SOFTWARE REQUIREMENTS SPECIFICATION

for

ALLERGY TRACKING APP

Version 1.3

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Contents

Version	**Date**	**Corrections**
1.1	19/05/2023	Added more detailed description of non-functional requirements Added propositions on app design decisions; Added versions table; Reformatted requirements section with a table and IDs;
1.2	26/05/2023	Added Sequence diagram, Use-case diagram, Actions diagram;
1.3	28/05/2023	Added database section with database descriptions
1.4	30/05/2023	Added full Use Case section with extended description and correct diagram; Corrected formatting; Split Sequence Diagram into separated Use Cases;

1 Introduction

1.1 Purpose

The "Breath easy" is an Android and IOS app that will help people with allergies to keep track of allergens in the nearby area. The app will contain a map where users will see alerts from other people and will be aware of specific allergens.

This will be especially relevant for people with severe allergies to prepare for the possible allergens before symptoms will hit them.

1.2 Intended Audience and Reading Suggestions

"Breath easy" is for people with allergies, mainly air allergies such as pollen, dust, ticks, mites, and chemicals.

1.3 Project Scope

"Breath easy" will function as a network of people with similar allergies.

- Sign-in/sign-up options. The users will be able to sign up using different social networks and log in later to the created account. Once the user is registered, we will provide a quick-entry questionnaire on types of allergies to personalize the interface.
- There will be 3 main sections in the App: the main page with some highlighted information, a map section with a monitoring stations layer, and with users' pin-point; and the tips and articles section with some tips from experts.
- Users will be able to view all sections, fill in everyday questionnaires and submit alerts.
- We also employ Health-tracking devices and app support that will be an additional source of health parameters and will be used for making alert suggestions.

1.4 Acronyms

1. UI - User Interface
2. OS - Operating System

3. HTA - Health Tracking Apps
4. App - a smartphone application "Breathe Easy"

2 General Description

2.1 Product Perspective

"Breathe easy" is a more dynamic way of monitoring coming waves of allergens in densely populated areas. Previously, the only source of information was very poorly organized websites of the local monitoring stations, but with our app, all information will be derived automatically and will be presented in the user-friendly format on the map. We also introduce a brand-new feature with user-to-user information sharing by submitting alerts.

2.2 Product Functions

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2.3 User Classes and Characteristics

Overall, "Breathe Easy" has three types of users:

- Allergic user - user that has viewer permissions as well as alert-submitting permission
- Expert - have all allergic user permissions and options, plus can submit an expert article
- Developer, database coordinator, support team - their role is to maintain the functionalities of the app, provide quick responses to user inquiries, and maintain the database integrity of the map interface

INSERT CLASS DIAGRAM

2.4 General Restrictions

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2.5 Assumptions and Dependencies

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2.6 Use cases

In the App, we will have many different Use cases. First of all, the actors in the scheme will be 1) normal Users 2) Experts that load articles, and 3) External Providers. Users will interact with the system by submitting quizzes, viewing different sections, and submitting and receiving alerts. External providers will include Monitoring Stations (via **Stations_data**, see Databases 2.7 section), Health Accessories, and Health Tracking Apps. The system will send requests to the External Providers to get the needed information.

You can find a list of all Use Cases as well as a Use Case diagram (see Figure 2.1) below.

Use Cases			
ID	**Name**	**Actors**	**Description**
UC-1	Receive a User Alert	User App (Notifications Receiver)	User receives an Alert submitted by another user. User gets Alerts only related to his/her allergens listed in the User Profile.
UC-2	Receive a Station Alert	User App (Notifications Receiver)	User receives an Alert from the Monitoring Station if the signal is higher than X, where X is a predefined intensity threshold. User gets Alerts only related to his/her allergens listed in the User Profile.
UC-3	Receive a Quiz suggestion based on Health Metrics	User App (Notifications Receiver)	User receives a suggestion to fill in the Quiz and submit an Alert if Health Metrix shows abnormal values.
UC-4	Receive a daily notification to fill in the Daily Quiz	User App (Notifications Receiver)	Every day User receives a notification suggesting to complete the Daily Quiz. User can turn this option off in the Settings-Profile section.
UC-5	View the Profile page	User App (Static Viewer)	User should be able to view his/her profile page with User information.
UC-6	View the Map	User App (Static Viewer)	User should be able to view the Map section, containing the physical map and two layers of alerts: from stations and from users. User should be able to zoom in/out the Map and move along the map. User should be able to view more detailed alert information by clicking on the corresponding Alert symbol.
UC-7	View the Articles section	User App (Static Viewer)	User should be able to view the Articles section: scroll-down list with nested articles pages.
UC-8	View the Main page	User App (Static Viewer)	Once logged in,User should be able to see the Main page with information of weather conditions and Allergens status based on the nearby station.
UC-9	Registration	User App (Submitting)	If the User does not have an existing account, he should be able to create new account via registering with email, Google Account, or Facebook account.
UC-10	Log in using email	User App (Submitting)	If the User already have an account he/she should be able to log in using the email saved in the profile and the corresponding password.
UC-11	Restore the password	User App (Submitting)	If User has forgotten the password it can be restored by sending an email with instructions to the User's email.
UC-12	Log in using Facebook profile	User App (Submitting)	Alternatively, if the user has an account linked to social media, he/she can log in faster via a social network (Facebook) account.
UC-13	Fill Daily Quiz "How are you feeling?"	User App (Submitting)	User should be able to fill in the Daily Quiz in the app. The data should be stored in the corresponding Database. Based on this Quiz user might be suggested to submit an Alert.
UC-14	Fill Welcome Quiz	User App (Submitting)	Right after successful registration, user should be able to fill in Welcome test that find out more details on the User's allergic reactions and allergens.

UC-15	Search articles	User App (Submitting)	User should be able to: sort articles based on the date, search by title and select articles by keywords.
UC-16	Accept entry permissions	User App (Submitting)	Once the App is installed, App will ask for permissions to use location, notifications, and health metrics data from the User's smartphone.
UC-17	Pay for non-advertisement version	User App (Submitting)	User should be able to switch to the non-Ad version of the app by clicking on the button in the Profile section. It should redirect him/her to the Payment form to submit.
UC-18	Submit an article	Expert App (Submitting)	Experts should be able to add submit their articles to the corresponding form for further edition and verification.
UC-19	Request data from Monitoring Stations	External Providers App (Submitting)	App will ask for data to view on the Map page. The Data for Monitoring Stations shall be derived from the corresponding database and be personalized based on the User allergies.
UC-20	Request data from User Alerts	External Providers App (Submitting)	App will ask for data to view on the Map page. The Data for User Alerts shall be derived from the corresponding database and be personalized based on the User allergies.
UC-21	Request health metrics	External Providers App (Submitting)	App will ask HTAs and health accessories to provide health metrics on a daily basis. The data will be stored in the corresponding database.

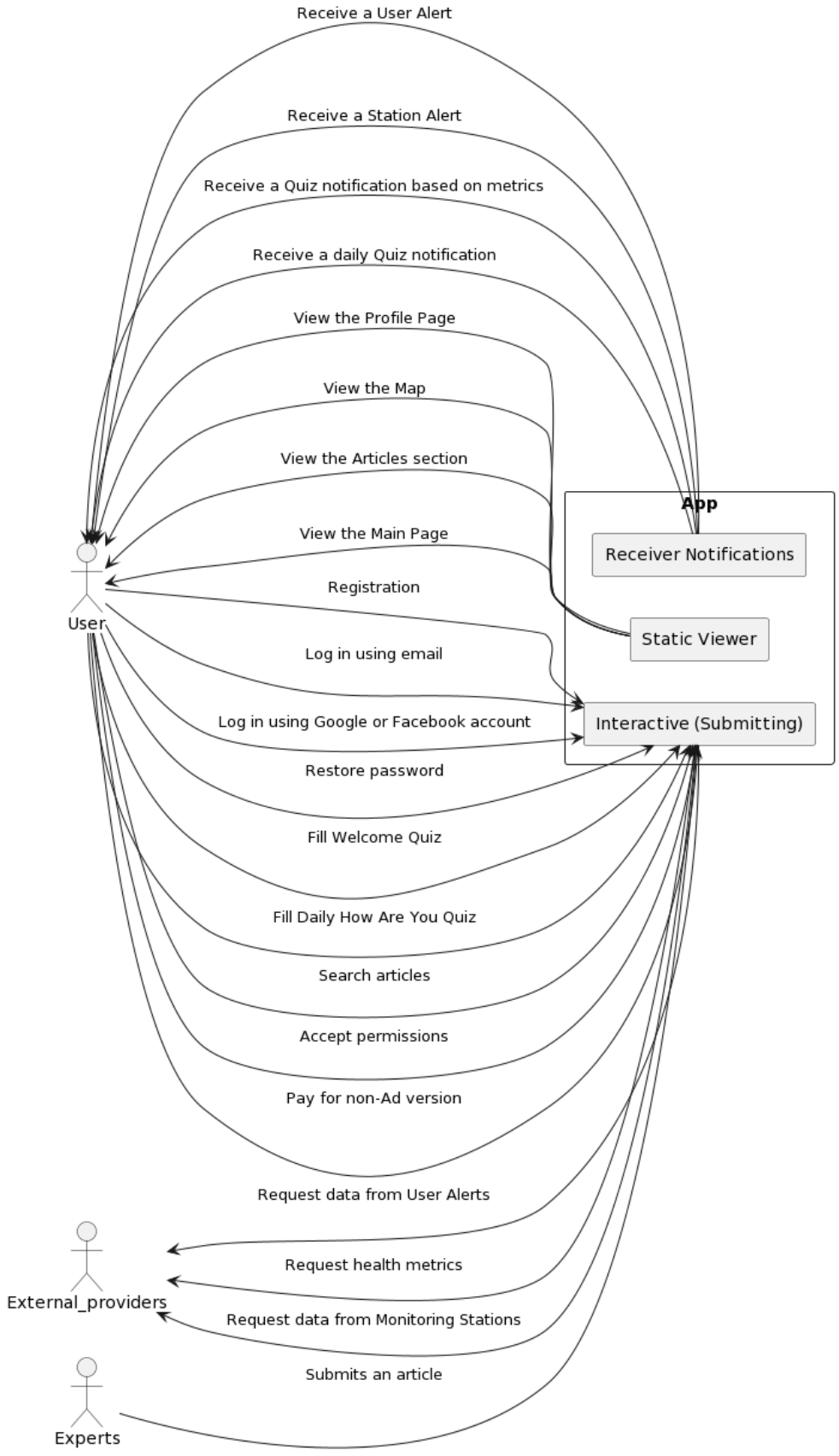

Figure 2.1: Use case diagram for "Breathe Easy."

INTRO TO SEQUENCE-ACTION DIAGRAMS

Since our application will use different sources of data, apart from user-app interactions we will implement the interactions with External Providers.

INSERT SEQUENCE-ACTION DIAGRAMS

2.7 Database

"Breathe Easy" will have big amount of data stored in the databases, that will be used to retrieve the relevant pieces of information according to the user profile and to perform analysis of health data and/or allergens data.

Overall, we will have the following tables stored in the external database:

1. **User tables.**
   User tables will store all the information about users according to the Personal Data Terms.
   The main **User_table** will have the following attributes for each user: login_parameter, user_name, first_name, last_name, user_id, email, set_of_allergens, social_network_profile (if applicable, if not - None). The user_id will be a primary key.

   Upon completing daily quizzes and health data monitoring one more table with user_id as a foreign key will be filled in. The **Daily_statistics** table will have columns such as body_temperature, time_stamp (of measurement or quiz submission), blood_pressure, heart_rate, and others.
   Thus each user will have a unique entry in the User_table and multiple records in the Daily_statistics table.

2. **Data from the Monitoring Stations.**
   Data from the Monitoring Stations will be stored in the **Stations_data** table. It will contain the following columns: record_id, time_stamp, station_id, latitude, longitude, intensity_today, intensity_tomorrow, and the allergen. The record_id will be the primary key. From each monitoring station, we will have many entries, at least one per day. Different stations can have different sets of allergens tracked, thus in the table we will have columns specifying allergens and the intensity of the signal for each of the allergens tracked in the current station.

3. **User-provided alerts.**
   This table, **User_alerts** will be organized in a similar way as the previous table and will have record_id (primary key), time_stamp, latitude, longitude, allergen, user_id (foreign key), and user_comment. Here, each user can have multiple alerts posted for different allergies of with "unspecified" in the "allergen" field.

2.8 Operating Environment

The App will be operating on two main platforms, operating systems: Android and IOS.

3 Requirements Specification

"Breathe Easy" is a smartphone app with an external database and regular updates from allergen monitoring stations. The main functionality consists of user interaction with the map, view of other sections, and interactive recommendation and notification systems that altogether form a user-friendly app interface.

There are several requirements related to the external interfaces such as hardware and software. The app will interact with several external databases to infer the set of map points, predictions, and alerts from the user. There are also some health-related apps we want "Breathe Easy" to interact with. Apart from software, we want our app to interact with SmartWatch (Apple Watch, Samsung Watch, etc.).

3.1 Business Requirements

should be from the point of view of the sponsor, business objectives The software shall provide user management functionality, allowing administrators to create and manage user accounts with different roles and permissions. Additionally, we...

3.2 System Requirements

TODO: add unexpected behavior Table of contents for the System Requirements:

Non-functional requirements			Functional requirements	
ID	**Type**	**Name**	**ID**	**Name**
NFR-1	Performance	Memory size	*FR-1*	Health metrics alert
NFR-2	Performance	Server (processor) capacity	*FR-2*	Forecast alert
NFR-3	Performance	Database update frequency	*FR-2*	User alert
NFR-4	Design [constrains]	Platforms	*FR-3*	Registration
NFR-5	Design [objectives]	Maintenance	*FR-4*	Welcome quiz
NFR-6	Design [decisions]	OS-specific	*FR-5*	Daily quiz
NFR-7	Design [decisions]	Databases	*FR-6*	Show login page
NFR-8	Design [decisions]	API	*FR-7*	Show main page
NFR-9	Design [decisions]	Cryptography	*FR-8*	Show map
NFR-10	Security	Security, access	*FR-9*	Show articles
NFR-11	External Interface	Hardware, accessories	*FR-10*	Upload articles
NFR-12	External Interface	Hardware, databases	*FR-11*	Sort articles
NFR-13	External Interface	Software, authentication	*FR-12*	Request allergens data
NFR-14	External Interface	Software, paying services	*FR-13*	User permissions
NFR-15	External Interface	Software, health tracking apps	*FR-14*	Show FAQ
NFR-16	External Interface	Software, databases access	*FR-15*	Contacts
NFR-17	External Interface	Software, permissions		

Functional requirements		
ID	**Name**	**Description**
FR-1	Health metrics-based alert	If the system recognizes abnormal metrics values received from the connected apps accessories, the user receives a notification suggesting to submit an alert.
FR-2	Forecast alert	If nearby stations show high levels of allergens identified in the user profile for tomorrow, a user gets a notification warning to be ready for the possible allergic reaction.
FR-2	User alert	User should be able to create an alert by clicking on the corresponding button on the main page. To view the next steps user has to press the "next" arrow, on the final step he should press "Submit an alert" button. 1) Once the button is pressed, user should be redirected to the page with a zoomable map with a pin with the current location. User can change the location of the pin by holding it and dragging it to the new location. 2) On the next page he/she will be suggested to choose allergens of select "Not sure" if he/she does not know exactly which to allergen he/she got the reaction. 3) Next page will contain symptoms that user can select from and a text box for user comments (<50 characters). User can then finish the procedure by clicking the "Submit an alert" button and should be redirected to the Map section with zoom on the created alert.
FR-3	Registration of the new user	Once user logged in using either email or social network, he/she should be redirected to the user profile page, where he has to specify the following details: 1) username that will be shown to other users: alphanumeric string from 4 to 8 characters 2) password to login using an email: alphanumeric string from 4 to 10 characters 3) date of birth 4) email should be automatically added if a person logged in using an email, if not it should be retrieved from the social network details 5) profile picture: user can choose a profile picture from some suggested options
FR-4	Welcome quiz	Once a new account has been registered, a user should fill in the Welcome quiz with questions on his allergens, general condition, and how often he/she has severe allergic reactions and other questions.
FR-5	Daily quiz	If a user enters the app first time for the day, he/she gets a pop-up window with daily "How are you feeling?" test. If he/she chooses that he/she feels bad, the system suggests creating an alert.

FR-6	Show login page	Once a user opens the app, the login page should appear. It should look like the orange background with a logo and write text boxes. In the middle, there will be a box for the nickname/email/buttons of Google and Facebook. Lower, there should be a box for password. Below these boxes, there should be links "Forgot the password", "Sign up as a new user". 1. If person writes correct information in both fields or logs in using social network (into already existing account), he/she should enter the main page. If either of fields fail, system erases info from text boxes and shows warning. 2. If person fails to enter correct credentials for 3 times, new warning should appear suggesting to click "Forgot the password". 3. If person clicks "Forgot the password", he should be redirected to the page with only text box for email. 3.1 If entered email exist, system should send the link for updating password to the entered email/ 3.2 If the email does not exist, system gives a warning with suggestion to register as a new user. 4. If user clicks on "Sign up as a new user", system redirects he/she to the register page, where he has to input information as indicated in FR-3.
FR-7	Show main page	On the main page user shall see the following information: 1) today's and tomorrow's weather (temperature, humidity, wind, rain/no rain) - shall be retrieved from the Google Weather 2) intensity of the allergens, specified in his/her profile, for today and tomorrow from the closest station to user location 3) featured article of the day 4) Button to submit a user alert (FR-2) 5) link to the profile section 6) link to FAQ
FR-8	Show map	User should be able to view the map section which will contain the interactive map with two layers, that can be activated or deactivated. 1. The first layer, stations, shall contain the information from the allergy stations about yesterday, today, and tomorrow's prognosis. Information from stations will look like a pinpoint on the map with a color corresponding to the intensity of the signal from the station (from green to red). User can click on the pinpoint to view full information of the alert containing: a) intensity of allergens on the 10-scale for each allergen specified in his profile for yesterday, today, and the prognosis for tomorrow b) special comments from the station if applicable 2. The second layer should contain the other users' alerts for the allergens specified in the user profile. They will look like exclamation marks on the map and will contain the following information: a) name of allergen/allergens b) date and time of the alert c) nickname of the user who submitted it d) user's comments on symptoms The map should be centered according to the user's location.
FR-9	Show articles	Users should be able to view the articles section, will all corresponding materials and pictures. The articles section will contain the Name of the article, Keywords, and a one-sentence description. The section should be organized as a list to scroll, containing hyperlinks to articles' pages. Once a user opens the article page, the return button should appear at the top.

FR-10	Upload articles	Experts should be able to upload their articles via the special form, so it will be sent to the redactors
FR-11	Sort articles	User should be able to sort articles according to the date published, topic or keyword
FR-12	Request allergens data	App should request new data from the database an update the table with user and station alerts on the daily basis
FR-13	User permissions	After first log in to the app user shall receive the notification with suggestion to give the app permission to: 1) access the smartphone location services 2) connect to installed health-tracking apps 3) get notifications from the app
FR-14	Show FAQ	User should be able to view the Frequently Asked Questions section of the main menu with the toggle list of main questions on data sources, app functionality and user policy
FR-15	Contacts	User should be able to contact developers with suggestions, corrections and comments on the app interface and content

Non-functional requirements		
ID	**Type** **Name**	**Description**
NFR-1	**Performance** Memory size	The server should have 200Gb memory to stop intermediate tables derived from databases and all interface-supporting elements.
NFR-2	**Performance** Server (processor) capasity	The server should work with 100000 simultaneous users and provide a response in less than two seconds.
NFR-3	**Performance** Loading speed	When the submit button of any quiz in the app is pressed the workspace should load within two seconds. When redirection to another page is required, after clicking the link, the server should take less than a second to switch to the next one.
NFR-4	**Performance** Database update frequency	Databases have to be updated each midnight with data from monitoring stations and each hour with user-alerts data.
NFR-5	**Design constrains** Platforms	The app will be only supported for the Android and IOS platforms, thus all auxiliary elements should be prepared and run properly on these two platforms.
NFR-6	**Design objectives** Maintenance	The app should be supported and be under maintenance for at least 5 years, having new versions following the software updates and new sources of information.
NFR-7	**Design decisions** OS-specific	We will have two versions of our app for two platforms: Android, written in Kotlin and/or Java; and IOS, written in Swift.
NFR-8	**Design decisions** Databases	We will have all our databases stored in the Oracle system, accessible via SQL calls with provided entry requisites (login, password).
NFR-9	Design decisions API	We will use API from National Allergy Bureau (AAAAI) to retrieve the data for the regions of North and South America, and EAN provided resources to retrieve the data for the European region. We will store this data in the Oracle database, for more detailed information on the database structure, please, refer to the Databases section. We will retrieve information from the Database, Alerts, and Stations tables on a daily basis to display in the App interface. We will also update information from the Alerts table each hour, so users will be updated.
NFR-10	Design decisions Cryptography	Encryption is the process of encoding all user data on a device using symmetric encryption keys. Once a device is encrypted, all user-created data is automatically encrypted before committing it to disk and all reads automatically decrypt data before returning it to the calling process.
NFR-11	Security Security, access	In order to access the app and perform all possible actions users have to be registered in the app. We will also use an API to access the public or private databases. First, we will maintain the Oracle database with data from monitoring stations which will have two modes of access, both only for users-developers with special login and password data. The first group of users will be developers-editors, who will be allowed to edit the database (by some software), and developer-retriever with only view-retrieve permissions. All users' data will be stored in the database which only developers can access.

NFR-12	External Interface Hardware, accessories	External providers will contain: 1) Health Apps (Samsung Health, Apple Health, Google Fit, or any other app identified by OS as health tracking) 2) Health and Sports Accessories (Apple Watch, Samsung Watch, Garmin, Suunto, and watch/pulsometers of other brands). the App should be synchronizable with these apps via internal or external interconnections. Data from these Apps should be stored in the OS-identified storage.
NFR-13	External Interface Hardware, databases	The App should be able to get the data from databases. The Databases should be stored in the Oracle Server and have default parameters along with the following specified: - processes = 150 - compatible ='12.0.0' - open_cursors=300 Access to the Database will be provided by the My SQL tools.
NFR-14	External Interface Software, authentication	The App should be able to perform authentication using Google services.
NFR-15	External Interface Software, paying services	The App should be able to connect to paid services, such as Google Pay or Apple Pay.
NFR-16	External Interface Software, health tracking apps	The App should be able to connect to paid services, such as Google Pay or Apple Pay.
NFR-17	External Interface Software, database access	The App should be able to connect to paid services, such as Google Pay or Apple Pay, or have a bank-provided payment operation system.
NFR-18	External Interface Software, permissions	Once the App is installed it should ask for the following permissions: - to send notifications - to access system-linked Health Tracking Apps - to access the location After the permissions are granted the user has access to the full functionality of the App. @ If notifications permission is rejected: warn the user that he can miss some relevant information. @ If access to HTA is not granted: warn that the user might miss an opportunity to get personalized prognosis and recommendations. @ If location access is not granted: warn the user that he can access only thelimited functionality of the App.

4 Software Quality Attributes

In the development phase also testing and conferences of users is been continued. So that the quality of the software is been maintained and all the requirements are been fulfilled.
Database, logical, and also UI test is required.