Eye Clinic Management System

Requirements Specification

Version 1.1

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Executive Summary

1.1 Project Overview

For any busy practitioner, streamlining the workflow and data management are extremely vital for smooth functioning of a business. Storing, managing, and retrieving bulky paper records is cumbersome in today's digital world. Our software suggests a way to digitalize and automate all the processes that a typical Eye Clinic manages on a day to day basis. As far as we are concerned, such solutions are still sparse in Albanian Market. The traditional way of handling work manually or via outdated programs, is still being applied in the vast majority of cases. The particular clinic that we are approaching falls into this category as well. It needs a new system that will manage its internal workflow, as well as provide faster interaction with its patients/clients.

What we are suggesting is a web-based information system that will assist in streamlining every element of this clinic. Automating key processes, increasing efficiency, and improving patient's experience are the key aspects of this product.

1.2 Purpose and Scope of this Specification

Our purpose as developers is to improve patients or clients experience and simplify operations inside this Eye Clinic. The system is able to provide the following:

1. Recordkeeping
2. Online scheduling of patients‟ appointments
3. Fast access to doctor's schedules
4. Prescriptions
5. Online ordering
6. Billing functions

2. Product/Service Description

Our software provides a way to automate all the processes that this Eye Clinic deals with on a day to day basis. With the increase in the number of customers, patients, employees and health records that need to be handled properly, it is troublesome and non-efficient to still use primitive methods to track the chain of operations of this business.

The product we are offering is intended to be used from all the parties involved in this particular business: doctors, receptionists, clients/patients etc. It is created to meet all of our stakeholders‟ requirements by following the way this clinic operates. It will provide practical solutions to the issues and requirements that our stakeholders have addressed.

2.1 Product Context

This product is independent and self-contained. Currently similar products of eye clinic management systems are being developed to benefit from the ease and convenience of having the management system in a web application. Although these products are of a bigger scale and meant for a wide publicum and usually are not affordable to many clinics.

Our product on the other hand will be designed to first and foremost meet the requirements of our current client. This product is not intended to communicate with other systems. It is intended to work within the scope of a specific clinic and its clients.

2.2 User Characteristics

This product is intended to be used from the following users:

Guest (Visitors - no login required)

Guests can come from different age groups and backgrounds. Our system serves the purpose of offering guests a simple appointment booking functionality, where they can pick an available date and time from our system. Furthermore, guests can Especially in the case of eye clinics, there can be many guests of older age groups, people with little technical expertise, people that demand a beautiful and simple User Interface in order to use the system etc. For these groups, our adaptive strategy is to carefully design the User Interface. (more covered on 3.2.1)

Patient

Patients are guests that show up for an appointment with a doctor at the clinic. They are then registered as patients by the receptionist, especially if the doctor prescribes treatments to the person. They can

come from different age groups and backgrounds. The E-Card for patients can be accessed from anywhere, as long as there is access to a web browser. This system should be easily adopted by younger age groups. In the case of older ages that do not like this or skeptics in general, our adaptive strategy is to make the creation of such an online E-Card optional. Nevertheless, health records will still get recorded in the system to ensure safety and backup of the documentations.
Possibly in the future they could want to use this service.

Doctor

Doctors in eye clinics are usually of the following backgrounds, but not limited to: ophthalmologists, surgeons and anesthesiologists. They are the most important people in the clinics, are highly educated and can adapt to new technologies easily. They are at the same time the busiest. Our system will provide them with the basic functionalities that they might need during their job and not overload them with options. The functionalities available to them must also be such that they are part of an industry standard.

Receptionist

Receptionists usually come from the IT background. If not, they have to be proficient with computers in order to do their job well. Receptionists have the responsibility to wait for customers and help them with their needs. In case that a customer is going to be examined, the receptionist creates a profile for him in the database registering him as a patient. Our system is meant to help receptionists do these tasks faster and in a safer way, guaranteeing a safe online repository for the documents or schedules. Our adaptive strategy for the receptionists includes frequent meetings with them in order to ask questions as to what services they are looking for in a management system. This should ensure that our product adapts as it grows with the receptionists needs.

Admin

Admin is a superuser that has available all the functionalities of other users combined, together with some extra functionality. Admins are from the IT department. One of the job responsibilities of admins is helping other employees of the clinic when uncertainties with the system arise. Other job responsibilities are taking care of the database, taking care of the infrastructure. They have access to the admin dashboard online from a web browser. This way, they can access the system from their offices that might not be located inside the clinic, so it would spare them a lot of commute time.

Economist

Economists come from an educated background too and their day to day activities nowadays are closely related with computers. They always have access to a PC at work and of course, a web browser. Job responsibilities include bookkeeping i.e. keeping track of employee salaries, transactions, due payments etc. Other job responsibilities might include accounting, financial accounting etc. Economists might need to use our management system in order to have a dashboard related to bookkeeping and possibly other tasks, like creating graphs for analytics purposes.

2.3 Assumptions

1. This system requires a stable internet connection, otherwise it will be unavailable. It is assumed that each user will have access to the system by connecting via a computer/tablet/mobile device.
2. The software will be available in English and no other language for the moment. The users of the system are assumed to have at least some limited working proficiency in English.
3. It is assumed that the employees of this clinic have basic computer skills. No training needs to be done in order for them to learn how to use the system.
4. It is assumed that when a client (patient) shows up for an appointment, the receptionist will create a profile in the system for him.
5. It is assumed that if a client does not show up for an appointment, either the system automatically deletes the appointment the next day via triggers or batch jobs, or the receptionist would have to manually delete the appointment.

2.4 Constraints

1. Accessibility Constraint: As a web application, the functioning of this system is constrained by the need of a stable internet connection.
2. This system is meant to be a fully functioning management system, so it does not work in parallel with other management systems. However, we could offer quick migration of the information stored in old databases into our system in the future.
3. Design Constraint: The programming language used for this project will be.

2.5 Dependencies

1. The system's database *Entity Relationship Diagram* or *Relational Schema* should be completed before we can continue working with the backend using PHP. This way we would have a working

prototype of the database before we start working in the backend. Later we can make changes to the database schema and migrate those changes from the backend to the database.

2. The system's functional requirements need to be implemented in the proposed *repository* packages, before we can continue with the implementation of the different employee dashboards.

3. Requirements

3.1 Functional Requirements

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_Admin_01	The system should allow the admin to perform CRUD operations on other users. However, he cannot modify/read other users‟ sensitive information.	Other users are Doctor, Patient, Economist, Receptionist. Sensitive information includes user passwords.	1	15/4/21	
BR_Admin_02	The system will automatically create the admin user. Initial credentials of the admin user will be provided by the developers to the clinic.	Change of password functionality will be provided.	1	15/4/21	
BR_Admin_03	The system should provide the admin user every functionality there is from all users	The admin user can do everything other users can do.	2	15/4/21	

BR_G_01	The system should allow guest users to book an appointment by filling out the required fields.	Required fields are full name, email, date, time, message.	1	15/04/21	

BR_G_02	The system should allow guests to view the different products offered by the clinic by clicking under Products menu.	Products menu which contains glasses and contact lenses	2	15/04/21	
BR_G_P_01	The system should notify Guests and Patients for their next appointment.	The system should be able to remind everyone who has left an appointment via email	2	15/04/21	
BR_G_03	System will provide Guests with the possibility of viewing a list of the available services and their respective prices.	This view will be provided in the Clinics main webpage.	2	15/04/21	
BR_G_04	System should allow Guests to view the doctors‟ public details.	Public details include education, qualification, contact info.	3	15/04/21	

BR_GR_05	The system should generate for each day a list of patients/guests who are expected to attend the clinic on that specific day.	This list of appointments is relevant to receptionists and doctors.	1	15/04/21	
BR_R_01	The system should give Receptionists full access to each doctor’s agenda.	Receptionists have full CRUD functionality on the doctor's agenda.	2	15/04/21	
BR_R_02	The system should allow Receptionists to assign a doctor to a requested	Receptionists can choose among the list of relevant doctors which are not busy on the requested	1	15/04/21	
	appointment based on his agenda.	time.			
BR_R_03	The system will allow Receptionists to reschedule/delete appointments.	If either party cannot show up for the appointment, the receptionist can handle the situation in two ways: by deleting the appointment or rescheduling by modifying the time and/or date.	1	15/04/21	
BR_R_04	The system should allow receptionists to enter a new appointment manually in the system.	This functionality is necessary in the case when the client contacts the clinic via phone or when a new appointment is scheduled at the time of the visit.	1	15/04/21	

BR_R_05	The system should not allow the Receptionists to modify doctor's prescriptions.	The receptionist can only see the receipts entered by the doctor but cannot change them.	3	15/04/21	
BR_R_06	The system will provide Receptionists the functionality of registering new patients into the system.	Patients are provided with an electronic health card.	1	15/04/21	
BR_P_01	The system shall not permit Patients to register themselves in the system.	The patients cannot register in the system by themselves, only by the receptionist.	2	15/04/21	

BR_P_02	The system should allow patients to access the system by using the credentials provided in the electronic health card.	Login credentials: PatientID password	1	15/04/21	
BR_P_03	The system should provide Patients with viewing access to their personal health records.	Health records should be available online in the Electronic Health Card menu.	1	15/04/21	
BR_P_04	The system allows Patients to make an appointment by filling out the required fields.	Required fields are full name, email, date, time, message	1	15/04/21	
BR_P_05	The system should allow patients to see the status of their appointment.	If the appointment is cancelled or modified the client will be notified and his calendar will be updated accordingly.	3	15/04/21	
BR_P_06	The system provides the Patient with the option of asking for a signed work or school absence excuse through the website.	The receptionist is reminded to send them an email with the absence excuse	1	15/04/21	
BR_E_01	The system provides to the Economists the right to edit the salary of any employee.	Editing of the salary is not determined by the economist, he just keeps records of it.	2	15/04/21	

BR_E_02	The system allows the Economists to view due payments.	Due payments can be salaries of employees or payments to other companies/individuals.	2	15/04/21	
BR_E_03	The system grants to the Economists the right to view unfinished payments by the customers.	He can then act accordingly.		15/04/21	
BR_D_01	The system authorizes Doctors to access their patients' data.	Doctors can access all previous health record data and other information.	2	15/04/21	
BR_D_02	The system will allow Doctors to add new health record data of the patient after each appointment.	A new health data record will be added with this patient's ID.	1	15/04/21	
BR_D_03	The system allows Doctors to change their personal information.	Contact Info, Credentials, Accomplishments etc.	3	15/04/21	
BR_D_04	The system should always keep the doctors updated about their daily schedule.	The system sends updates for all new entries.	2	15/04/21	
BR_D_05	The system can allow doctors and patients to exchange messages directly with each other.	A mini-chatting functionality provided between two end users.	3	15/04/21	

BR_GR_05	The system should provide its users the possibility to request for a temporary password in case they forget it.	Temporary passwords will be automatically generated and emailed to the user.	2	22/04/21	

3.2 Non-Functional Requirements

3.2.1 Product Requirements

3.2.1.1 User Interface Requirements

General UI requirements:

- The user interface should have big font sizes and use only sans-serif font family in order for the system to be easily readable.

- The user interface should have big sized buttons of over 25 px height and 35 px width in order for it to be easy to navigate from a mobile device.

Homepage related UI requirements:

- There will be a navigation bar on the top of the homepage with a login button on the right side. The login button will redirect to a simple login page.
- The login page will be minimalistic with only two fields to be filled: employee ID / patient ID and password. There will also be a submit button as well as a “Forgot password” hyperlink.
- There will be a products button on the navigation bar of the homepage, which will redirect the user to a products page containing information about the glasses, sunglasses, contact lenses and other accessories offered by the clinic.
- There will also be a services button on the navigation bar of the homepage, which will redirect the user to a page containing a list of services by the ophthalmologists of the clinic. This can include provided treatments or clinical procedures to eye disorders.
- There will also be a “book appointment” button for the guest users. It will redirect the guest user to a page prompting the user to enter the full name and choose an available date and time from

the system for the appointment. Mobile number, email address and comments on extra inquiries can also be added optionally.

User dashboards UI requirements:

- Other than the homepage, the system will contain several user dashboards specifically tailored to the logged in user's role. All of these dashboards will contain a navigation bar at the side where users can navigate through the different menus that are provided to them.
- The patient dashboard will contain the following menus:
    - Profile menu - here he can view and edit personal information about him ○ Health records menu - here he can view in a chronological way the different examinations he did in the clinic. Different entries of health records will be posted and sorted by date. He can inform himself more on a specific health record by clicking the button “Details” and then he can see the doctor’s records on that examination, the diagnosis and the treatment prescribed.
    - Book appointment menu - This menu should redirect the patient to the book appointment page for the patients. There he will be prompted to choose an available date and time from the system for the appointment. Comments on extra inquiries can also be added optionally.
- The doctor dashboard will contain the following menus:
    - Profile menu - here he can view and edit personal information about him ○ Patients menu - here the doctor can view a list of all patients of the clinic and can click a button to access more information about any one of them.
    - Create a record menu - here the doctor can create a health record for the patient based on the examination. He can specify the patient, some commentary for the record, the diagnosis and the treatment prescribed.
    - Health records menu - here can view a list of health records he has created so far. He can also edit them.
    - Appointments menu - here he can view all the appointments he has for the day and possibly future and past appointments.
- The receptionist dashboard will contain the following menus:
    - Profile menu - here he can view and edit personal information about him ○ Patients list menu - here he can view a list of all patients of the clinic and can click a button to access more information about any one of them. He can also edit the information of a user.

- Create a patient menu - here he can create a new patient user. He can add personal information and assign a doctor to the patient.
- Appointments menu - here he can view all the appointments scheduled for the day and future appointments, possibly even past appointments. He can add, delete and edit appointments in this list.
- Staff menu - here he can view a list of the staff members of the clinic. Staff can either have a user, like doctors or they cannot have a user, like lawyers. He can search for staff on this menu.
- Billing menu - here he can create invoices for an examination. He can possibly print them.

- The economist dashboard will contain the following menus:
  - Staff menu - here he can access information about each staff member, including critical information like salary. He can also create and modify users like doctor, receptionist, patient, economist as well as extra staff that do not need a user, but only an entry in the database.
  - Customer payments menu - here he can track customer payments and specify if a payment was made or not. He can also filter all unpaid invoices. He can access customer information like telephone number and email address to contact them for the unpaid invoices. ○ Products and services menu - here he can add, edit and delete products or services offered by the clinic.
- The admin dashboard will contain all the menus and functionalities of every other user mentioned above. He can also add, remove or modify other users.

3.2.1.2 Usability

 The software should be easy to work with and each user should find it effortless and comfortable to access it. A pdf manual should be available for all the users to show them how to effectively use the software.

 To satisfy user experience and minimize errors, alert messages will be present if a user tries to log-in with the wrong credentials or if any input validation fails. The interface should keep prompting the user for the correct user input.

 When possible, the system should limit the usage of text input fields and increase the usage of input selections, to decrease the possibility of errors when entering a record into the system.

 Additionally, for „risky" operations such as deletions, the system should ask for user confirmation before proceeding with the operation.

3.2.1.3 Performance

Since this product is web-based, its performance is strongly dependent on internet connection strength, the number of active users that are accessing the web simultaneously or server hardware performance.

3.2.1.3.1 Capacity

- Average page load from a user perspective must be less than 500ms.
- Slowest page load cannot take more than 3s.
- The application should load perfectly, even on a slow Internet connection speed.

3.2.1.3.2 Availability

- The system will be available for use 24/7, especially for patients which may try to access the system at any instant.
- The software is supposed to be functioning 99.9% of the time on average during working hours.
- The system may be offline to be improved for maybe 30 minutes or maximum 1 hour on midnight Sunday, so it won't have an impact on business operations.
- It is intended to be accessed from any geographical area inside Albania.

3.2.1.3.3 Latency

The maximum acceptable time for a service request should not exceed 100ms.

3.2.1.4 Manageability/Maintainability

3.2.1.4.1 Monitoring

- The system will be evaluated on a regular basis.
- Some specific tools will be used in order to have the best assessment, and to prevent substantial as well as non-substantial errors.

3.2.1.4.2 Maintenance

Website maintenance is crucial to maintaining a healthy website. Therefore, we will be careful to fix possible problems as soon as possible. But in case of a crash or failure the system will restart and the user will be redirected to the exact page they were working in the first place. If the system does not restart successfully the user should contact the developers of the software who will take care of the problem.

3.2.1.5 System Interface/Integration

3.2.1.5.1 Network and Hardware Interfaces

Our system will listen for incoming connection requests on port 443 of the host machine. Port 443 uses HTTPS protocol. The host machine will not allow any incoming traffic on other ports. HTTPS is simply an HTTP connection based on the famous TCP protocol coupled with TLS (Transport Layer Security). Every browser will be able to support this connection, this way our system will function properly.

3.2.1.5.2 Systems Interfaces

Our system is not designed to interface with any other existing system.

3.2.1.6 Security

3.2.1.6.1 Protection

- Our system provides access through the use of HTTPS connections protocol.
- User passwords are encrypted using AES-256 encryption.
- We are extensively using the Blade template engine *@csrf* tag specifically designed to inject code that protects against Cross-Site-Request-Forgery.
- Using a client-server architecture allows us to have a secure server and database in the cloud where our data are safe against accidents or incidents.

3.2.1.6.2 Authorization and Authentication

- Our system provides access through the use of HTTPS connections protocol.
- User passwords are encrypted using AES-256 encryption.

- We are extensively using the Blade template engine *@csrf* tag specifically designed to inject code that protects against Cross-Site-Request-Forgery.
- Using a client-server architecture allows us to have a secure server and database in the cloud where our data are safe against accidents or incidents.

3.2.1.7 Data Management

We specify the following guidelines and key principles related to data management that should be followed when developing and using our product.

Regarding patients:

1. All personal data of patients should be collected with their consent. Using a printed questionnaire is recommended, although not mandatory.
2. **Purpose limitation:** basic personal data like name and surname are collected in the mutual interest of providing patients prescriptions to their diagnosis. Other personal data are collected for providing patients with an electronic health card. Using this electronic health card, they have on demand access to information regarding their health records.
3. **Data proportionality:** we guarantee that the personal data collection of patients should be proportional to the scope of the health records and the electronic health card.
4. **Data accuracy:** We provide registered patients who have access to the electronic health card with online functionalities for them to update their personal information.
5. **Data retention limitations:** Personal data of patients cannot be kept for longer than is necessary. When a patient decides to delete their electronic health card, their user credentials are deleted after 30 days.

Regarding the clinic and its employees:

1. It is in the legitimate interest of the clinic to have a well-structured management system able to store and process documentations and health records. At the very least our system provides a secure storage for patient examinations that can later be invoked.
2. Personal data of employees should be stored in our system in accordance with existing contractual necessities between the employer and the employee. If no such contractual necessities exist, adaptations must be made to the contract in order for the storage of personnel data to be accomplished.
3. **Data retention limitations:** personal data of employees cannot be kept for longer than is necessary. When an employee leaves the clinic, their personal information is deleted after 30

days. In the case of doctors, their name and surname will continue to be saved in the health records of examinations for legal purposes.

3.2.1.8 Standards Compliance

Our system will first and foremost comply with the laws of Albania and standards and regulations applied by law enforcement agencies of the Albanian government.

Data management policies will be in accordance with the following legislations and also other applicable legislations that are not shown in the list:

- Law no. 9887, dated 10.03.2008 “On personal data protection” of the constitution
- Convention on the Protection of Individuals regarding the automatic processing of personal data
- Decision of the Commissioner for the protection of personal data no. 2, dated 10.03.2010 “On determination of procedures for registration administration of data and their recording, procession and extraction”

3.2.1.9 Portability

As a web application, this system is not Operating System dependent. It can be accessed using a device which has access to the internet and a web browser.

3.2.2 Organizational Requirements

3.2.2.1 Environmental Requirements

Our software will be efficient and highly effective, helping doctors, patients and receptionists keep track of their appointments, records, etc.
Power Supply: The power is provided from the infrastructure of the clinic and it only needs access to a computer for maintenance, a PC or laptop (for regular usage).
Internet Connection: The clinic’s internet connection, home internet connection (Wi-Fi or Ethernet), and/or mobile data will be sufficient for accessing the application.

3.2.2.2 Operational Requirements

Our software is a web application that will provide easier task managements for doctors and receptionists that are part of the clinic. Patients will also benefit from the application because it will be easier to book appointments and keep track of their previous visits or health record. The clinic management systems also facilitates communication between patient and doctor.
The admin will have access to the system’s implementation.
Receptionists and doctors will have access to CRUD operations while patients can only view available products and view their health records.

3.2.2.3 Development Requirements

a. Front End

- The technologies that are going to be used regarding the client-side web development:
  HTML
  CSS
  JavaScript

b. Back End

- The technologies that are going to be used in the server-side web development:
  PHP
  MySQL

3.2.3 External Requirements

3.2.3.1 Regulatory Requirements /////TODO

3.2.3.2 Ethical Requirements

Patients must agree to share their personal information and medical history within the system.

a. The personal information that they will share:

- Full name
- Date of birth
- Email address
- Phone number

b. The medical history that they will share:

- Previous and future medical conditions
- Previous and future medications
- Previous and future surgeries

The patient's information will be accessed by the receptionist and their personal doctor only for medical purposes.

Doctors must agree to share their personal information for communication and authentication purposes.
The personal information that doctors will share:

- Full name
- Date of birth
- Email address
- Phone number
- Qualifications

Their information will be accessed only by the receptionist and admin which should agree not to share sensitive information without the doctor's permission

3.2.3.3 Legislative Requirements /////TODO

3.3 Domain Requirements

The system manages all activity of an eye clinic so the system will be available and will serve only to eye clinics that will acquire the software.
As for the users (doctors, patients, receptionist) we can not specify them as it will depend on the clinic which will use the software.

4 User Scenarios/Use Cases

4.1 User Scenarios

1. Scenario title: Successful user log-in

a. The user opens the clinic's homepage in order to log in to the system.
b. At the top-right of the homepage he clicks the login button. He is immediately redirected to the login page.
c. At the login page he is prompted to enter his ID and password. He enters the credentials accurately and then clicks on the submit button.
d. The login is successful and the user gains access to the system via a dashboard designed based on his user rights.

2. Scenario title: User forgets his password

a. The user is trying to login to the system via the login page. He enters his credentials but they won't get accepted by the system. He gets an error message of "Invalid login or password"
b. The user checks if the ID / email he entered is correct. He understands that he has forgotten the password, because his submitted ID or email is correct.
c. At the bottom of the login form the option "Forgot password" is available. He clicks that hyperlink and is redirected to the "Reset your password" page.
d. At the "Reset your password" page he is prompted to specify his ID or email, so he types it and clicks submit.
e. The system automatically sends an email to the user with the automatically generated password.

Receptionist Scenarios

3. Scenario title: Reviewing appointments requested by Guest/Patient

- **a.** When a patient or a guest requests a new appointment via the official website, a notification arrives for the receptionist.
- **b.** The receptionist opens the „Requested Appointment" View.
- **c.** In the list of requested appointments, he selects a specific appointment.
- **d.** He will review the appointment and:
    a. Accept it by assigning a doctor to it, and notifying the guest in the provided email.
    b. Modifying the appointment, by changing the time/date and notifying the guest.
    c. Removing the appointment completely, due to incorrect data.

4. Scenario title: Scheduling a new appointment

- **a.** A patient has finished his examination at the clinic. The doctor requested him to come a second time to undergo a specific procedure or for another check in.
- **b.** The receptionist is informed about this new appointment by the doctor or the patient himself.
- **c.** The receptionist clicks on „Add Appointment" functionality.
- **d.** He creates a new appointment by filling out the required fields: patient's ID, appointment's date, time, service and doctor.
- **e.** The appointment is added into the system. Notification of the patient is done immediately via email.

5. Scenario Title: Modifying an existing appointment

- **a.** The receptionist is notified for a possible change of a scheduled appointment for a specific reason.
- **b.** In the „Appointments Bookkeeping", he finds the aforementioned appointment by filtering by date and time.
- **c.** He is able to change the doctor assigned to the appointment and/or reschedule the appointment by modifying the date and/or time.
- **d.** If the appointment is rescheduled, the receptionist uses the patient info in the appointment bookkeeping to notify the patient of the new changes.

6. Scenario Title: Removing an appointment

- **a.** Receptionist is notified for an immediate cancellation of an appointment for a specific reason.
- **b.** He will find the aforementioned appointment by entering the patient ID and then delete the appointment

c. The patient is notified for the cancellation using his contact info.

7. Scenario Title: Accessing all appointments

a. The receptionist wishes to check all appointments for a specific day in order to create a general idea of that day's schedule.
b. He accesses the appointments by clicking on the Appointments Bookkeeping Menu.
c. First view will be the Calendar of today's appointments and the name of the doctor assigned to each appointment.
d. In the search bar he is able to select a specific day.
e. Appointments for that day are displayed.

8. Scenario Title: Patient Registration

a. After the guest's first examination is finished, the receptionist will create a new Patient account.
b. The receptionist will ask the patient for his personal information such as name, surname, age and contact information in order to fill out the required fields.
c. After filling out the form, by pressing the „create patient" button an account for that patient will be created.
d. Patient will be given the credentials to access his account: The username will be the patient's EHealth card ID (auto generated by the system using a specific format). The password will be a default one.
e. The receptionist will ask the doctor to update the patient's E-Health card after the creation.

9. Scenario Title: Access doctors schedule

a. Receptionist wishes to check the schedule of each doctor in order to better distribute the workload among doctors.
b. Receptionist will go to the Users section.
c. After the Users section Receptionist will click on the Doctors section.
d. From there the receptionist can check the subsection Schedule, to check the daily schedule of each Doctor.

Doctor Scenarios

10. Scenario Title: Doctor wants to check a patient's E-Health card

a. The doctor wishes to check the previous health records of a patient. He logs in to the system.
b. The doctor's dashboard is revealed to him. He goes to the patient's section and enters the patient's ID or name in the search bar.
c. All the patient's health records are shown to him in a chronological fashion.

11. Scenario title: Creating a new health record for a patient

a. Upon completing the examination of a patient, the doctor needs to create a new health record for him. The doctor makes sure he is logged-in in the system.
b. In the doctor's dashboard, the doctor goes under the patient's menu and searches for the patient by his patient ID or name in the search bar.
c. The patient or a list of patients is shown to him. He goes to the correct patient's profile and there chooses the "Create Record" menu.
d. A new page with a form related to the examination is shown to him. He completes the form and enters save.
e. The new health record for the patient is saved in the system.

12. Scenario title: Doctor wants to check his appointment schedule

a. The doctor logs in to the system.
b. In the doctor's dashboard, he chooses the "Appointments" menu. A new page is revealed to him.
c. The appointments are shown graphically to him in time grids.

Patient Scenarios

13. Scenario Title: Appointment Booking

a. Patient has decided to have a consultation at the clinic. He is logged in into the system.
b. On his dashboard, he clicks on the „Book Appointment" module.
c. A form with the following input fields is shown: full name, email, phone number, date and time. When booking online, the appointment is treated as a general one so he does not have to select a specific procedure (service). The specific procedure that the patient needs to undergo is determined by the doctor after the examination.
d. Full name, email and phone number are already pre-filled based on his profile information. Patient needs only select a time slot in the appointment calendar.
e. By clicking on the 'Book now' button, the general appointment is created.

f. The receptionist is notified for this requested appointment.

14. Scenario Title: Managing Own Appointments

a. Patient has opened his own dashboard by successfully logging in into the system.
b. He clicks on the „Appointments" menu, to have access to his appointments.
c. A list of finished and incoming appointments is displayed.
d. Patient clicks on a specific appointment to view its details. Incoming Appointments have canceling options.
e. By clicking on „Cancel Appointment", the patient can cancel an incoming appointment.
f. A confirmation window pops up to confirm the operation.
g. When cancelation is confirmed, the appointment's status is changed and the receptionist and the doctor are notified for this change in the agenda.

15. Scenario Title: Accessing Electronic Health Records

a. Patient is logged in into the system and requests to see his previous health records.
b. On his dashboard he clicks on 'E-Health Records'.
c. A table containing his records in a sorted by date ascending order is displayed.
d. The patient can filter specific records by date.
e. Based on the filtering parameters, the requested records are displayed.

Guest Client Scenarios

16. Scenario Title: Viewing products offered by the clinic

a. A guest user visits the clinic's official website to search for products offered by the clinic.
b. He navigates to the „Products" module. No authentication is required to access this view.
c. The view shows a list of products available with their respective prices. Products are separated into different categories.

17. Scenario Title: Viewing Services

a. A guest inquiry about the specific services offered by the clinic. He visits the official website.
b. In the navigation bar, he clicks on the services module.
c. The services offered by the clinic alongside the price and a brief explanation are shown.

18. Scenario Title: Staff Information

a. A visitor to the website wants to learn more about the doctors of the clinic and their qualifications. He clicks on the „Our staff" link on the navigation bar.
b. A list of doctors grouped based on their expertise is displayed.
c. He clicks on a specific doctor and is able to see his public details, contact information, achievements and qualifications.

Economist Scenarios

19. Scenario Title: Monthly Transactions

a. The Economist wants to have an overview of all the transactions done in the clinic in the last month (30 days). He is logged in into the system.
b. He will access the Transactions section.
c. In the Transactions section he will click on „View All Transactions"
d. At the specifications of this view he will click on the option 1 month.
e. All transactions done in the last month will be shown in the dashboard.

20. Scenario Title: Access to all transactions in a given period

a. The Economist wants to have an overview of all the transactions done in the clinic in a custom period of time.
b. He will access the Transactions section.
c. In the Transactions section he will click on „View All Transactions"
d. At specifications of this view he will click on the option custom.
e. He will specify the period of time.
f. All transactions done in that specific time will be shown in the dashboard.

21. Scenario Title: Checking the salary of each member of the staff

a. Economist wishes to access the salary data of each employee
b. Economist goes to the Staff section
c. At the staff section he will check the salaries of each member of the staff

22. Scenario Title: Checking the expenses

a. The economist wishes to check the expenses done in the clinic
b. The latest transactions are directly shown on the economists' dashboard.

c. To view older transactions, he can expand the list by clicking on “Show more” button and choose one of the following options:

Today This week This month This year Specific Period

23. Scenario Title: Add product

a. The economist wishes to add a new product offered by the clinic.
b. After clicking on View Products, the economist view is shifted into a new one.
c. In this view, a table with all the products is shown.
d. At the bottom there is a blank line which can be used to enter a new product, with some other required fields which detail the type of product, its name and its quantity.
e. After filling the required fields, he can click add new.
f. To save the changes he clicks save.
g. If the economist tries to leave the view without saving a warning message is shown.

24. Scenario Title: Delete product

a. The economist wishes to delete one of the products offered by the clinic
b. After clicking on View products, the economist view is shifted into a new one.
c. In this view a table with all the products is shown.
d. The Economist selects one or multiple products that he wishes to delete.
e. A modify button is shown at the end of the table.
f. After clicking on modify the selected product/products become editable and a delete button shows at the end.
g. If the Economist clicks delete a warning “These changes are irreversible, are you sure you want to delete the following product/s?”
h. The Economist clicks Yes - The selected product/s are deleted
i. The Economist click No - The view goes back to the editable table.
j. To save the changes he clicks save.

25. Scenario Title: Edits an employee's payment

a. The economist wishes to change the wage of one of the employees
b. He/She first selects the View Employees row by clicking it.
c. He selects the employees he wishes to change.
d. He then clicks the Edit button.
e. Only the payment column is editable for the selected employees

f. After he is finished the economist clicks “Save”
g. If entries are filled out correctly the row will be updated.
h. Otherwise if entries are filled in violation of rules, a warning will be shown in order to refill again.

Admin Scenarios 26.

Scenario Title: Admin wants to create a new user

a. The admin makes sure he is logged in. Under the admin dashboard he chooses the menu Users. He is redirected to a new page.
b. He is shown a list of current users. On the side of the page there is a menu “Create New User”. He chooses this menu.
c. A form prompting for personal information of the new user including full name, email address, age and role is shown.
d. The admin fills this form and then hits “Save User”. The new user is saved in the database of the system.
e. The user is notified via email that a new profile has been created for him in our system. Also the login credentials are shown to him.

27. Scenario Title: Admin wants to delete or deactivate a user

a. The admin makes sure he is logged in. Under the admin dashboard he chooses the menu Users. He is redirected to a new page.
b. He is shown a list of current users. He goes to the search bar, types the user ID or name and surname and presses enter.
c. A user or a list of users is shown to him, along with short information on the side. He chooses the correct user.
d. In the user’s profile he chooses either the option “Delete User” or “Deactivate User”, depending on the preference.
e. The user is deleted from the system.

28. Scenario Title: Admin wants to edit information of a user

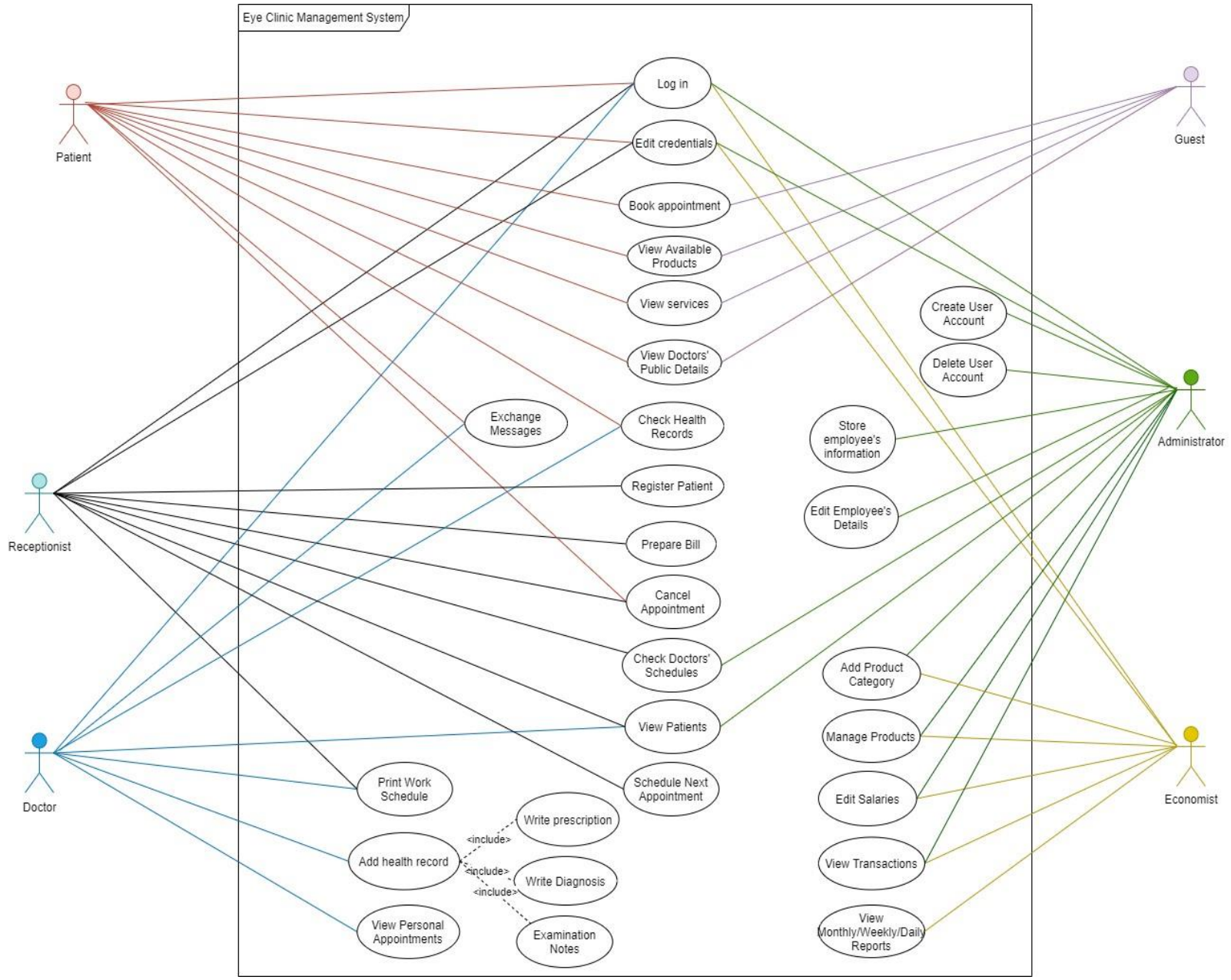
a. The admin makes sure he is logged in. Under the admin dashboard he chooses the menu Users. He is redirected to a new page.
b. He is shown a list of current users. He goes to the search bar, types the user ID or name and surname and presses enter.

c. A user or a list of users is shown to him, along with short information on the side. He chooses the correct user.

d. The user's profile consists of a form filled with personal information. The admin chooses either entries in the form, edits their contents and clicks "Update Profile".

e. The new field values are persisted in the database of the system.

4.2 Use Cases Diagram


Eye Clinic Management System
Patient
Guest
Receptionist
Administrator
Doctor
Economist
Log in
Edit credentials
Book appointment
View Available Products
View services
View Doctors' Public Details
Exchange Messages
Check Health Records
Register Patient
Prepare Bill
Cancel Appointment
Check Doctors' Schedules
View Patients
Print Work Schedule
Add health record
View Personal Appointments
Write prescription
Write Diagnosis
Examination Notes
<include>
<include>
<include>
Create User Account
Delete User Account
Store employee's information
Edit Employee's Details
Add Product Category
Manage Products
Edit Salaries
View Transactions
View Monthly/Weekly/Daily Reports
Schedule Next Appointment

4.3 Use Cases Extended

Use case 1

Name	**Log in**
Summary	Each user can login in the system by entering their own credentials.
Actors	Receptionist, Patient, Doctor, Economist, Admin
Description	Users enter the username and password and if it is correct, can go directly in their own profile. If not, the system shows a warning message prompting the user to re-enter their credentials.
Pre-Condition	Users should already have a valid account. All staff accounts will be created by the admin and all the patients accounts will be created by the receptionist.
Post-Condition	User will be directed to its home page.

Use case 2

Name	**Log out**
Summary	Users will be able to log out from the system.
Actors	Receptionist, Patient, Doctor, Economist, Admin
Description	At any time, staff or patient users can log out after finishing their duties in the system by clicking a logout button on the top navigation bar.
Pre-Condition	Users must be logged in.
Post-Condition	Users can no longer make significant changes in their accounts but can still access some specific aspects of the system (products page, about us page, etc).

Use case 3

Name	**Edit Credentials**
Summary	Users can edit their account or information details
Actors	Receptionist, Patient, Doctor, Economist, Admin
Description	Each user can change their own profile information including name, birthday or username and password combination in valid rules.
Pre-Condition	Users must be logged in.
Post-Condition	The information regarding the user is now changed.

Use case 4

Name	**Book appointment**
Summary	Patients or guests can book an appointment according to their will.
Actors	Patient, Guest
Description	If an existing patient or a potential customer of the clinic needs to book an appointment for a specialized examination, they can go to the menu “book appointment”. There they can choose an available date and time and book that time slot for themselves.
Condition	No conditions. Patients can authenticate after they have filled in the form.

Use case 5

Name	**View available products**
Summary	Guests and patients can view available products of the clinic.
Actors	Guest, Patient
Description	Guests and patients might be interested to know which products does the clinic offer for sale. They can view all the products by navigating to the “Products” menu on the top navigation bar.
Condition	No conditions apply.

Use case 6

Name	**View services**
Summary	Guests and patients can view a list of services offered by the clinic.
Actors	Guest, Patient
Description	Guests and patients can view a list of services offered by the clinic, whenever they are wondering if the clinic offers the services that they need. They can access this list from the “Services” menu on the top navigation bar.
Condition	No conditions apply.

Use case 7

Name	**View doctor’s public details**
Summary	Guests and patients can look up personal information of each doctor in the clinic.
Actors	Guest, Patient
Description	If guests and patients are interested in the clinic they might need to see a resume of each doctor in the clinic before they decide for the clinic. They might also need some contact information for the doctors in order to contact them via phone or email. They can do so easily in our system by navigating to the “Our staff” section of the clinic’s webpage.
Condition	No conditions apply.

Use case 8

Name	**Check health records**
Summary	Patients and doctors can look up their health records.
Actors	Patient, Doctor

Description	The patient can look up a list of all the health records written for him in a chronological fashion by accessing the menu “My health records” from the patient dashboard. Similarly, a doctor can view a list of all the health records he has written by accessing the menu “Health records” from the doctor dashboard.
Pre-Condition	Doctor / patient must have logged in.

Use case 9

Name	**Register patient**
Summary	The receptionist can register a patient for the first time in the clinic.
Actors	Patient
Description	The patient shows up for the first time in the clinic. His personal information is saved in the system by the receptionist. With his consent, the receptionist can create a user account for him and hand him the login credentials. The patient can use this account to login to the system and access the online services of the clinic.
Pre-Condition	1. The patient must come for the first time in the clinic. 2. He must have already booked a meeting online.
Post-Condition	The patient has a user account and will be able to interact with the system.

Use case 10

Name	**Prepare bill**
Summary	The receptionist prepares an invoice for the customer.
Actors	Receptionist
Description	When a sale has been made or an appointment has ended, the receptionist can prepare a bill to hand to the patient or client. He can do so by going to the menu “Billing” in the receptionist dashboard.
Pre-Condition	1. Sale has been made or appointment has ended.
Post-Condition	The amount on the bill is added to the income part of the transactions and the billing page is refreshed.

Use case 11

Name	**Cancel appointment**
Summary	Either the receptionist or the patient can cancel an appointment.
Actors	Receptionist, Patient
Description	Whenever a patient cannot make it to an appointment, or the clinic needs to cancel a meeting with a patient for various reasons, both the patient and the receptionist are served with the option of cancelling the meeting.
Pre-Condition	Either the receptionist or the patient must be logged in the system.
Post-Condition	The once-busy appointment time is now available for booking after the page is refreshed.

Use case 12

Name	**Check doctor's schedules**
Summary	The doctor or administrator can check a doctor's schedule.
Actors	Doctor, Receptionist, Administrator
Description	Doctor can check his daily or weekly schedule by going to the menu "Appointments". Even the administrator or the receptionist can check a doctor's schedule and can make changes accordingly, whenever necessary. The receptionist in particular can also make changes to the doctor's appointments by cancelling or changing the date and time of an appointment.
Pre-Condition	The respective actor should have already logged in.

Use case 13

Name	**View patients**
Summary	A list of patients with their personal information is shown.
Actors	Doctor, Receptionist, Administrator

Description	A list of patients with their personal information can be shown from the “Patients” menu of the doctor’s, receptionist’s or administrator’s dashboard. It can also be searched for a specific user and clicking on an entry in the patient’s list shows that user’s personal information.
Pre-Condition	Actors must have already logged in the system.

Use case 14

Name	**Schedule next appointment**
Summary	The receptionist can arrange a new appointment in the system.
Actors	Receptionist
Description	The receptionist fills out the required forms, including ID, appointment date, hour etc. Afterwards, a notification for the appointment will be sent automatically via email to the patient.
Pre-Condition	The appointment needs to be arranged beforehand with the patient.
Post-Condition	After refreshing the page 1. New appointment is added to the doctor’s schedule. 2. The once available time is now busy.

Use case 15

Name	**Print work schedule**
Summary	The system can print out the work schedule of doctors.
Actors	Doctor, Receptionist
Description	Whenever necessary, either the doctor or receptionist can print out the work schedule for the day of each doctor. This way, the doctors can see clearly when they are the busiest in a printed A4 page, without having to constantly use the computer.
Pre-Condition	Doctor or receptionist must be logged in to retrieve the information and print it.

Use case 16

Name	**Add health record**
Summary	After completing the examination of the patient, the doctor creates a new health record.
Actors	Doctor
Description	The doctor will be able to create new health records for the patients whenever he needs. He simply has to go to the menu “Create Health record” from the doctor dashboard. There he can specify the patient, he can write a prescription, a diagnosis and can ultimately write some examination notes.
Pre-Condition	1. The doctor must be logged into the system. 2. The patient must have shown up for the appointment.
Post-Condition	A new health record will be available for the patient.

Use case 17

Name	**Exchange messages**
Summary	The doctor and patient can exchange messages via the system.
Actors	Doctor, Patient
Description	The system offers a messaging functionality between the doctor and the patient. If either the doctor or the patient needs to initiate some online contact, they can do so without having to send an email, which is very formal or sending a SMS or WhatsApp message, which is very personal.
Pre-Condition	The doctor or the patient have to be logged in before they can send a message.
Post-Condition	New conversation is started and the message is saved.

Use case 18

Name	**Create user account**
Summary	Admin can create a user account in the system.
Actors	Admin

Description	The admin can create a user account either for a staff member or a patient. He can simply go and fill out a form in the “Create User” menu from the admin dashboard with the required information.
Pre-Condition	The admin user must be logged in the system.
Post-Condition	The new user has access to interact with the system.

Use case 19

Name	**Delete user account**
Summary	Admin can delete a user account from the system.
Actors	Admin
Description	The admin has already created a user account either for a staff member or a patient. Whenever he needs to delete a user account, he can simply search for that user from the Users menu in the admin dashboard. After opening the profile, he can click on the option “delete user”.
Pre-Condition	1. The admin user must be logged in the system. 2. The user must exist in the database.
Post-Condition	If the deleted user was an employee the information remains in the database but the employee does not have access to the system. However, if the deleted user is not an employee the information is deleted from the database and the user no longer has access to the system.

Use case 20

Name	**Edit user account**
Summary	The admin can edit the user account of a staff member or patient.
Actors	Admin
Description	Whenever necessary, the admin can make changes in the employee's profiles or patient profiles.

Pre-Condition	1. Admin has to be logged in their own profile. 2. There must be consensus between the admin and the employee or patient to change account information.
Post-Condition	The patient's credentials will be changed and updated.

Use case 21

Name	**Store employee's information**
Summary	The administrator can store employee's information on the system.
Actors	Admin
Description	After hiring and signing a contract with a new employee, the administrator can store his personal information on the system for legal and managerial purposes.
Pre-Condition	1. Admin has to be logged in to their own profile. 2. Admin already is in the "Create User" menu
Post-Condition	1. The employee's information is used to create a user account. 2. The employee now has access to the system.

Use case 22

Name	**Add product category**
Summary	Either the administrator or the economist can add a new product category.
Actors	Administrator, Economist
Description	In cases when the clinic adds a new line of products for sale, a new product category has to be created for the online system. This can be achieved easily with the help of a special menu called "add product category".
Pre-Condition	1. The economist or administrator has to be already logged in into the system. 2. They have already accessed the menu "Products" from their respective dashboard.
Post-Condition	The new added product is available for sale to the patients.

Use case 23

Name	**Manage products**
Summary	The economist or the administrator can add or remove a product offered by the clinic.
Actors	Economist, Administrator
Description	Economists or administrators can add, remove and edit a product according to the needs of the clinic. To fulfill this use case, a special menu related to product management will be added to the dashboard.
Pre-Condition	Economists or administrators have to be logged in.
Post-Condition	1. If the product is removed, it will no longer be available for sale. 2. If a product is edited, its information is updated.

Use case 24

Name	**Edit salaries**
Summary	The economist can update an employee’s salary in the system.
Actors	Economist
Description	Salary is critical personal information that is part of the economist's job to analyze, change and manage the payments at the end of the month for each of the employees. If changes in the contract related to the salary happen, then the economist can update that new salary into the system.
Pre-Condition	1. A change in salary was made in the new employee contract. 2. Economist must have logged in into the system.
Post-Condition	The monthly money amount that the employee receives is updated.

Use case 25

Name	**View transactions**
Summary	The economist can view a list of all payments made by or to the clinic.
Actors	Economist
Description	The system offers the economist a clear overview of all the payments made to the clinic after a sale by the clients or after a patient appointment was finished. It keeps track of such payments to the clinic and also by the clinic to other parties, like in the case when new equipment is bought.
Pre-Condition	1. Economist has logged in into the system. 2. He has accessed the menu “Transactions”.

Use case 26

Name	**View monthly, weekly or daily reports**
Summary	The system generated statistical reports for the economist to interpret.
Actors	Economist
Description	Based on the statistics of patient appointments and sales, the economist can generate a graphical report and see clearly which of the months were the most profitable for the clinic. Similarly, it can generate reports for clinic spendings like purchases or salaries.
Pre-Condition	The economist must have logged in into the system.