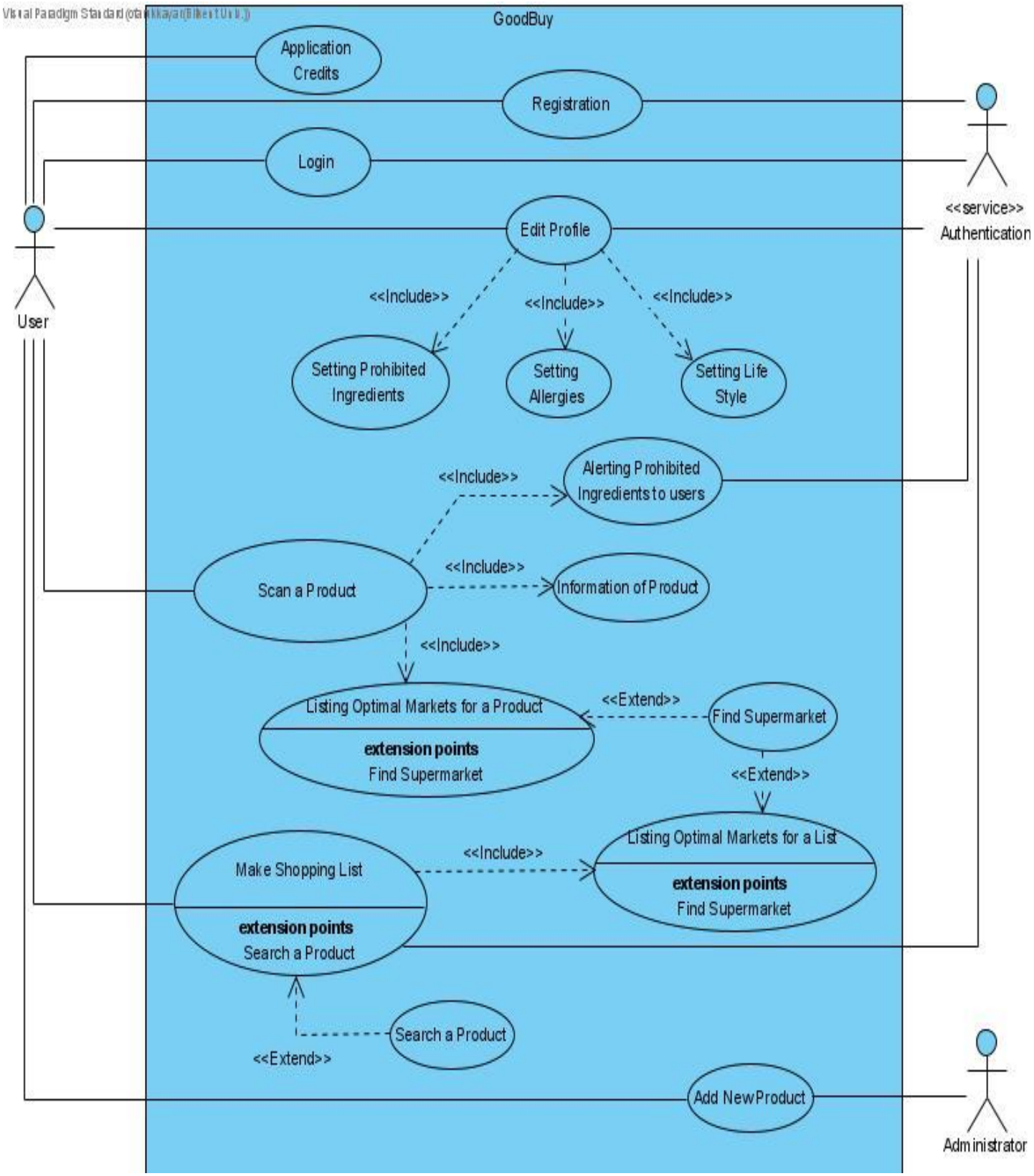
Entry Conditions	After creating the shopping list and choosing your location you are able to find the nearby markets which offer the best price for your shopping list by pressing the Show Supermarkets button.
Exit Conditions	The back button will navigate users to the Making shopping list page.
Main Flow Events	Users: 1. Create their shopping list. 2. Choose their location. 3. Press the Show Supermarkets button. 4. Figure out the price which they have to pay in each market and how far they are. 5. click the back button and they are navigated to the Making the Shopping list page.

Scenario 14	
Use Case Name	Find Supermarket
Participating Actors	Users
Entry Conditions	When users press the Show Supermarket, they are provided with the information about the market, the price and how far they are. Furthermore users by pressing the each supermarket which is provided can find out where it is and how they can reach there. Moreover, users with a search bar in this page are able to search their desired markets.
Exit Conditions	The back button will navigate users to the previous page.

Main Flow Events	Users: 1. Press the Show Supermarkets button. 2. The price and how far they are will be shown. 3. By pressing each market you are able to find out its location. 4. Search their name on the search bar. 5. Click the back button to navigate them to the previous page.

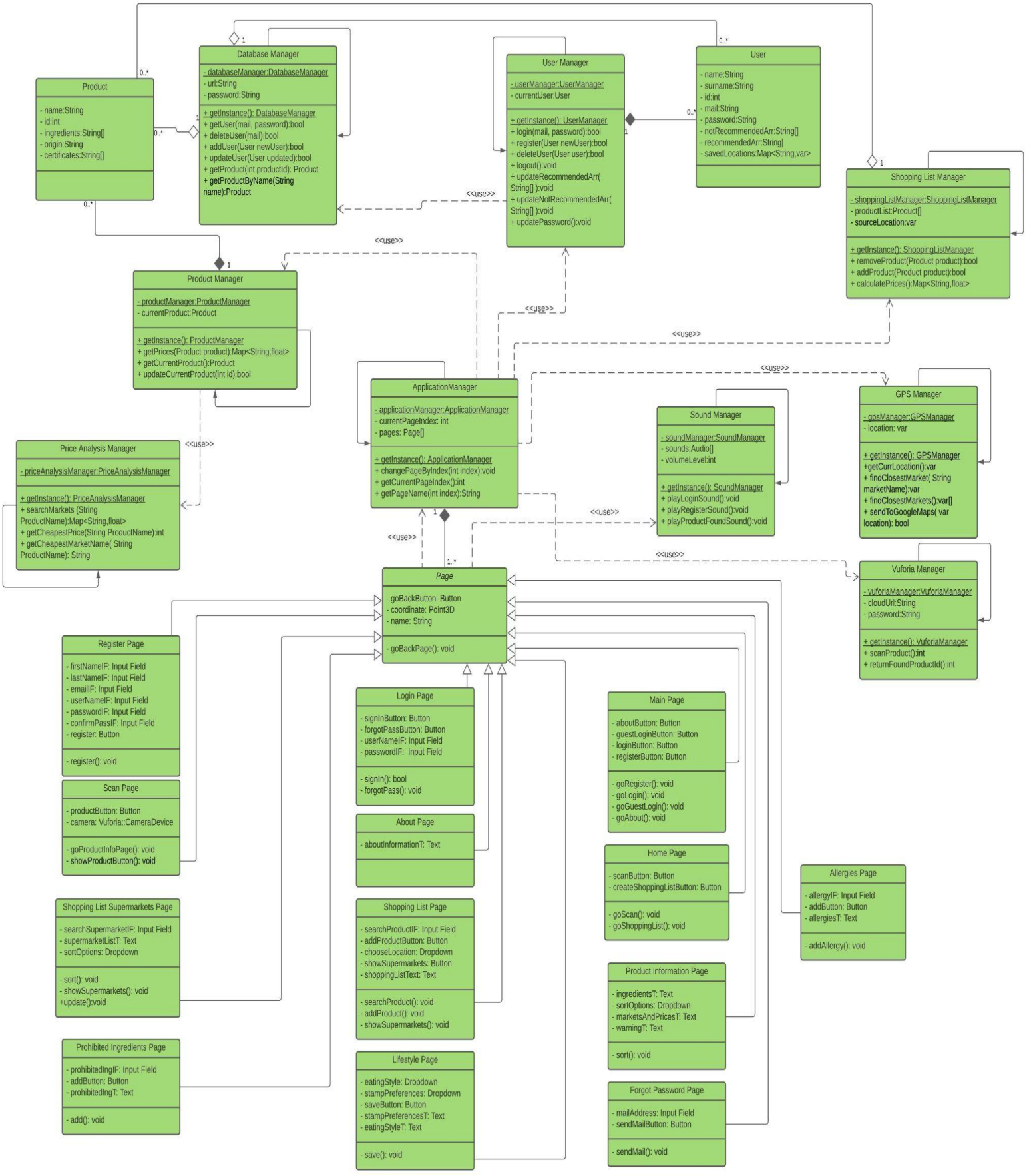
Scenario 15	
Use Case Name	Add New Product
Participating Actors	User, Authentication Service & Administrator
Entry Conditions	By pressing the Add New Product button from the home page, users are able to add a new product to the system if the administrator accepts.
Exit Conditions	The back button will navigate users to the home page.
Main Flow Events	Users: 1. Login to the application. 2. Press the Add New Product button. 3. Take the picture and fill out the compulsory information about the product. 4. If the administrator accepts that product it would be added into the system. 5. Click the back button and they are navigated to the home

3.5.2 Use Case Model



3.5.2.1. GoodBuy Use Case Model

3.5.3 Object and Class Model



3.5.3.1. GoodBuy Object and Class Model

3.5.3.1 Explanation of Object And Class Model

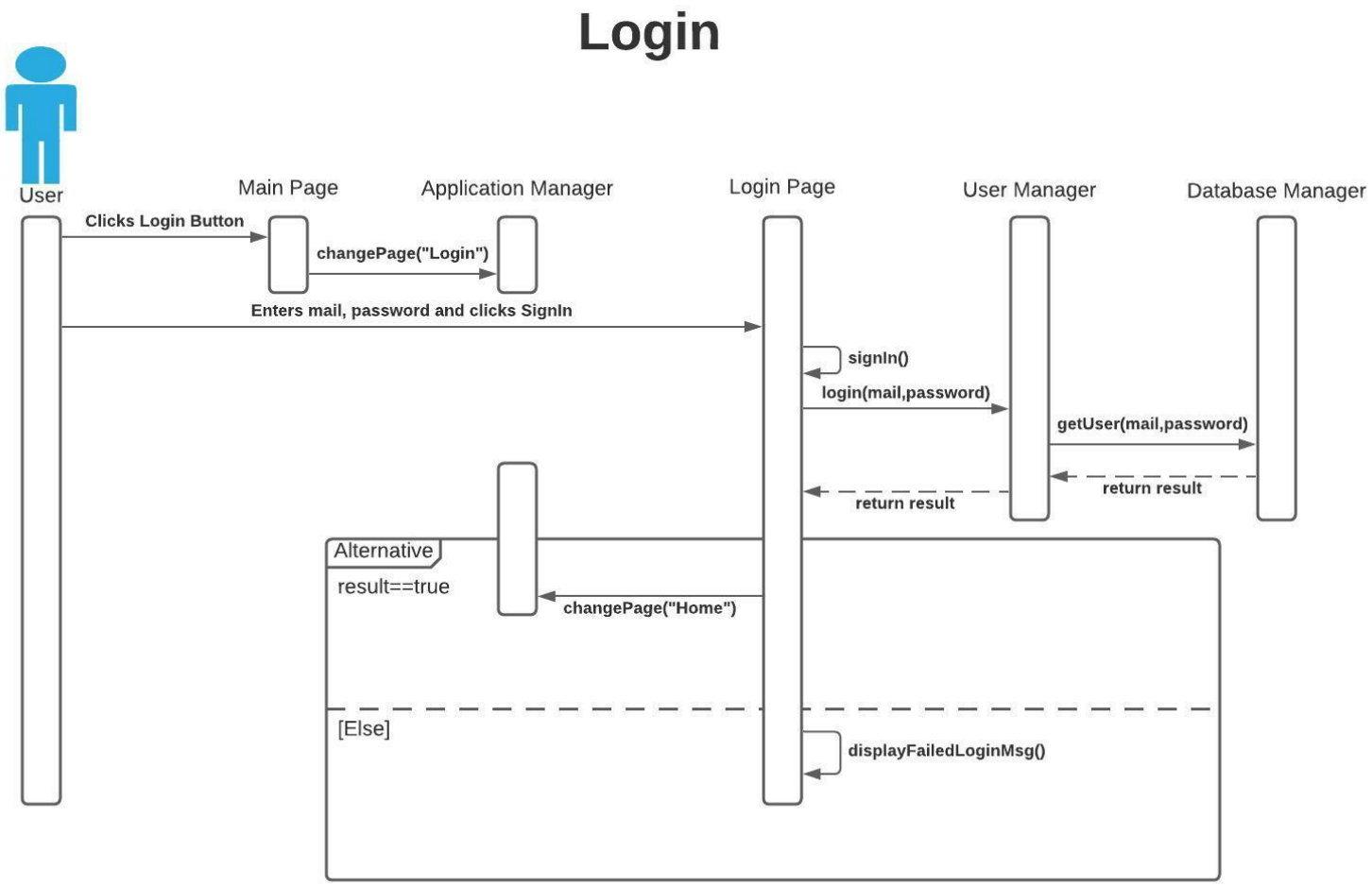
- **Application Manager:** Application manager is working as a wrapper class that arranges and controls initializations and other manager classes. On the other hand, it manages the Unity camera and controls page transitions.
- **Sound Manager:** Sound manager controls sounds and sound effects on actions.
- Vuforia Manager: Vuforia manager controls the processes of communication with Vuforia cloud and login procedures.
- **GPS Manager:** GPS manager handles finding closest markets by getting location of user and connects our application with Google Map.
- **User Manager:** User manager handles user information, login, register, recommended list arrays.
- **User:** This class keeps track of user information.
- **Database Manager:** Database manager controls connection with our database and handles database needed processes.
- **Product:** This class keeps track of product information.
- **Product Manager:** This manager keeps track of prices of the products and controls product information.
- **Price Analysis Manager:** This manager controls prices of the products on other markets.
- **Page:** It is an abstract class that includes button for go back, coordinate of pages in 3D plane and name.
- **Register Page:** This class keeps necessary UI elements and methods for registration page.
- **Scan Page:** This class keeps necessary UI elements and methods for scan product page.
- **Shopping Cart Supermarkets Page:** This class keeps necessary UI elements and methods for shopping list supermarkets page.
- **Prohibited Ingredients Page:** This class keeps necessary UI elements and methods for prohibited ingredients page.
- **Login Page:** This class keeps necessary UI elements and methods for login page.
- **About Page:** This class keeps necessary UI elements for about page.
- **Shopping Cart Page:** This class keeps necessary UI elements and methods for create shopping cart page.
- **Lifestyle Page:** This class keeps necessary UI elements and methods for lifestyle page.
- **Main Page:** This class keeps necessary UI elements and methods for main page.

- **Home Page:** This class keeps necessary UI elements and methods for home page.
- **Product Information Page:** This class keeps necessary UI elements and methods for product information page.
- **Forgot Password Page:** This class keeps necessary UI elements and methods for forgot password page.
- **Allergies Page:** This class keeps necessary UI elements and methods for allergies page.

3.5.4 Dynamic Models

Login

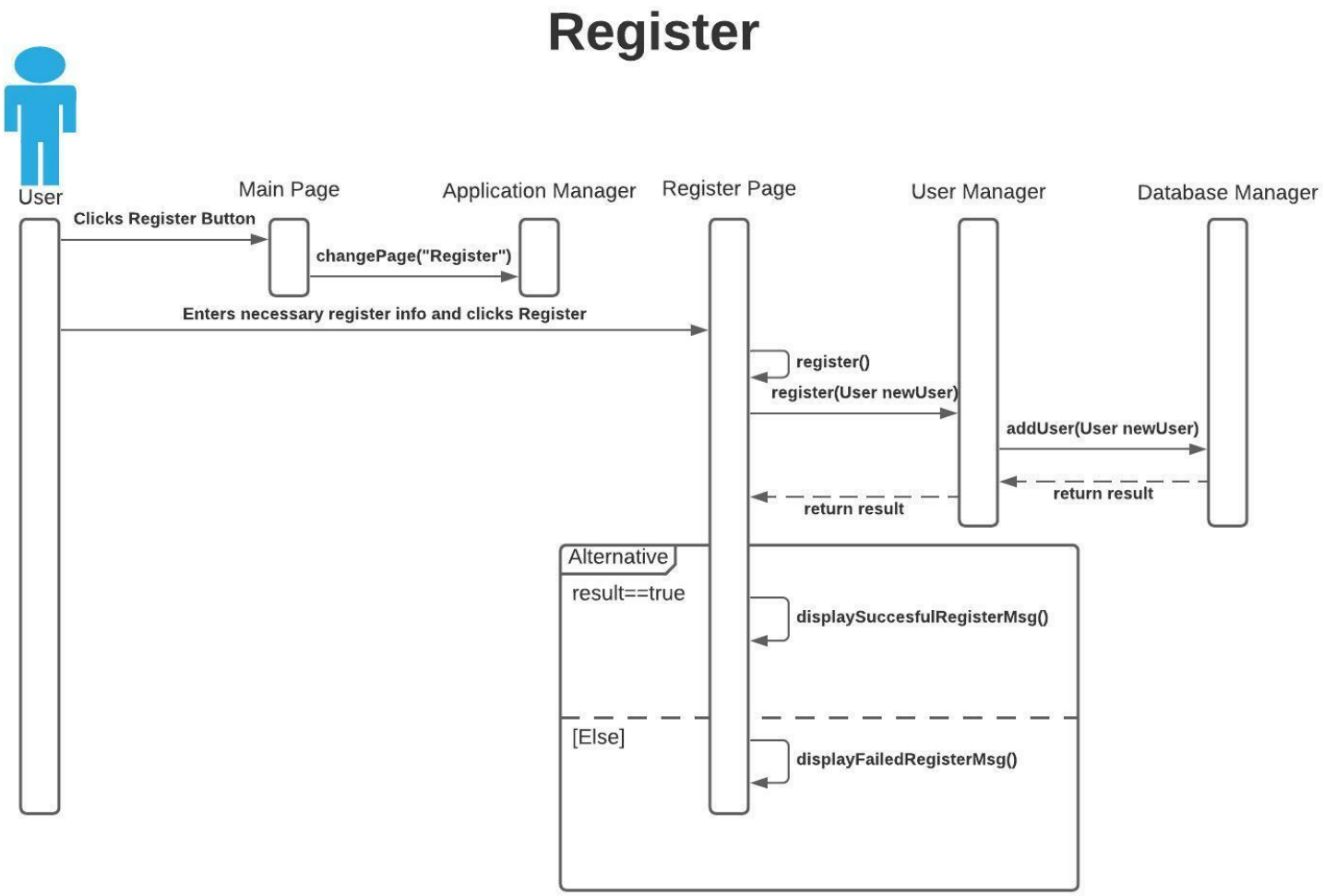
This sequence diagram shows the interaction between various objects when a user tries to login to the application.



3.5.4.1. GoodBuy Login Sequence Diagram

Register

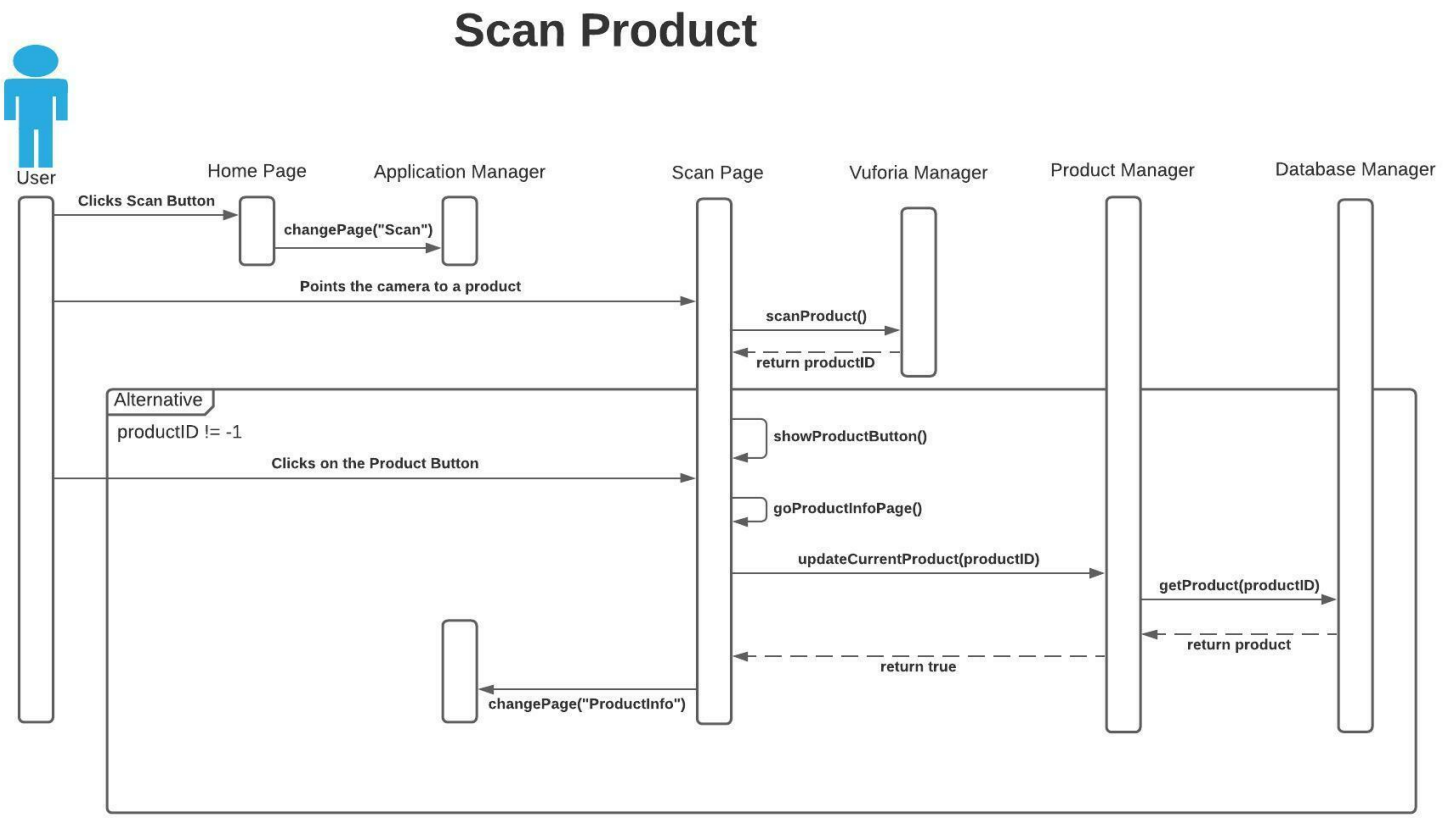
This sequence diagram shows the interaction between various objects when a user tries to register to the application.



3.5.4.2. GoodBuy Register Sequence Diagram

Scan product

This sequence diagram shows the interaction between various objects when a user tries to scan a product using his/her device's camera.



3.5.4.3. GoodBuy Scan Sequence Diagram

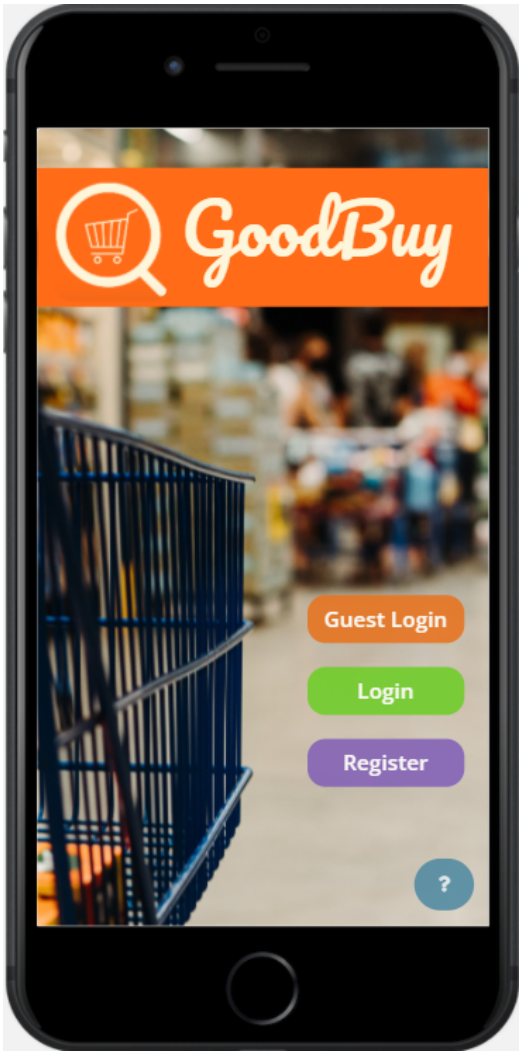
Create Shopping List

This sequence diagram shows the interaction between various objects when a user tries to create a shopping list from the application. In this scenario the user specifies where he/she is as the current location provided by the GPS module of his/her device.

3.5.4.4. GoodBuy Shopping List Sequence Diagram

3.5.5 User Interface - Navigational Paths and Screen Mock-ups

3.5.5.1. GoodBuy Main Page

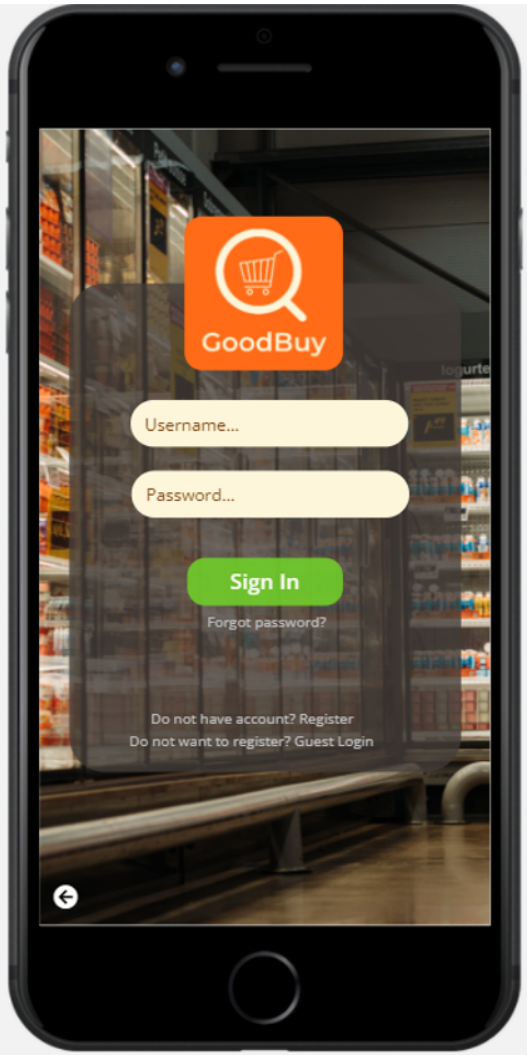


3.5.5.1.1. GoodBuy Main Page

When the user opens the application, he first reaches the main page above. If the user wants to log in to the system without being a member, he can log in by clicking the orange "Guest Login" button at the top. By clicking the green "Login" button under this button, users who are members of the system are directed to the member login page. If the user is not a member of the system, they can reach the registration page by clicking the "Register" button

at the bottom to become a member. They can access detailed information about the system by clicking the question mark button in the lower right corner.

3.5.5.2. GoodBuy Login Page

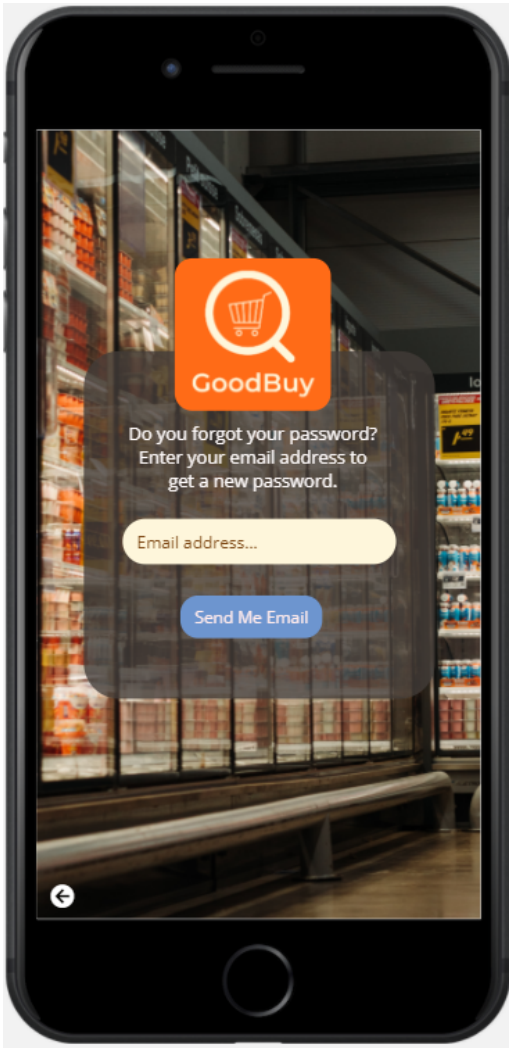


3.5.5.2.1 GoodBuy Login Page

Users who are members of the system can start using the application by entering their username and password in the corresponding sections, then clicking the green "Sign In" button. If users have forgotten their passwords, the "Forgot password?" button under the button. By clicking on the button, they will be directed to the page where they will receive a new password. If users do not have accounts in the system and they want to register, they are directed to the registration page by clicking on the "Do not have account? Register" section at the bottom. If they want to log in to the system without being a member, they can

click on "Do not want to register? Guest Login". You can return to the previous page by clicking the back button in the lower left corner.

3.5.5.3. GoodBuy Forgot Password Page



3.5.5.3.1 GoodBuy Forgot Password Page

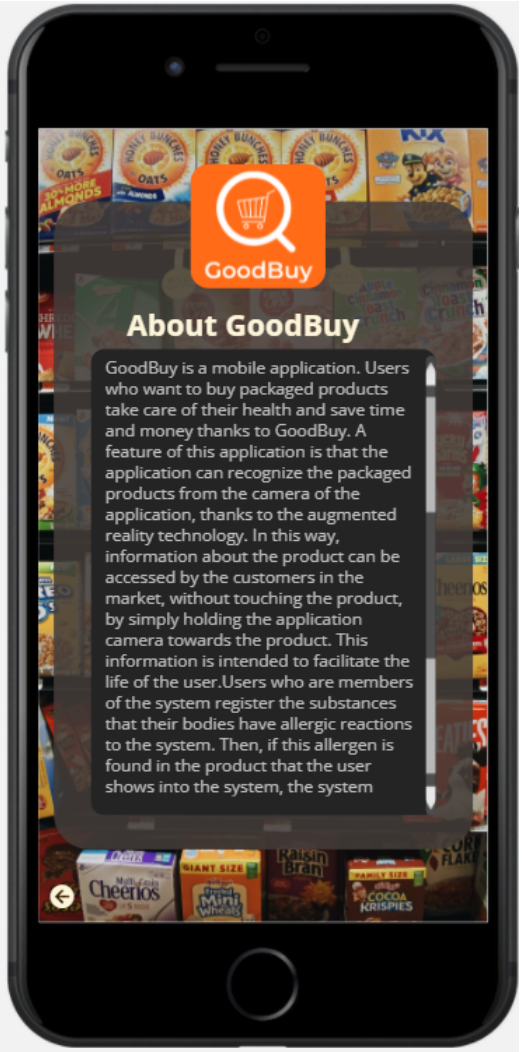
User can get a new password via email when he writes his email from the corresponding section. By clicking the “Send Me Email” button he can get an email about this problem. He can return to the previous page by clicking the back button in the lower left corner.

3.5.5.4. GoodBuy Registration Page

3.5.5.4.1 GoodBuy Registration Page

After filling in the first name, last name, email address, username, password and password confirmation sections to become a member of the system, the user can become a member of the system by clicking the purple "Register" button below. If there is an account in the system, click on "Do you have an account? Login" and you will be directed to the login page. If he wants to log in to the system without being a member, he can log in to the system without being a member by clicking "Do not want to register? Guest Login". You can return to the previous page by clicking the back button in the lower left corner.

3.5.5.5. GoodBuy Detailed Information Page



3.5.5.5.1 GoodBuy Detailed Information Page

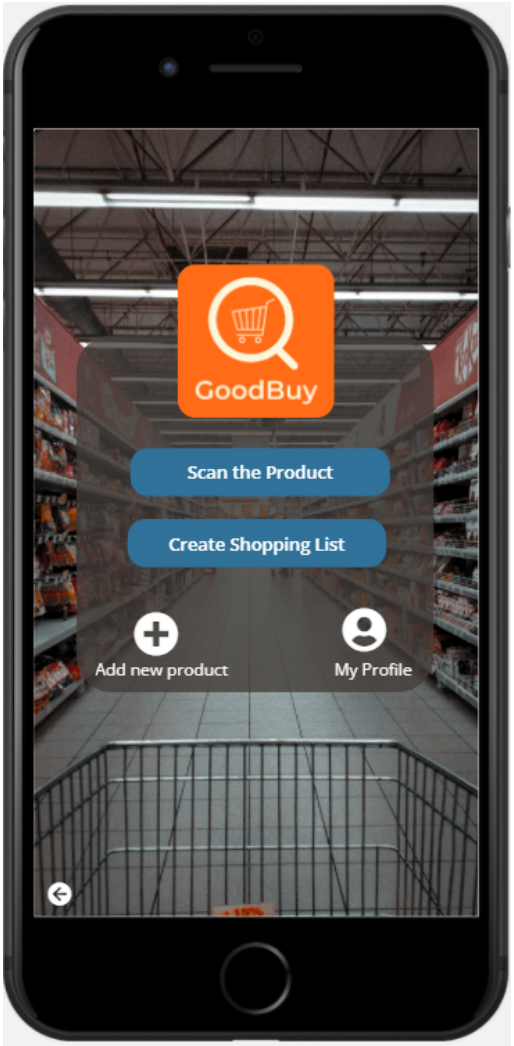
You can get the detailed information about the GoodBuy system from this page.You can return to the previous page by clicking the back button in the lower left corner.

3.5.5.6. GoodBuy Guest User Page

3.5.5.6.1 GoodBuy Guest User Page

When the user logs into the system without being a member, he encounters this page. You can scan a product in the market by clicking the "Scan the Product" button at the top. By clicking on the "Create Shopping List" button under this button, you can start creating your shopping list. You can return to the previous page by clicking the back button in the lower left corner.

3.5.5.7. GoodBuy User Page



3.5.5.7.1 GoodBuy User Page

When the member of the system logs in, he encounters this page. You can scan a product in the market by clicking the "Scan the Product" button at the top. By clicking on the "Create Shopping List" button under this button, you can start creating your shopping list. You can go to your profile page by clicking the “My Profile” button. You can add a new product to the system by clicking the “Add new product” button. You can return to the previous page by clicking the back button in the lower left corner.

3.5.5.8. GoodBuy Scan Page

3.5.5.8.1 GoodBuy Scan Page

Users can scan the product via the page above.They can access the details page about the product by clicking the green “Show Details” button in the right bottom corner. They can return to the previous page by clicking the back button in the lower left corner.

3.5.5.9. GoodBuy Product Details Page

3.5.5.9.1 GoodBuy Product Details Page

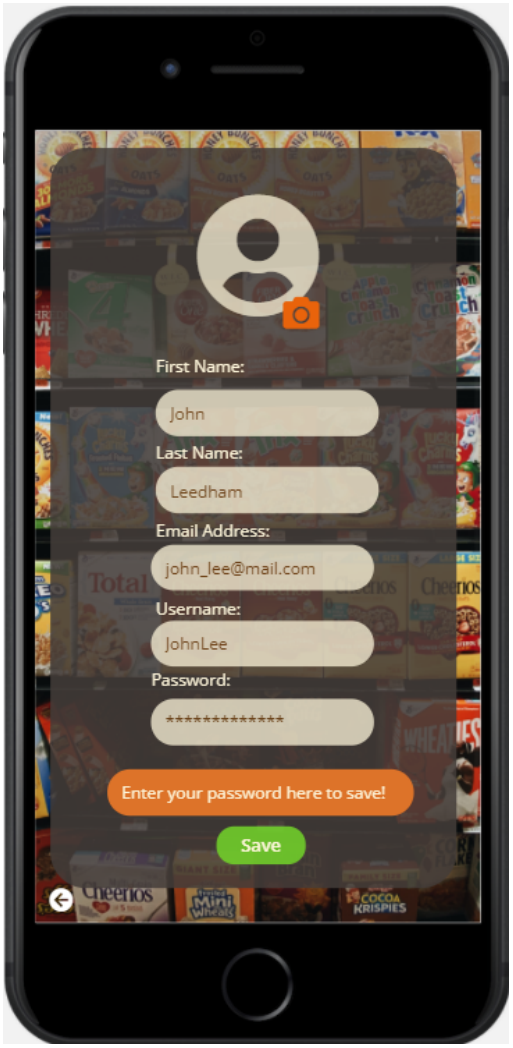
When the user wants to see the details of the product after scanning the product from the system, he is directed to this page. Here you can find detailed information about the product. The prices of the product in other markets can also be reached. You can sort by price and location. The location information of the markets can be accessed by clicking the "Show Locations" button. If the user is a member of the system, warnings may occur on the product according to the warnings determined by the user. The user can return to the previous page by clicking the back button in the lower left corner.

3.5.5.10. GoodBuy User Profile Page

3.5.5.10.1 GoodBuy User Profile Page

User profile page is as above. A profile picture can be added by clicking the camera icon. The profile can be edited by clicking the "Edit Profile" button. By clicking on the "Allergies" button, the user can enter their allergies into the system. By clicking on the "Prohibited Ingredients" button, the user can be directed to the page where he/she will enter the products that he/she does not want to be included in the packaged product. By clicking on the "Life Style" button, the user can reach the page where he/she will specify his/her lifestyle.The user can return to the previous page by clicking the back button in the lower left corner.

3.5.5.11. GoodBuy Update Profile Page



3.5.5.11.1 GoodBuy Update Profile Page

User update profile page is as above. Users can change first name, last name, email address, username and password from corresponding parts. The orange "Enter your password here to save!" section, you must enter your current password. Then the profile can be updated by clicking the green "Save" button. The user can return to the previous page by clicking the back button in the lower left corner.

3.5.5.12. GoodBuy Allergies Page

3.5.5.12.1 GoodBuy Allergies Page

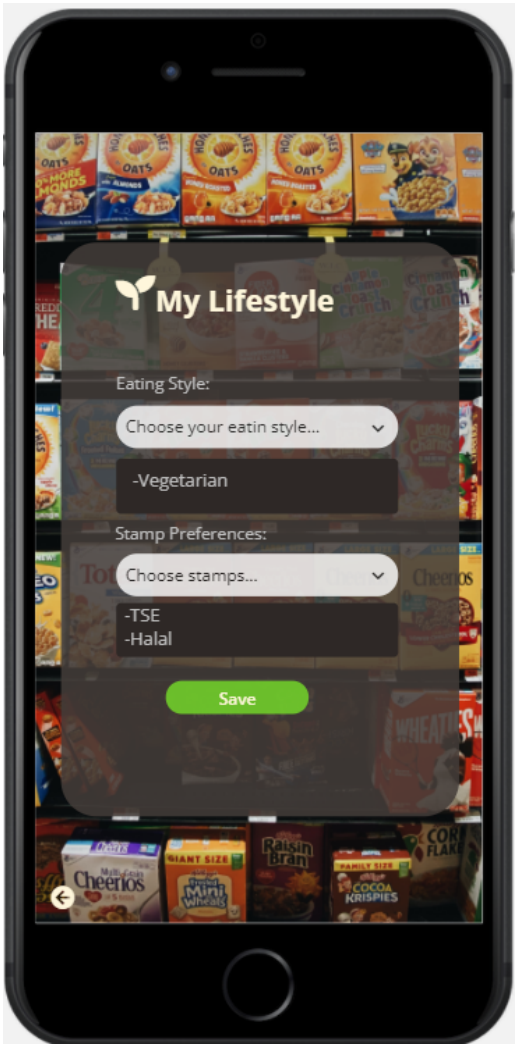
Users can enter their allergies to the system on this page and click the "Add" button to add them.The user can return to the previous page by clicking the back button in the lower left corner.

3.5.5.13. GoodBuy Prohibited Ingredients Page

3.5.5.13.1 GoodBuy Prohibited Ingredients Page

Users can enter the prohibited ingredients to the system on this page and click the "Add" button to add them.The user can return to the previous page by clicking the back button in the lower left corner.

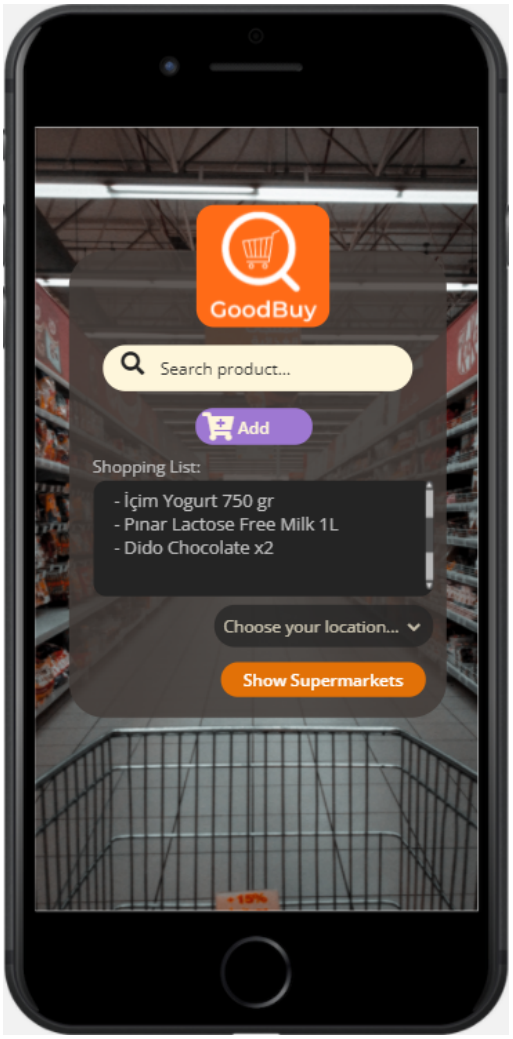
3.5.5.14. GoodBuy Lifestyle Page



3.5.5.14.1 GoodBuy LifeStyle Page

Users can enter the lifestyles to the system on this page and click the "Save" button to save them.The user can return to the previous page by clicking the back button in the lower left corner.

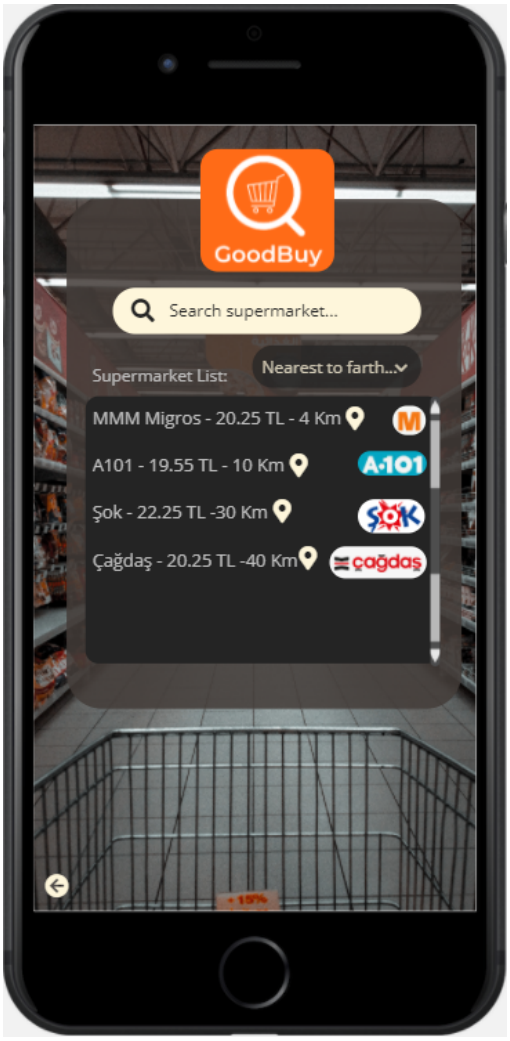
3.5.5.15. GoodBuy Create Shopping List Page



3.5.5.15.1 GoodBuy Create Shopping List Page

Users will be able to create a shopping list on the above page. You can search and add the product. Then, by selecting the location where it is located and clicking the "Show Supermarkets" button, you can be directed to the page where you will see which market these products are sold in that location and at what price.

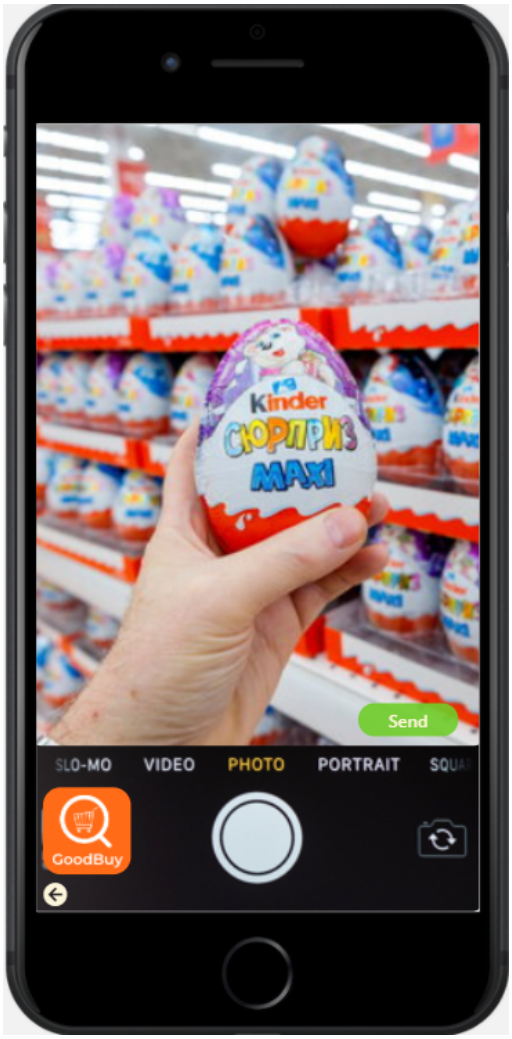
3.5.5.16. GoodBuy Supermarket List Page



3.5.5.16.1 GoodBuy Supermarket List Page

The page where the User will see the products in the shopping list sold at that location in which market and at what price is as above. The desired markets can be filtered from the Search supermarket section. In the upper right corner, rankings such as nearest to far, cheap to expensive can be made. When the location icon next to the markets is clicked, the location of those markets is shown to the user on the maps. The user can return to the previous page by clicking the back button in the lower left corner.

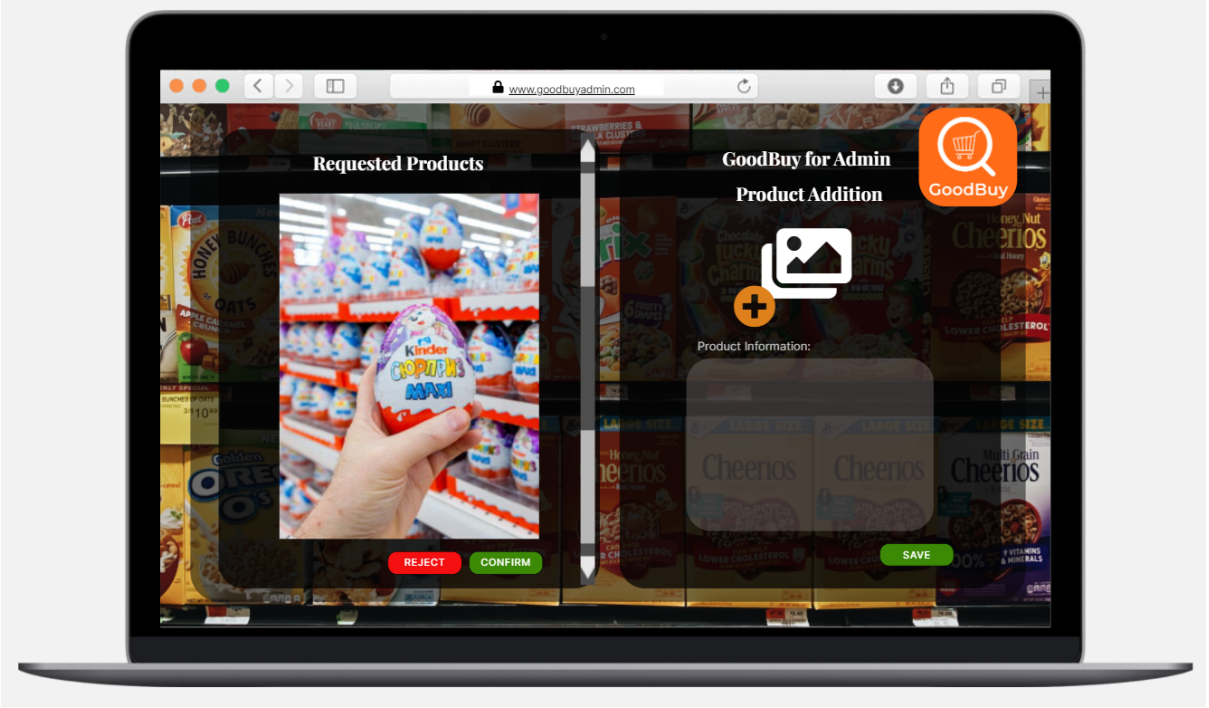
3.5.5.17. GoodBuy Add Product Page



3.5.5.17.1 GoodBuy Add Product Page

If there is no product scanned by the user in the system, the user can scan this product and send it to the site via the above page. It is enough to scan the product and press the "Send" button. The user can return to the previous page by clicking the back button in the lower left corner.

3.5.5.18. GoodBuy Admin Add Product Page



3.5.5.18.1 GoodBuy Admin Add Product Page

GoodBuy admin page is as above. The admin sees the requested products from the users on the left of the screen and can reject the request by clicking the red "Reject" button under the photo or can confirm the product by clicking the green "Confirm" button. The admin performs the process of uploading photos and entering information from the right of the screen for the product he approves and adds the product to the system by clicking the "Save" button at the bottom right.

4. Other Analysis Elements

In this part of the report, possible factors and risks that can occur in the application and development of the product will be examined.

4.1. Consideration of Various Factors in Engineering Design

Following topics are the factors that can possibly be affected by our project.

Security Concerns

Since we collect personal information from our users, the security of these data will be crucial. We will be following most accepted regulations such as GDPR so that users can trust the product. In addition, we use the GPS data of the user and the supermarkets in the application. Thus, there will not be any sharing of location data of the users to the servers for the sake of best security. We will be setting the boundary of security tight so that there cannot be any leakage.

Public Health and Sustainability

We are basically developing an application where you can see the ingredients of a packaged product so this means we make it easier for users to detect the best option for them. This best option could be in terms of price and health. Presenting a better option is an example of sustainability since there will be less consumption of unwanted products. According to our estimates, in the long term, extensive use of this application will cause a positive effect on public health.

Communication and Sustainability

In our application, we will be implementing a feedback loop for the renewal and addition of products that come from the users. This will provide a sustainable environment for our continuing system. In addition, we will be adding an extra language option for the menu and context since all the tourists are our possible customers. This feature will bring a variety to the communication inside the application.

Social Factors

GoodBuy has no apparent factor on gender, age, weight, height or race. Our application can be used by any individual of society.

4.2. Risks and Alternatives

In this part, we will be discussing possible risks and alternative routes.

Working as a Team

We are prepared for any issues that can cause a team member to not contribute. This cause can be a health issue which is pretty common these days because of pandemic. As a precaution for any situation like this, we implement and develop every part and ideas as a group where no one misses any detail. Because, absence of a teammate can be resolved if no one is indispensable in the group.

Server Cost

User data and product recognition system will require servers for each. These servers come up with a cost that should not exceed the planned budget. Alternatively, we will be choosing free server options with lesser performances.

AR System Failure

We have planned to scan the packaged products with a product recognition system that uses AR technology. If the implementation cannot catch the expectations, we may switch to a different recognition system that uses barcode scans.

4.3. Project Plan

Objectives	**Moderator**	**Contributors**
Discussions	Turan	Ömer, Güneş, Pelin, Radman
Reports	Pelin	Güneş, Ömer, Turan, Radman
Application Implementation	Güneş	Ömer, Turan, Pelin, Radman

AR Implementation	Turan	Ömer, Güneş, Pelin, Radman
Database Management	Ömer	Turan, Güneş, Pelin, Radman
User Interface	Pelin	Ömer, Güneş, Turan, Radman
GPS implementation	Radman	Turan, Ömer, Güneş, Pelin

4.4. Ensuring Proper Teamwork

In our project group, we all are skilled students and every one of us has a strong side. Thus, our project plan in terms of roles is basic, we all are contributors. If it is necessary to identify a leader, Turan has the most experience on the product recognition system so he is the moderator of the meetings and discussions. In the implementation part, since Güneş has the most experience on Unity, he will be the leader at that part of the development. All of the implementation stages will be tracked on GitHub repository.

4.5. Ethics and Professional Responsibilities

GoodBuy is a free to download mobile application that does not discriminate against any ethnic group or any individual with any kinds of difference. This application can be used by anyone who respects others' privacy rights. Any sort of violation of a user's privacy will be investigated and reported to the competent authorities.

As product developer and manager, we guarantee the safety of personal information of the users. Moreover, any sort of personal information will not be published to third party institutions and organizations. In case of any violation, the perpetrator of the incident will be identified and necessary sanctions will be made. Precaution will be taken against possible future situations.

4.6. Planning for New Knowledge and Learning Strategies

In the process of developing GoodBuy there are some technologies that should be learned.

- C#
- Unity
- Mobile App development
- Vuforia Engine/Server
- Firebase

All members will be at least familiar with the concepts of each of these technologies. All of the above can be learned from their own ‘documents’ part of their websites. In addition, exercising with the tools and learning from more experienced team members will be other learning methods.

5. Glossary

AR: Augmented Reality
App: Application
GDPR: General Data Protection Regulation
GPS: Global Positioning System

6. References

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[6] "Uizard", *Uizard.io*, 2021. [Online]. Available: https://uizard.io/. [Accessed: 14- Nov- 2021].