University of Tartu

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Hospital Information System

Workshop 4, submitted by:
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Revision History

Date	Reason for changes	Version
12/10/2018	Document created	0.0
13/10/2018	Initial requirements, introduction and structure	1.0
21/10/2018	Initial requirements, introduction and structure. Improved version	1.1
11/11/2018	Non-functional requirements, strategic dependency models, goal model, use cases and scenarios were added.	2.0
17/11/2018	Descriptions and goal IDs were added for strategic dependency models, description and IDs were added for use case diagram, non-functional requirements were edited.	2.1
2/12/2018	Class, state and sequence models were added, solution-oriented requirements were added.	3.0
11/12/2018	Class, state and sequence diagrams were updated, solution-oriented requirements were corrected, traceability model was edited.	3.1
12/16/2018	Prototype for booking an appointment was added, class, state and sequence diagrams and traceability model were updated.	4.0

1. Introduction

1.1 Purpose

The purpose of this document is defining the requirements for Hospital Information System (HIS). Hospital Information System's specific features, constraints, development scope will be also described in the document.

1.2 Product Scope

The subject facet: User Interface, creating a user for online booking system, searching for doctor availability, appointment reservation, reservation cancellation, reservation rescheduling,
The usage facet: Appointment booking, appointment rescheduling, appointment cancellation, hospital schedule viewing, managing doctor's schedule, creating treatment details, on site payment, getting payment reports, editing price list.
IT Facet: HIS Database, Web service for user interface, desktop application, integration with external systems.
Development Facet: Regulations about banking service, protection of personal data, hospital policy should be paid regard to.

1.3 Definitions and Acronyms

Term	**Meaning**
Appointment	An arrangement for patients to be able to visit the doctor at particular time.
Banking Service	It is a service that helps hospital to communicate with banks regarding sending payment request and getting confirmations.
Closed Invoice	It is a paid invoice.
Credentials	It is the verification of identity or tools for authentication.
Database	It is an organized collection of data, stored and accessed electronically.
Department	A division of the hospital.

Desktop Application	It is a type of application which is designed to run stand alone on desktop or laptop computers.
Doctor Schedule	It is a schedule that shows doctor's timesheet (when they are busy or free).
Financial Administrator	Hospital personnel which is responsible for viewing registered payments, managing price list, downloading payment documents etc.
Functionality	It is the range of operations that can be run on the HIS.
HIS	Hospital Information System
HIS Database	A place where HIS saves its data.
Hospital Schedule	It is a schedule that shows all the doctors available and busy hours.
Invoice	It is a document which includes all treatment activities, their prices and the total amount that should be paid by a patient for one treatment.
Link	It is a reference to another document.
Password	It is a word or string of characters used for user authentication to prove identity and get access to the HIS.
Patient	A person who needs a medical treatment.
Payment	It is is the trade of value from one party to another for goods, or services, or to fulfill a legal obligation.
Payment report	It shows the financial activities of the hospital.
Price list	It is a list that contains the price of all treatment activity
Profile	It is a set of data portraying the features of particular user in the HIS.

Proprietary Software	It is a type of software which requires purchasing to use. It is not an open source.
Requirement Priority	It shows the significance level of the requirements. Requirements with “1” are the most important ones. Requirements with “2” are the second important requirements and the requirements with “3” are the least important requirements.
Registered Payments	It explains the process of saving the payment in the system when the treatment is finished.
SMS Gateway Service	It is a service that enables system to send a text messages to patients.
System	It is set of detailed methods, procedures and routines created to carry out a specific activity.
System Administrator	It is a person who is responsible for the authorization of user activity and fixing the systemic problem regarding HIS.
TBD	To be determined.
Treatment details	It is thorough information about the cure that will be applied to deal with a medical problem.
User	It is a person who is registered and able to use HIS.
User Interface	It is a designed visual system that helps to human-machine interaction.
Web Service	It is a piece of software that makes itself available over the internet for the external users.
Web/Mobile Interface	It is a user interface which is accessible from web and mobile applications.

1.4 Overview

The document basically consists of three sections and appendices. The first section, introduction, includes the information about the purpose and scope. It also explains the terms and abbreviations in ‘Definitions and Acronyms’ part and mentions references. The second

section provides the overall description which comprises product perspective, product functions, user classes and characteristics, assumptions and dependencies, use cases, strategic dependency models and parts. In the third section, functional requirements and non-functional requirements are explained. In the final part, prioritization table for cost and value are shown and, traceability model, traceability matrix and ROI graph are presented.

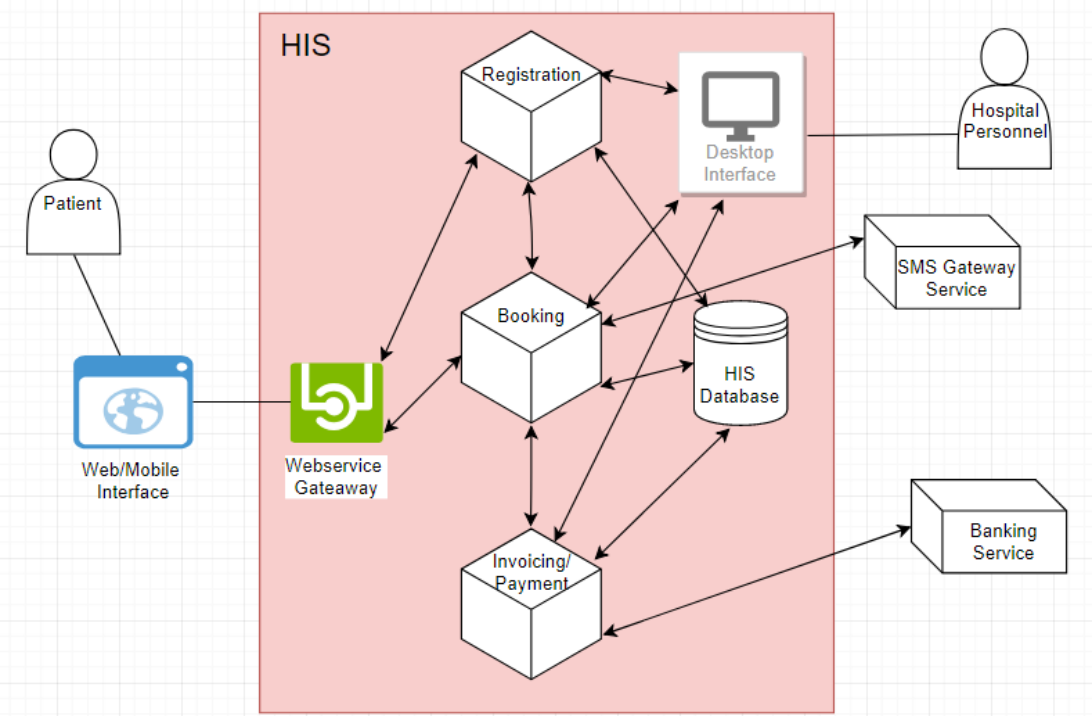
1.5 References

1. Vorobey, V. (2018). Software Requirements Specification “UralChem Project”, CactusSoft.
2. Jonathan Leea, Nien-Lin Xuea, Jong-Yih Kuo (2000). “Structuring requirement specifications with goals”, Information and Software Technology 43 (2001) 121-13.

2. Overall Description

2.1 Product Perspective

HIS is a proprietary software. In addition to a being a desktop application which is used by hospital personals, HIS provides a web and mobile user interface for its customers. HIS is able to communicate with Banking Service for the payments which are made with card. It also communicates with SMS Gateway Service for sending SMS to patients.
HIS basically comprises 3 sub-services which are Registering, Booking and Invoicing/Payment. Communication between sub-services is possible. Patients themselves can use registration and booking subsystems via web/mobile interface. However, it is not possible to access invoicing/payment subsystem via web/mobile interface because this process can only be done by hospital personnel.
Main properties of the HIS are as following:
User Account: It is enabled that customers/patients can create their accounts in the system and they can also view and update their profiles.
Booking system: Allows patients and receptionist to booking an appointment.
Invoicing/Payment System: Allows hospital to generate an invoice and make collections. Moreover, it keeps the history log about previous transactions.



2.2 Product Functions

Product functions of the HIS system (ID):

1. Registration and Authorization (F1)
    a. Patients Registration (F1.1)
    b. Users Authorization (F1.2)
    c. Password Recovery (F1.3)
2. Appointment Scheduling (F2)
    a. Appointment Booking (F2.1)
    b. Appointment Rescheduling (F2.2)
    c. Appointment Cancellation (F2.3)
3. Schedule Management (F3)
    a. Doctor's Schedule Management(F3.1)
4. Invoicing and Payment (F4)
    a. Treatment Details Creation (F4.1)
    b. Payments Registration (F4.2)
    c. Getting Payment Reports (F4.3)
    d. Price List Management (F4.4)
5. System Administration (F5)
    a. Users Management (F5.1)

2.3 User Classes and Characteristics

Actor (ID)	**Interests**	**Goals (ID)**
Patient (A.01)	Usage interest: - Easy and effective management of personal appointments in the hospital online.	Booking an appointment (G01.1) Rescheduling an appointment (G01.2) Canceling an appointment (G01.3)
Receptionist (A.02)	Usage interest: - Easy and effective management of patients' appointments in the hospital online.	Booking a patient's appointment (G02.1) Rescheduling a patient's appointment (G02.2) Canceling a patient's appointment (G02.3)
Doctor (A.03)	Usage interests: - Easy and effective management of personal schedule online; - Fast and easy	Managing personal schedule (G03.1) Creating treatment details (G03.2)

	treatment details creation online.	
Financial Employee (A.04)	Usage interests: - Safe and easy invoices, payments and price list management of the hospital online.	Registering payments of the patients (G04.1) Getting payment reports (G04.2) Managing price list (G04.3)
System Administrator (A.05)	Development interest: - Cheap and easy system maintenance. Usage interest: - Fast, easy and safe system user management.	Managing users (G05.1) - Create User (G05.1.1) - Edit User (G05.1.2)

All Users (A.01-A.05) have a common goal: - Having a personalized access to the system and their personal data in the system (G06.1).

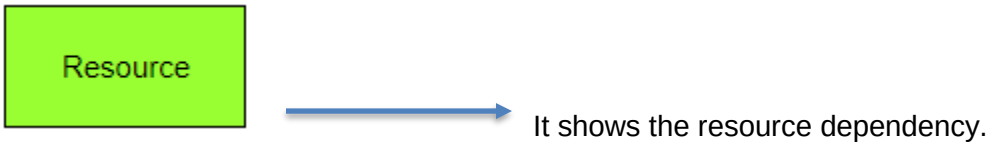
2.4 Assumptions and Dependencies

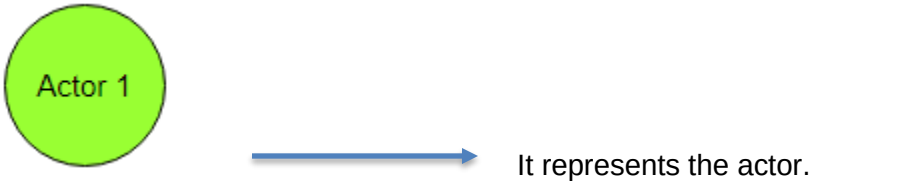
Parent dependency for external usage of HIS (by patients) is having internet connection. Integration with banking service and SMS gateway service is the other important dependency. It is assumed that system servers are powerful enough to support large number of users.

2.5 Strategic Dependency Models

Strategic dependency model basically provides a visual description of a process regarding network of dependency relationships between actors.

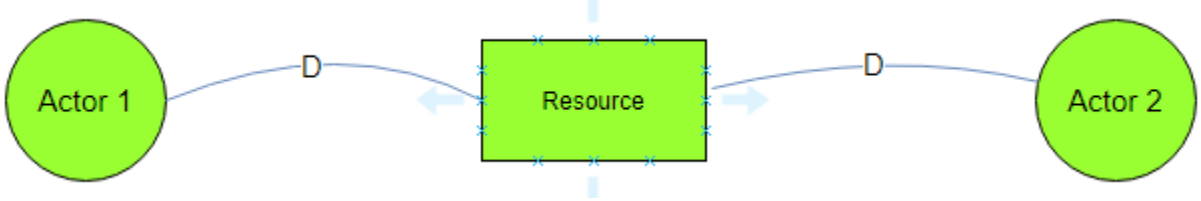
Representation





For example;

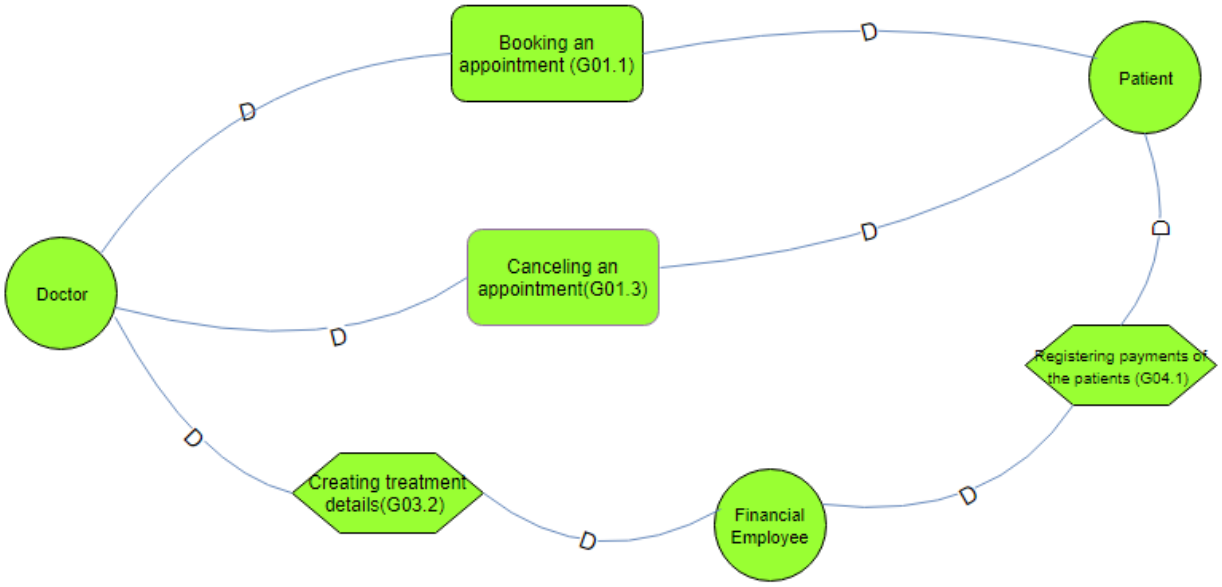
Actor 2 is dependent on Actor 1 in order to complete the Task.



Actor 1 provides the required resource, so Actor 2 is dependent on Actor 1 to get the resource.

2.5.1 Strategic Dependency Model Before HIS

For goals IDs please go to Goals.

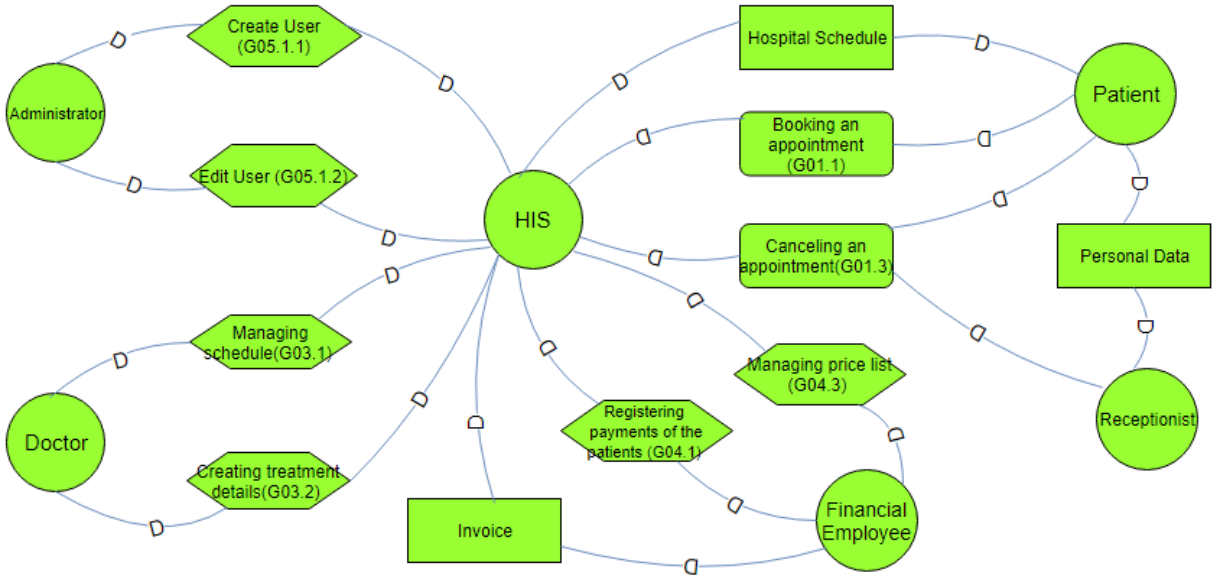


Sample dependency from the model;

As it can be seen from the model, Patient is dependent on doctor regarding to fulfill G01.1, G01.3 which refer to Book an Appointment and Cancel an Appointment respectively.

2.5.2 Strategic Dependency Model After HIS

For goals IDs please go to Goals.



Sample dependencies from the model;

The model illustrates that Patient is dependent on HIS for the Hospital Schedule. On the other hand, to complete the G01.1, HIS dependent on Patient. Another example is that HIS dependent on Doctor to fulfill G03.2 which is creating treatment details.

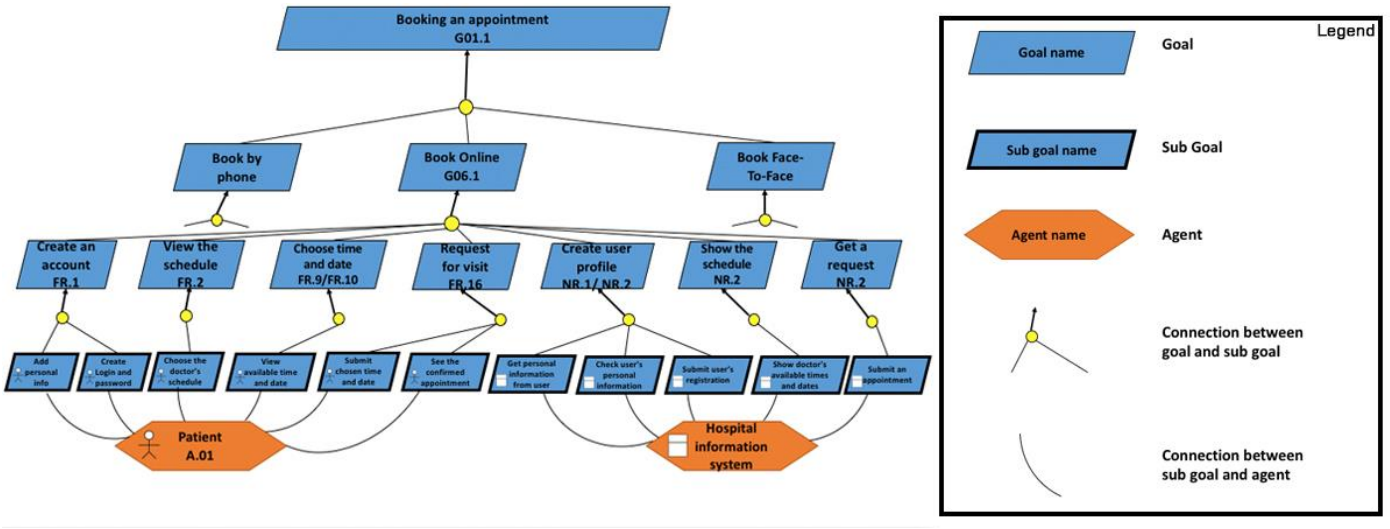
2.6 System Goal Model

KAOS model is a goal-oriented software requirements capturing approach in requirements engineering.

Goal – Prescriptive assertion that captures an objective which the system-to-be should meet
• Achieve/Cease goals – Reach some desired state eventually
• Maintain/Avoid goals – Keep some property invariant

Sub goal – Cannot really be fully satisfied
• Accuracy, Performance, Security

Agent – Active object which plays a specific role towards goal achievement by monitoring or controlling specific object behavior

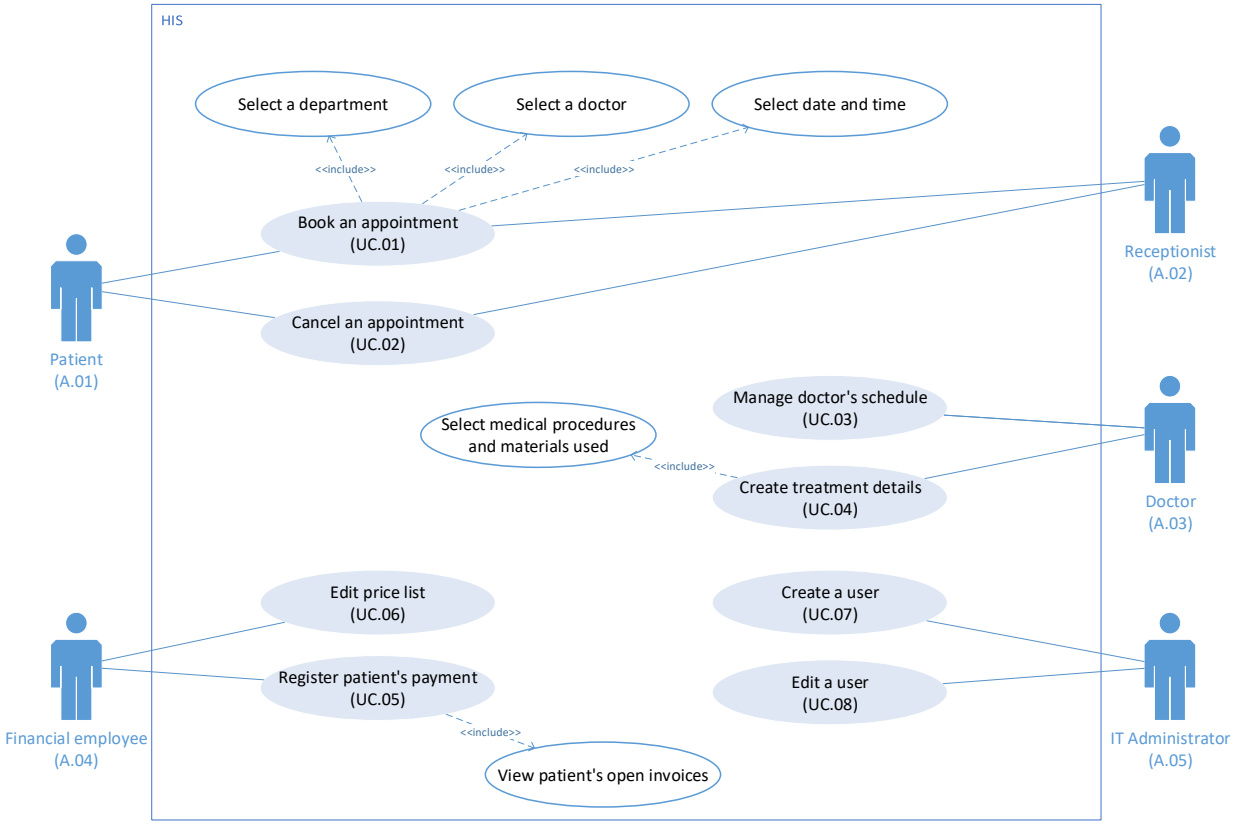


2.7 Use Cases

2.7.1 Use Case Diagram

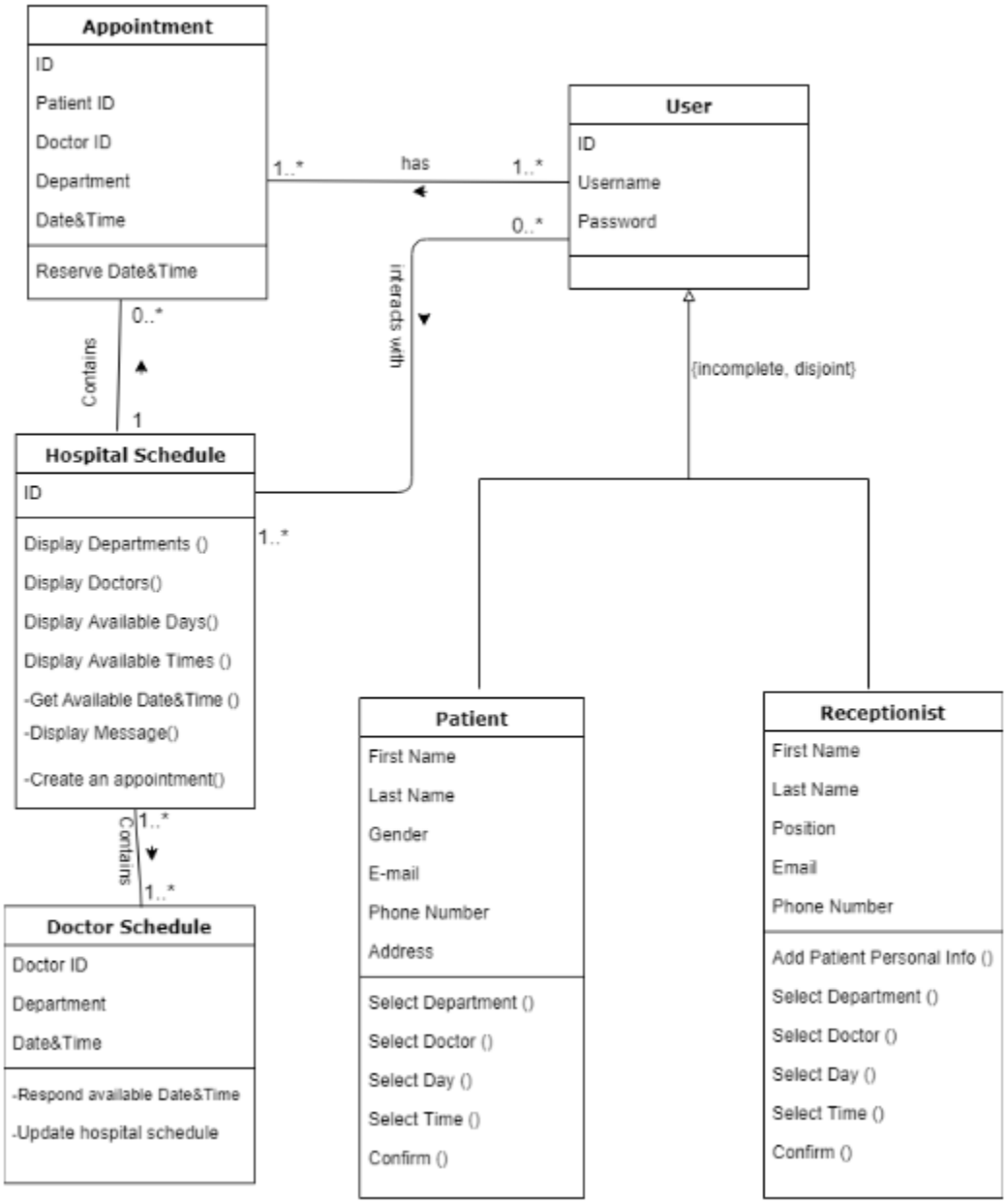
Use case diagram shows which functions are provided by the system and the connections among actors and the function they can use.

Actors are linked with the use cases which they can perform within the system. “Include” connection indicates use cases which are invoked by a lined one.



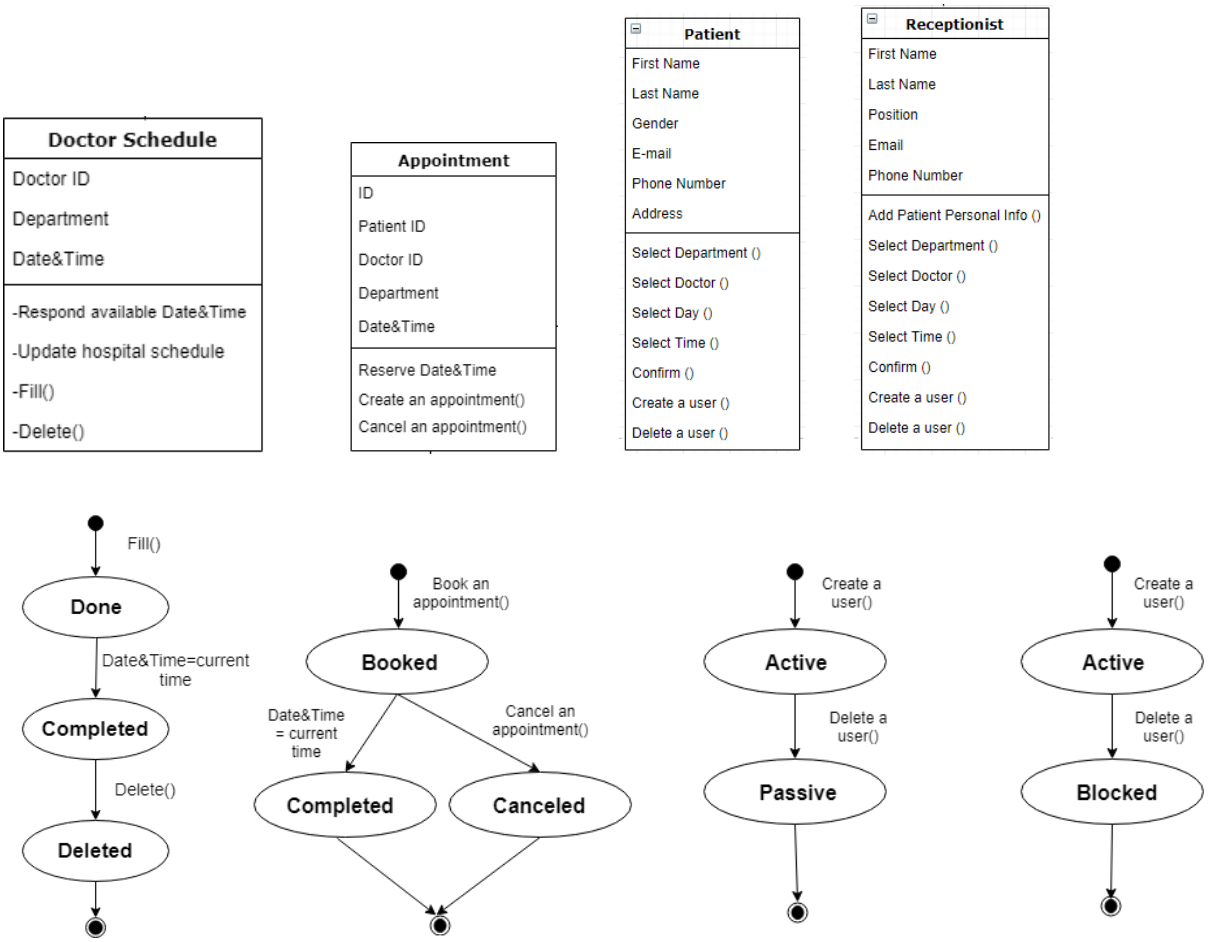
2.7.2 Class Diagram of Booking an Appointment

Class model illustrates and describes the group of objects, which has some similar attributes and common relationships to other objects. This class model is based on the process of booking the appointment.
It contains two actors –patient and receptionist, three objects and their interaction in the system.



2.7.3 State Diagram for Objects of Booking an Appointment

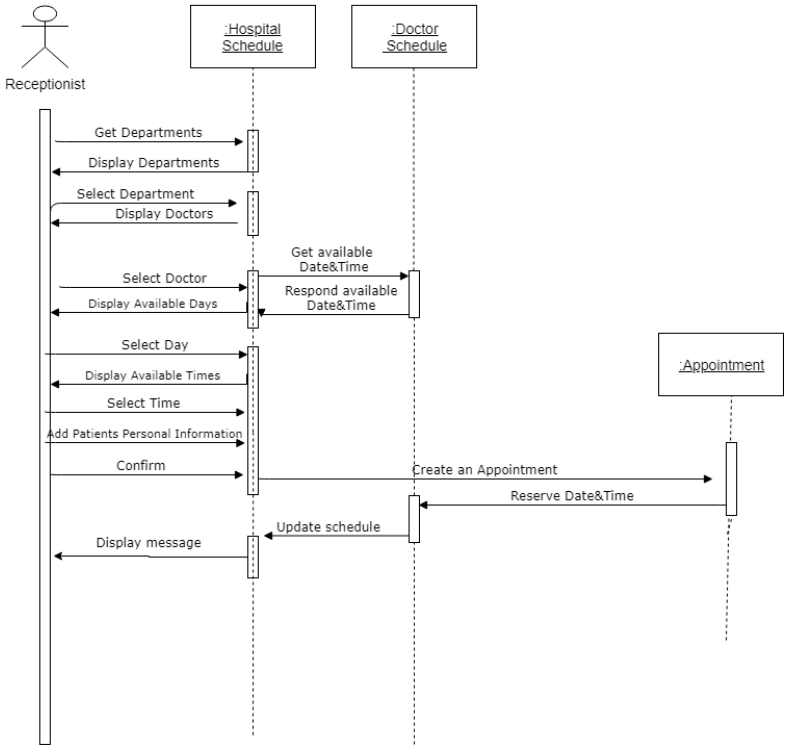
In this state model, there are four objects for booking the appointment. The model describes possible states of the object and shows, which activities or events can change their state.



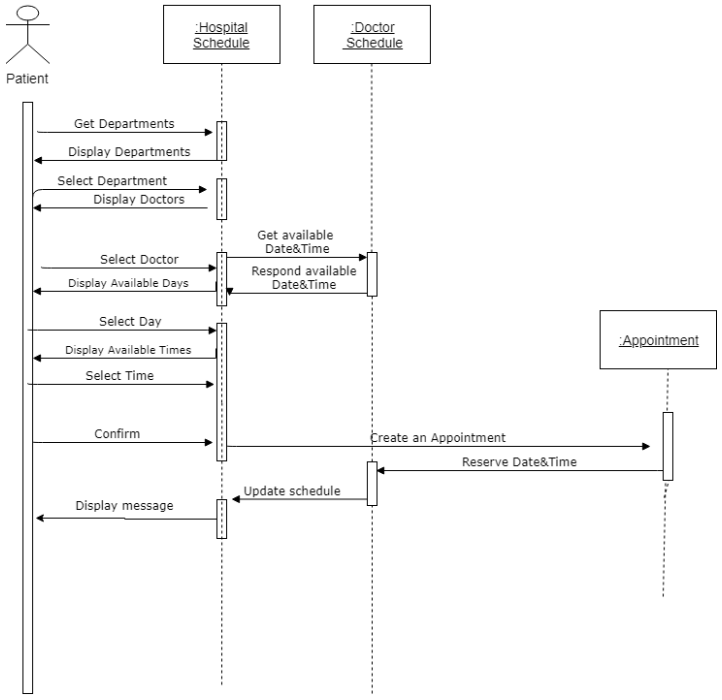
2.7.4 Process of Booking an Appointment

Sequence model describes the process of booking the appointment. It contains participating objects and iterations between them during particular amount of time.

Booking an Appointment for Receptionist



Booking an Appointment for Patient



2.7.5 Use Case Scenarios

ID	UC.01
Name	Book an appointment
Created by	Katsiaryna L.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Patient
Stakeholders and interests	Patient: Wants to visit a doctor. Hospital: Wants to get booking information from patient.
Preconditions	Patient has logged into the HIS.
Postconditions	Appointment is booked.
Main Flow	1. Patient initiates an appointment booking process. 2. HIS displays available hospital departments. 3. Patient selects a department. 4. HIS displays available doctors of the selected department. 5. Patient selects a doctor. 6. HIS displays available day options of the selected doctor. 7. Patient selects a day option. 8. HIS displays available time options of the selected day. 9. Patient selects a time option. 10. Patient submits a confirmation for booking. 11. HIS creates the appointment. 12. HIS reserves the day and time for the appointment in doctor schedule. 13. HIS updates a hospital schedule. 14. HIS displays a notification about a successful appointment booking. 15. HIS sends the patient a confirmation via the email.
Alternative Flow	Patient books an appointment by contacting the hospital receptionist.
Exceptional Flow	1-9. Patient cancels the appointment booking process.
Traceability	Satisfies: G01.1
Version	UC.01v.2

ID	UC.02
Name	Cancel an appointment
Created by	Cem A.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Patient
Stakeholders and interests	Patient: Wants to cancel an appointment booking.
Preconditions	Patient has logged into the HIS. An appointment is booked for the patient in HIS. Patient is viewing the appointment booking.
Postconditions	Appointment booking is canceled.
Main Flow	1. Patient initiates an appointment cancellation process. 2. HIS requests a confirmation for an appointment cancellation. 3. Patient confirms the appointment cancellation. 4. HIS cancels the appointment booking. 5. HIS releases day-time option of the appointment. 6. HIS displays a notification about a successful cancellation.
Alternative Flow	Patient cancels an appointment by contacting the hospital receptionist.
Exceptional Flow	1-3. Patient cancels the cancellation process.
Traceability	Satisfies: G01.3
Version	UC.02v.1

ID	UC.03
Name	Manage doctor's schedule
Created by	Nino G.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Doctor
Stakeholders and interests	Doctor: Wants to manage his/her doctor’s schedule. Hospital: Wants to have a valid hospital schedule.

Preconditions	Doctor has logged into the HIS. Doctor is viewing his/her doctor's schedule.
Postconditions	Hospital schedule is updated.
Main Flow	1. Doctor initiates the doctor's schedule updating process. 2. HIS displays the personal schedule in an editing mode. 3. Doctor updates his/her working days and hours. 4. Doctor submits the updated doctor's schedule. 5. HIS saves the updated doctor's schedule. 6. HIS updates the hospital schedule. 7. HIS displays a notification about a successful schedule update.
Exceptional Flow	1-4. Doctor cancels the doctor's schedule updating process.
Traceability	Satisfies: G03.1
Version	UC.03v.1

ID	UC.04
Name	Create treatment details
Created by	Cem A.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Doctor
Stakeholders and interests	Hospital: Wants to create an invoice for a customer. Financial employee: Wants to get the invoice as a basis for patient's payment collection.
Preconditions	Doctor has logged into the HIS. Doctor is viewing the patient's appointment.
Postconditions	Treatment details are created.
Main Flow	1. Doctor chooses an appointment. 2. Doctor initiates the treatment details creation. 3. HIS displays a list of medical procedures and materials. 4. Doctor chooses the executed medical procedures and used materials. 5. Doctor submits the treatment details. 6. HIS saves the treatment details. 7. HIS creates an invoice on the basis of the treatment details and the valid pricelist. 8. HIS displays a notification about a successful treatment details

	creation.
Exceptional Flow	1-3. Doctor cancels the treatment details creation.
Traceability	Satisfies: G03.2
Version	UC.04v.1

ID	UC.05
Name	Register patient's payment
Created by	Katsiaryna L.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Financial employee
Stakeholders and interests	Hospital: Wants to receive a patient's payment. Financial employee: Wants to collect the patient's payment.
Preconditions	Financial employee has logged into the HIS.
Postconditions	Patient's payment is collected and registered in HIS.
Main Flow	1. Financial employee initiates a payment registration. 2. HIS displays a form for the patient's ID indication. 3. Financial employee enters patient's ID. 4. Financial employee submits patient's ID. 5. HIS checks whether there are open invoices for the submitted patient's ID. 6. Open invoices are found. HIS displays open patient's invoices and the cumulative sum for them. 7. Financial employee collects the payment and closes the open invoices. 8. HIS displays a notification about a successful invoice payments.
Exceptional Flow 1	1-6. Financial employee cancels the payment registration.
Exceptional Flow 2	6. Open invoices are not found. HIS displays a notification about absence of open invoices for the submitted patient's ID.
Traceability	Satisfies: G04.1
Version	UC.05v.1

ID	UC.06
Name	Edit price list
Created by	Cem A.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Financial employee
Stakeholders and interests	Hospital: Wants to have a valid price list. Financial employee: Wants to edit the price list.
Preconditions	Financial employee has logged into the HIS.
Postconditions	The price list is edited.
Main Flow	1. Financial employee initiates the price list editing. 2. HIS displays the price list in the editing mode. 3. Financial employee edits the price list. 4. Financial employee submits the edited price list. 5. HIS saves the updated data of the price list. 6. HIS displays the updated price list. 7. HIS displays a notification about a successful price list update.
Exceptional Flow	1-3. Financial employee cancels the price list editing.
Traceability	Satisfies: G04.3
Version	UC.06v.1

ID	UC.07
Name	Create a user
Created by	Nino G.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Administrator
Stakeholders and interests	Users: Want to get a personalized access to the system. Administrator: Wants to create a user.
Preconditions	Administrator has logged into the HIS.

Postconditions	The user is created.
Main Flow	1. Administrator initiates a user creation. 2. HIS displays a form for entering user's personal data. 3. Administrator enters user's personal data. 4. Administrator submits the form for the user creation. 5. HIS checks if the user's ID is unique for the specified user role. 6. The user's ID is unique. HIS creates the user. 7. HIS send a notification email to a new user with a login link to the specified email address. 8. HIS displays a notification about a successful new user creation.
Exceptional Flow 1	1-3. Administrator cancels the new user creation.
Exceptional Flow 2	5. The user ID is not unique. HIS displays a notification that such user is already created.
Traceability	Based on: G05.1
Version	UC.07v.1

ID	UC.08
Name	Edit a user
Created by	Alexandra M.
Scope	Hospital Information System (HIS)
Level	User goal
Primary actor	Administrator
Stakeholders and interests	Administrator: Wants to edit user's data.
Preconditions	Administrator has logged into the HIS. The user is created. Administrator is viewing the user's personal profile.
Postconditions	The user is edited.
Main Flow	1. Administrator initiates a user editing. 2. HIS displays a user's personal profile in the editing mode. 3. Administrator edits user's personal data. 4. Administrator submits the form for the user editing.

	5. HIS sends a notification email to the user that his/her personal data have been edited. 6. HIS displays a notification about a successful user editing.
Exceptional Flow	1-3. Administrator cancels the new user creation.
Traceability	Based on: G05.1
Version	UC.08v.1

3. Functional Requirements

3.1 Registration and Authentication

Patients Registration (F1.1)

Requirement ID	FR.1
Requirement Type	Functional
Description	Patients should register to system.
Rationale	Patients should be able to get the access to the systems' functionalities.
Originator	Katsiaryna L.
Fit Criterion	System enables patients to enter their personal information and creates their personal profile.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal G06.1
Version	FR.1v.2

Users Authorization (F1.2)

Requirement ID	FR.2
Requirement Type	Functional
Description	Users should login to system.
Rationale	Users should be able to get the personalized access to the systems' functionalities.
Originator	Katsiaryna L.
Fit Criterion	Users' credentials match the credentials stored in the database and the access to the system is granted.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal G06.1
Version	FR.2v.2

Password Recovery (F1.3)

Requirement ID	FR.3
Requirement Type	Functional
Description	User should send a request for password recovery.
Rationale	In case user forgets the password, user should be able to recover the password in order to get access into the system.
Originator	Katsiaryna L.
Fit Criterion	System gets a request for password recovery of the existing user.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium

Traceability	Based on: Goal G06.1
Version	FR.3v.1

Requirement ID	FR.4
Requirement Type	Functional
Description	System should send password recovery link.
Rationale	In case user forgets the password and requests a password recovery, the system should send a link for password recovery to the user's email.
Originator	Katsiaryna L.
Fit Criterion	User receives an email with a password recovery link.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal G06.1
Version	FR.4v.1

Requirement ID	FR.5
Requirement Type	Functional
Description	Users should set new password.
Rationale	In case user forgets the password, user should be able to set a new password to get access into the system.
Originator	Katsiaryna L.
Fit Criterion	User is able to login entering user's login and new password.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium

Traceability	Based on: Goal G06.1
Version	FR.5v.1

3.2 Appointment Scheduling

Appointment Booking (F2.1)

Requirement ID	FR.6
Requirement Type	Functional
Description	Patient should book an appointment.
Rationale	Patient should book an appointment considering chosen doctor and desirable time of visit.
Originator	Katsiaryna L.
Fit Criterion	Appointment is created, the chosen time at the doctor's schedule is booked, changes are displayed in doctor's and hospital schedules.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Satisfies: Goal G01.1
Version	FR.6v.1

Requirement ID	FR.13
Requirement Type	Functional
Description	Receptionist should book an appointment.
Rationale	Patient should book an appointment for a patient considering chosen doctor and desirable time of visit.
Originator	Katsiaryna L.
Fit Criterion	Appointment is created, the chosen time at the doctor's schedule is booked, changes are displayed in doctor's and hospital schedules.

Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Satisfies: Goal G02.1
Version	FR.13v.1

Requirement ID	FR.7
Requirement Type	Functional
Description	Patient should choose the hospital department.
Rationale	In order to choose a doctor according to his/her needs.
Originator	Katsiaryna L.
Fit Criterion	The doctors of the chosen department are displayed and correspond to the data in the database.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal G01.1, Goal G01.2
Version	FR.7v.1

Requirement ID	FR.8
Requirement Type	Functional
Description	Patient should choose the doctor.
Rationale	In order to book the appointment at the doctor’s according to his/her preferences.
Originator	Katsiaryna L.
Fit Criterion	The schedule of the chosen doctor is displayed and corresponds to the data in the database.
Customer Satisfaction	5

Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal G01.1, Goal G01.2
Version	FR.8v.1

Requirement ID	FR.9
Requirement Type	Functional
Description	Patient should choose the date of an appointment.
Rationale	In order to choose the desired date of an appointment according to his/her preferences.
Originator	Katsiaryna L.
Fit Criterion	The timing options of the chosen doctor on the chosen date are displayed and correspond to the data in the database.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal G01.1, Goal G01.2
Version	FR.9v.1

Requirement ID	FR.10
Requirement Type	Functional
Description	Patients should choose the time of an appointment.
Rationale	In order to choose the desired time of an appointment according to his/her preferences.
Originator	Katsiaryna L.
Fit Criterion	The timing option is chosen and corresponds to the data in the database.
Customer Satisfaction	5

Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal G01.1, Goal G01.2
Version	FR.10v.1

Requirement ID	FR.16
Requirement Type	Functional
Description	Patient should view hospital schedule.
Rationale	Patient should be able to find and choose the doctor needed and the free date and time to book the appointment.
Originator	Katsiaryna L.
Fit Criterion	Patient views hospital schedule which corresponds to the hospital schedule in the database.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal 01.1, Goal 01.2
Version	FR.16v.1

Requirement ID	FR.17
Requirement Type	Functional
Description	Receptionist should view hospital schedule.
Rationale	Receptionist should be able to find and choose the doctor needed for a patient and the free date and time to book the appointment.
Originator	Katsiaryna L.
Fit Criterion	Receptionist views hospital schedule which corresponds to the hospital schedule in the database.
Customer Satisfaction	5

Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal 02.1, Goal 02.2
Version	FR.17v.1

Appointment Rescheduling (F2.2)

Requirement ID	FR.11
Requirement Type	Functional
Description	Patients should reschedule an appointment.
Rationale	Patient should be able to change the date and time of the created appointment.
Originator	Katsiaryna L.
Fit Criterion	Precious date and time of the appointment are released at the doctor's schedule, new stated date and time are booked, the updated data is displayed in the doctor's and hospital schedules.
Customer Satisfaction	3
Customer Dissatisfaction	1
Priority	Low
Traceability	Satisfies: Goal G01.2
Version	FR.11v.1

Requirement ID	FR.14
Requirement Type	Functional
Description	Receptionist should reschedule the appointment.
Rationale	Receptionist should be able to change the date and time of the created appointment for a patient.
Originator	Katsiaryna L.
Fit Criterion	Precious date and time of the appointment are released at the

	doctor’s schedule, new stated date and time are booked, the updated data is displayed in the doctors and hospital schedules.
Customer Satisfaction	3
Customer Dissatisfaction	2
Priority	Low
Traceability	Satisfies: Goal G02.2
Version	FR.14v.1

Appointment Cancellation (F2.3)

Requirement ID	FR.12
Requirement Type	Functional
Description	Patient should cancel an appointment.
Rationale	Patient should be able to cancel the appointment in case he/she will not come to the appointment.
Originator	Katsiaryna L.
Fit Criterion	Appointment date and time are released at the doctor’s schedule, the updated data is displayed in the doctors and hospital schedules.
Customer Satisfaction	4
Customer Dissatisfaction	4
Priority	High
Traceability	Satisfies: Goal G01.3
Version	FR.12v.1

Requirement ID	FR.15
Requirement Type	Functional
Description	Receptionist should cancel the appointment.
Rationale	Receptionist should be able to cancel the appointment for a patient in case the patient will not come to the appointment.

Originator	Katsiaryna L.
Fit Criterion	Appointment date and time are released at the doctor's schedule, the updated data is displayed in the doctors and hospital schedules.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Satisfies: Goal 02.3
Version	FR.15v.1

3.3 Schedule Management

Doctor's Schedule Management (F3.1)

Requirement ID	FR.18
Requirement Type	Functional
Description	Doctors should view their personal schedule.
Rationale	Doctors should be able to know when they need to take a patient and when they have free time.
Originator	Alexandra M.
Fit Criterion	Doctors view his personal schedule which corresponds to the hospital schedule in the database.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal 03.1
Version	FR.18v.1

Requirement ID	FR.19
Requirement Type	Functional

Description	Doctors should edit their personal schedule.
Rationale	Doctors should be able to manage the date and time when they can take patients.
Originator	Alexandra M.
Fit Criterion	Previous date and time are released at the doctor's personal schedule, new stated date and time are booked, the updated data is displayed in the doctors and hospital schedules.
Customer Satisfaction	3
Customer Dissatisfaction	3
Priority	Medium
Traceability	Based on: Goal 03.1
Version	FR.19v.1

3.4 Invoicing and Payment

Treatment Details Creation (F4.1)

Requirement ID	FR.20
Requirement Type	Functional
Description	Doctors should create treatment details.
Rationale	Doctors should be able to provide treatment details to the patients.
Originator	Alexandra M.
Fit Criterion	System saves the treatment details and creates an invoice based on the treatment details and the valid pricelist.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Satisfies: Goal 03.2
Version	FR.20v.1

Payments Registration (F4.2)

Requirement ID	FR.21
Requirement Type	Functional
Description	Financial administrator should view registered payments.
Rationale	Financial administrator should be able to view payments and payment details for managerial purposes.
Originator	Nino
Fit Criterion	System shows invoices sorted by date which corresponds to the data stored in the database.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal 04.2
Version	FR.21v.1

Requirement ID	FR.22
Requirement Type	Functional
Description	Financial administration should register payments.
Rationale	Financial administrator should be able to add new payments that are made by patients.
Originator	Nino
Fit Criterion	System allows user to enter the dates, patient’s details in order to provide a payment document.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium

Traceability	Based on: Goal G04.2
Version	FR.22v.1

Getting Payment Reports (F4.3)

Requirement ID	FR.23
Requirement Type	Functional
Description	Financial administrator should download payment report.
Rationale	Financial administrator should be able to download payment report for managerial purposes.
Originator	Nino
Fit Criterion	System creates payment report on the basis of the payments stores in the database and downloads to the user's device.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	Medium
Traceability	Based on: Goal 04.2
Version	FR.23v.1

Price List Management(F4.4)

Requirement ID	FR.24
Requirement Type	Functional
Description	Financial administrator should view the price list.
Rationale	Financial administrator should be able to see price list of all services in a hospital.
Originator	Nino
Fit Criterion	System should show valid prices of all services in the hospital.
Customer Satisfaction	5
Customer	5

Dissatisfaction	
Priority	High
Traceability	Based on: Goal 04.3
Version	FR.24v.1

Requirement ID	FR.25
Requirement Type	Functional
Description	Financial administrator should edit price list.
Rationale	Financial administrator should edit prices of the services in case these prices should be changed.
Originator	Nino
Fit Criterion	System deletes the previous price for the service and sets new price for the service, price list is updated.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal 04.3
Version	FR.25v.1

3.5 System Administration

Users Management (F5.1)

Requirement ID	FR.26
Requirement Type	Functional
Description	Administrator should view the system users.
Rationale	Administrator should be able to see the list of users and their profiles.
Originator	Alexandra M.

Fit Criterion	Administrator can view all users' profiles of the system in the database.
Customer Satisfaction	2
Customer Dissatisfaction	3
Priority	High
Traceability	Based on: Goal 05.1
Version	FR.26v.1

Requirement ID	FR.27
Requirement Type	Functional
Description	Administrator should add a user.
Rationale	Administrator should be able to provide a new user an access to the HIS service.
Originator	Alexandra M.
Fit Criterion	System creates a new user and provides him/her access to the system.
Customer Satisfaction	5
Customer Dissatisfaction	5
Priority	High
Traceability	Based on: Goal 05.1
Version	FR.27v.1

Requirement ID	FR.28
Requirement Type	Functional
Description	Administrator should edit a user.
Rationale	Administrator should be able to change user profile.
Originator	Alexandra M.
Fit Criterion	System saves the changes and shows updated version of user

	profile in HIS.
Customer Satisfaction	4
Customer Dissatisfaction	4
Priority	High
Traceability	Based on: Goal 05.1
Version	FR.28v.1

Requirement ID	FR.29
Requirement Type	Functional
Description	Administrator should delete a user.
Rationale	Administrator should be able to delete user profile from the HIS database.
Originator	Alexandra M.
Fit Criterion	System removes user profile from database.
Customer Satisfaction	2
Customer Dissatisfaction	2
Priority	High
Traceability	Based on: Goal 05.1
Version	FR.29v.1

4. Non-Functional Requirements

REQUIREMENT ID	NR.1
REQUIREMENT TYPE	Non-Functional. Performance
STATEMENT	No more than 1% of the requests for booking an appointment should fail.
PRIORITY	High
TRACEABILITY	Based on: F2.1
VERSION	NR.1v.2

REQUIREMENT ID	NR.2
REQUIREMENT TYPE	Non-Functional.Performance
STATEMENT	HIS should create the appointment request within 1 second.
PRIORITY	Medium
TRACEABILITY	Satisfies; FR.6, FR.13
VERSION	NR.2v.2

REQUIREMENT ID	NR.3
REQUIREMENT TYPE	Non-Functional.Performance
STATEMENT	HIS should create the request for the treatment details creation within 1 second.
PRIORITY	Medium
TRACEABILITY	Satisfies; FR.20
VERSION	NR.3v.2

Requirement ID	NR.4
REQUIREMENT TYPE	Non-Functional.Reliability
STATEMENT	Patients should access to HIS over Internet.
PRIORITY	High
TRACEABILITY	Satisfies; FR.1, FR.2, FR.3, FR.4, FR.5, FR.6, FR.7, FR.8, FR.9, FR.10, FR.11, FR.12
VERSION	NR.4v.1

REQUIREMENT ID	NR.5
REQUIREMENT TYPE	Non-Functional.Reliability
STATEMENT	No more than 1 per 1000000 appointment creations shall result in a failure.
PRIORITY	High
TRACEABILITY	Satisfies; FR.6, FR.13
VERSION	NR.5v.1

REQUIREMENT ID	NR.6
REQUIREMENT TYPE	Non-Functional.Security
STATEMENT	Access to HIS must comply with the access policy specification of the system.
PRIORITY	High
TRACEABILITY	Satisfies; FR.1
VERSION	NR.6v.2

REQUIREMENT ID	NR.7
REQUIREMENT TYPE	Non-Functional.Security
STATEMENT	The system shall identify users before allowing them to use system capabilities.
PRIORITY	High
TRACEABILITY	Satisfies; FR.1, FR.2
VERSION	NR.7v.1

REQUIREMENT ID	NR.8
REQUIREMENT TYPE	Non-Functional.Maintainability
STATEMENT	Updating of HIS should not change any of the database contents.
PRIORITY	High
TRACEABILITY	Satisfies; FR.1, FR.2, FR.6, FR.13
VERSION	NR.8v.1

REQUIREMENT ID	NR.9
REQUIREMENT TYPE	Non-Functional.Maintainability
STATEMENT	The bugs related with user authorization should be fixed in 4 hours by a software developer which has at least 1 year experience.
PRIORITY	High
TRACEABILITY	-
VERSION	NR.9v.2

REQUIREMENT ID	NR.10
REQUIREMENT TYPE	Non-Functional.Portability
STATEMENT	HIS should be portable to the Windows, Macos and Linux operating systems.
PRIORITY	High
TRACEABILITY	-
VERSION	NR.10v.1

5. Solution-oriented requirements

Requirement ID	SR.1
Requirement Type	Solution Oriented
Description	Patient should be able to book more than one appointment.
Priority	High
Traceability	Based on: F2.1, Class diagram
Version	SR.1v.2

Requirement ID	SR.2
Requirement Type	Solution Oriented
Description	Patient should have a unique personal ID.
Priority	High
Traceability	Based on: Class diagram
Version	SR.2v.1

Requirement ID	SR.3
Requirement Type	Solution Oriented
Description	Patient should select the department to add the department value to the appointment.
Priority	High
Traceability	Based on: F2.1, Class diagram
Version	SR.3v.1

Requirement ID	SR.4
Requirement Type	Solution Oriented

Description	HIS should have at least 1 doctor’s schedule to create a hospital schedule.
Priority	High
Traceability	Based on: Class diagram
Version	SR.4v.1

Requirement ID	SR.5
Requirement Type	Solution Oriented
Description	The status of the appointment is “cancelled” after patient confirms the appointment cancellation.
Priority	High
Traceability	Based on: State diagram
Version	SR.5v.2

Requirement ID	SR.6
Requirement Type	Solution Oriented
Description	The status of the appointment should be “completed” after the date&time of the appointment equals to the current date&time in HIS.
Priority	High
Traceability	Based on: State diagram
Version	SR.6v.2

Requirement ID	SR.7
Requirement Type	Solution Oriented
Description	The status of patient should be “active” after the patient is created in HIS.
Priority	High

Traceability	Based on: State diagram 2
Version	SR.7v.2

Requirement ID	SR.8
Requirement Type	Solution Oriented
Description	Receptionist with the status “blocked” should have no access to HIS.
Priority	High
Traceability	Based on: State diagram
Version	SR.8v.1

Requirement ID	SR.9
Requirement Type	Solution Oriented
Description	Patient should view the list of available doctors of the specified department after the department is selected.
Priority	High
Traceability	Based on: Sequence diagram
Version	SR.9v.1

Requirement ID	SR.10
Requirement Type	Solution Oriented
Description	Patient should select the doctor to view available Date&Time options for the selected doctor.
Priority	High
Traceability	Based on: Sequence diagram
Version	SR.10v.1

Requirement ID	SR.11

Requirement Type	Solution Oriented
Description	Patient should select department, doctor and date&time for the appointment to be created.
Priority	High
Traceability	Based on: Sequence diagram
Version	SR.11v.2

Requirement ID	SR.12
Requirement Type	Solution Oriented
Description	After the appointment is created, the specified Date&Time should be reserved in the hospital schedule.
Priority	High
Traceability	Based on: Sequence diagram
Version	SR.12v.2

6. Appendices

6.1 Requirements Prioritization

Must have (mandatory)	Should have	Should not have
FR.1	FR.3	FR.11
FR.2	FR.4	FR.14
FR.6	FR.5	
FR.7	FR.12	
FR.8	FR.15	
FR.9	FR.23	
FR.10	FR.24	
FR.16	FR.28	
FR.17		
FR.18		
FR.19		
FR.20		
FR.21		
FR.22		
FR.25		
FR.26		
FR.27		
FR.29		

Value Table:

VALUE	F1.1	F1.2	F1.3	F2.1	F2.2	F2.3	F3.1	F4.1	F4.2	F4.3	F4.4	F5.1
F1.1	1,00	8,00	7,00	0,33	9,00	2,00	3,00	0,33	0,50	5,00	4,00	5,00
F1.2	0,13	1,00	0,50	0,10	2,00	0,17	0,20	0,13	0,14	0,33	0,25	0,50
F1.3	0,14	2,00	1,00	0,11	2,00	0,17	0,20	0,11	0,13	0,33	0,25	0,50
F2.1	3,00	10,00	9,00	1,00	10,00	7,00	6,00	9,00	8,00	4,00	5,00	3,00
F2.2	0,11	0,50	0,50	0,10	1,00	0,14	0,17	0,10	0,11	0,25	0,20	0,33
F2.3	0,50	6,00	6,00	0,14	7,00	1,00	2,00	0,33	0,50	3,00	2,00	4,00
F3.1	0,33	5,00	5,00	0,17	6,00	0,50	1,00	0,25	0,33	3,00	2,00	4,00
F4.1	3,00	8,00	9,00	0,11	10,00	3,00	4,00	1,00	2,00	5,00	4,00	6,00
F4.2	2,00	7,00	8,00	0,13	9,00	2,00	3,00	0,50	1,00	5,00	4,00	6,00
F4.3	0,20	3,00	3,00	0,25	4,00	0,33	0,33	0,20	0,20	1,00	0,50	2,00
F4.4	0,25	4,00	4,00	0,20	5,00	0,50	0,50	0,25	0,25	2,00	1,00	3,00
F5.1	0,20	2,00	2,00	0,33	3,00	0,25	0,25	0,17	0,17	0,50	0,33	1,00
SUM	10,86	56,50	55,00	2,97	68,00	17,06	20,65	12,37	13,33	29,42	23,53	35,33

Normalized:

	F1.1	F1.2	F1.3	F2.1	F2.2	F2.3	F3.1	F4.1	F4.2	F4.3	F4.4	F5.1	SUM	SUM/12	RESULT
F1.1	0,09	0,14	0,13	0,11	0,13	0,12	0,15	0,03	0,04	0,17	0,16997	0,14151	1,41	0,11782	**11,8%**
F1.2	0,01	0,02	0,01	0,03	0,03	0,01	0,01	0,01	0,01	0,01	0,01062	0,01415	0,18	0,01481	**1,5%**
F1.3	0,01	0,04	0,02	0,04	0,03	0,01	0,01	0,01	0,01	0,01	0,01062	0,01415	0,21	0,01729	**1,7%**
F2.1	0,28	0,18	0,16	0,34	0,15	0,41	0,29	0,73	0,60	0,14	0,21246	0,08491	3,56	0,29685	**29,7%**
F2.2	0,01	0,01	0,01	0,03	0,01	0,01	0,01	0,01	0,01	0,01	0,0085	0,00943	0,14	0,01132	**1,1%**
F2.3	0,05	0,11	0,11	0,05	0,10	0,06	0,10	0,03	0,04	0,10	0,08499	0,11321	0,93	0,0777	**7,8%**
F3.1	0,03	0,09	0,09	0,06	0,09	0,03	0,05	0,02	0,03	0,10	0,08499	0,11321	0,78	0,06479	**6,5%**
F4.1	0,28	0,14	0,16	0,04	0,15	0,18	0,19	0,08	0,15	0,17	0,16997	0,16981	1,88	0,15634	**15,6%**
F4.2	0,18	0,12	0,15	0,04	0,13	0,12	0,15	0,04	0,08	0,17	0,16997	0,16981	1,52	0,1263	**12,6%**
F4.3	0,02	0,05	0,05	0,08	0,06	0,02	0,02	0,02	0,02	0,03	0,02125	0,0566	0,45	0,0373	**3,7%**
F4.4	0,02	0,07	0,07	0,07	0,07	0,03	0,02	0,02	0,02	0,07	0,04249	0,08491	0,60	0,0496	**5,0%**
F5.1	0,02	0,04	0,04	0,11	0,04	0,01	0,01	0,01	0,01	0,02	0,01416	0,0283	0,36	0,02988	**3,0%**

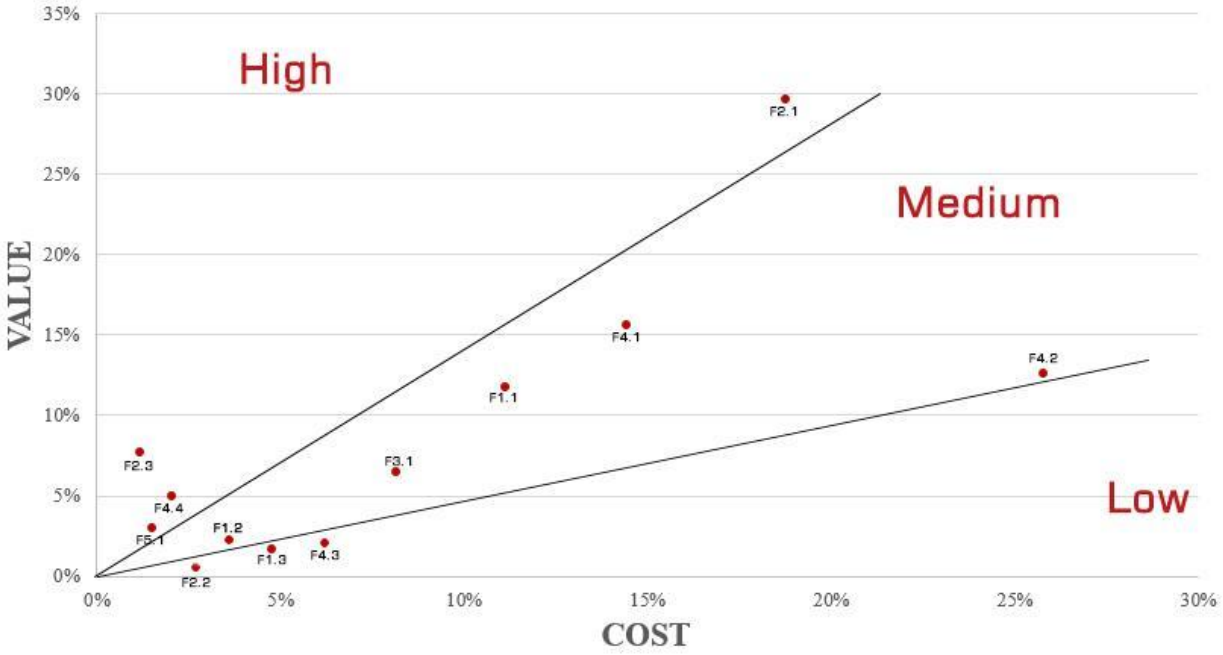
Cost Table:

COST	F1.1	F1.2	F1.3	F2.1	F2.2	F2.3	F3.1	F4.1	F4.2	F4.3	F4.4	F5.1
F1.1	1,00	4,00	5,00	0,33	6,00	8,00	2,00	0,50	0,25	3,00	6,00	7,00
F1.2	0,25	1,00	0,50	0,14	2,00	5,00	0,25	0,17	0,13	0,33	3,00	4,00
F1.3	0,20	2,00	1,00	0,17	3,00	6,00	0,33	0,20	0,14	0,50	4,00	5,00
F2.1	3,00	7,00	6,00	1,00	7,00	10,00	3,00	2,00	0,50	4,00	8,00	9,00
F2.2	0,17	0,50	0,33	0,14	1,00	4,00	0,25	0,14	0,11	0,33	2,00	3,00
F2.3	0,13	0,20	0,17	0,10	0,25	1,00	0,14	0,11	0,10	0,17	0,33	0,50
F3.1	0,50	4,00	3,00	0,33	4,00	7,00	1,00	0,33	0,20	2,00	5,00	6,00
F4.1	2,00	6,00	5,00	0,50	7,00	9,00	3,00	1,00	0,33	3,00	7,00	8,00
F4.2	4,00	8,00	7,00	2,00	9,00	10,00	5,00	3,00	1,00	5,00	8,00	9,00
F4.3	0,33	3,00	2,00	0,25	3,00	6,00	0,50	0,33	0,20	1,00	4,00	5,00
F4.4	0,17	0,33	0,25	0,13	0,50	3,00	0,20	0,14	0,13	0,25	1,00	2,00
F5.1	0,14	0,25	0,20	0,11	0,33	2,00	0,17	0,13	0,11	0,20	0,50	1,00
SUM	11,88	36,28	30,45	5,21	43,08	71,00	15,84	8,06	3,20	19,78	48,83	59,50

Normalized:

	F1.1	F1.2	F1.3	F2.1	F2.2	F2.3	F3.1	F4.1	F4.2	F4.3	F4.4	F5.1	SUM	SUM/12	RESULT
F1.1	0,08	0,11	0,16	0,06	0,14	0,11	0,13	0,06	0,08	0,15	0,12287	0,11765	1,3332	0,11	**11,1%**
F1.2	0,02	0,03	0,02	0,03	0,05	0,07	0,02	0,02	0,04	0,02	0,06143	0,06723	0,43037	0,04	**3,6%**
F1.3	0,02	0,06	0,03	0,03	0,07	0,08	0,02	0,02	0,04	0,03	0,08191	0,08403	0,5727	0,05	**4,8%**
F2.1	0,25	0,19	0,20	0,19	0,16	0,14	0,19	0,25	0,16	0,20	0,16382	0,15126	2,24909	0,19	**18,7%**
F2.2	0,01	0,01	0,01	0,03	0,02	0,06	0,02	0,02	0,03	0,02	0,04096	0,05042	0,32222	0,03	**2,7%**
F2.3	0,01	0,01	0,01	0,02	0,01	0,01	0,01	0,01	0,03	0,01	0,00683	0,0084	0,13833	0,01	**1,2%**
F3.1	0,04	0,11	0,10	0,06	0,09	0,10	0,06	0,04	0,06	0,10	0,10239	0,10084	0,97767	0,08	**8,1%**
F4.1	0,17	0,17	0,16	0,10	0,16	0,13	0,19	0,12	0,10	0,15	0,14334	0,13445	1,73031	0,14	**14,4%**
F4.2	0,34	0,22	0,23	0,38	0,21	0,14	0,32	0,37	0,31	0,25	0,16382	0,15126	3,08943	0,26	**25,7%**
F4.3	0,03	0,08	0,07	0,05	0,07	0,08	0,03	0,04	0,06	0,05	0,08191	0,08403	0,73055	0,06	**6,1%**
F4.4	0,01	0,01	0,01	0,02	0,01	0,04	0,01	0,02	0,04	0,01	0,02048	0,03361	0,24546	0,02	**2,0%**
F5.1	0,01	0,01	0,01	0,02	0,01	0,03	0,01	0,02	0,03	0,01	0,01024	0,01681	0,18066	0,02	**1,5%**

Plot ROI graph



6.2 Prototype of the Appointment Booking Process

Step 1: Patient initiates the booking process from this page by pressing the “BOOK an appointment” button.

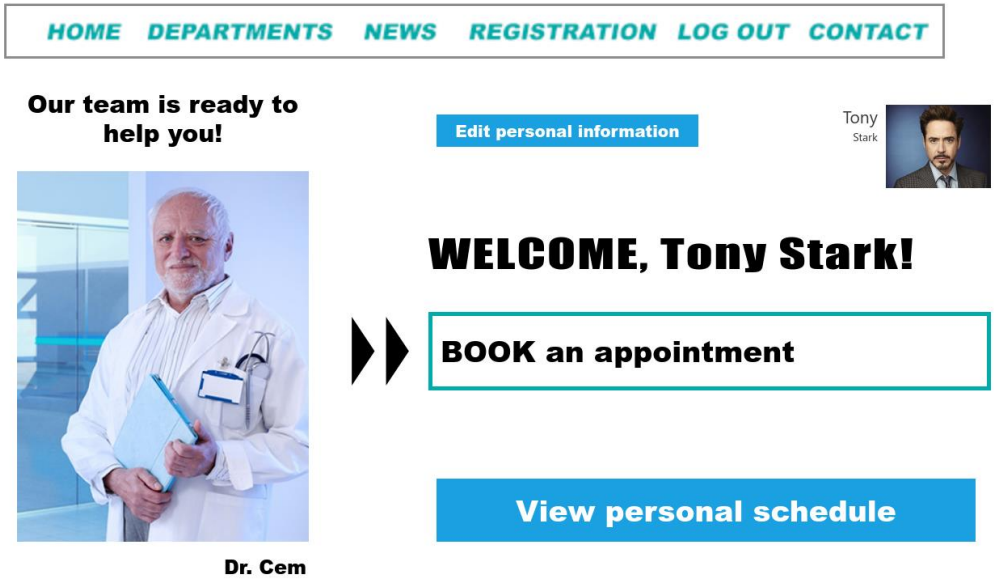


Image 1 – Initiate booking an appointment.
Traceability: Based on UC.01.

Step 2: Patient chooses a department.
Step 3: Patient chooses a doctor.

Image 2 - Choose department and doctor.
Traceability: Based on UC.01.

Step4: Patient chooses the day.

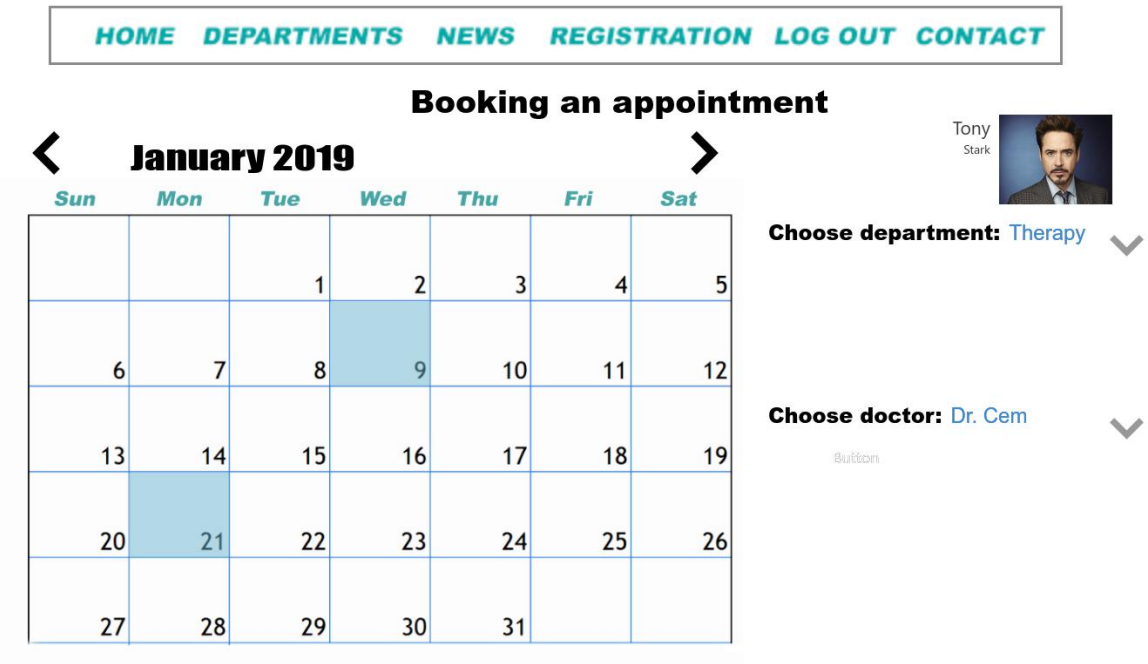


Image 3 - Choose available day
Traceability: Based on UC.01.

Step5: Patient chooses the time.
Step6: Patient confirms the appointment.

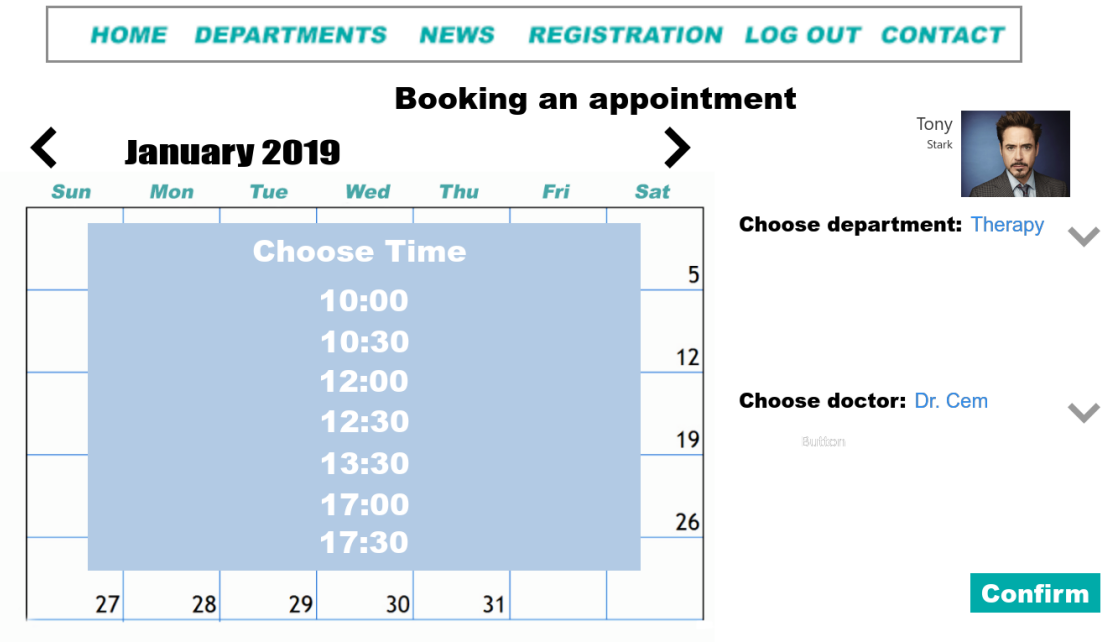


Image 4 - Choose available time and confirm.

Traceability: Based on UC.01.
Step7: The system displays a message.

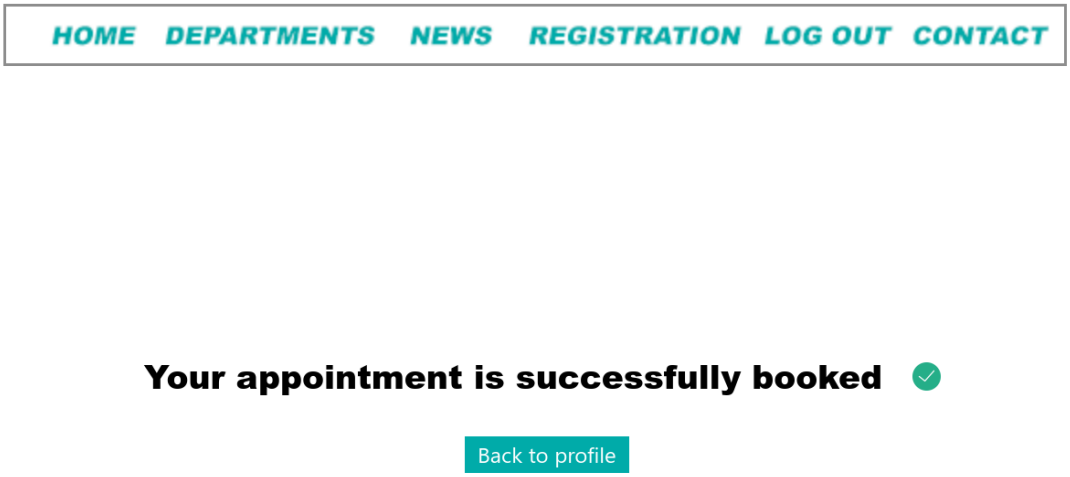


Image 5 – Display a message.
Traceability: Based on UC.01.

Link

https://wetransfer.com/downloads/71e69ccd6117e194ee6077ce6dfe97fb20181216224615/5c8015?fbclid=IwAR1P5dtwr10UtMjaAxPx9GcwcW3ExxOxDbXt48nbNfxmfuJLCbkkyi47low

6.3 Traceability

Traceability Model

The traceability model shows that the specification has the following artefacts: goals, use cases, features, requirements and diagrams. These artefacts are interconnected with such traceability relations as "satisfies" and "based on".