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SOFTWARE ENGINEERING

COMP433

Project Phase NO:1

i-Smile

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Introduction

First of all, we are pleased that you have considered our company among your options and be confident that we will provide the best software solutions. We have read your request and identified the issues you are facing in your current system. As your clinic has grown exponentially, it has become more challenging to manage doctors, patients and the other employees using MS access and various documents such as Excel files or google sheets and hard copies, it is difficult to manage the large number of patients, Financial and inventory matters. This variety in data-saving approaches adds complexity to report generation, and the system struggles to efficiently produce reports, resulting in delays when collecting data from employees who save information differently.

In your current system, we understand that patients must contact the reception staff to schedule appointments and manually complete paper registration forms during their initial visit. This manual scheduling process can be time-consuming and present difficulties, such as scheduling conflicts between doctors or unexpected unavailability. It becomes even more intricate if one doctor needs to replace another. Furthermore, managing changes and cancellations of inpatient appointments adds to the complexities of the scheduling process. To address these issues, we are developing software that will enable patients to conveniently schedule their appointments directly through a website. This means that the software we're developing will help you create a new software system that utilizes modern technology to solve your issues and provide intelligent features that can improve your efficiency and reduce staff time and effort, all while focusing on patient-centered care.

During each patient's appointment, doctors manually record treatment details, necessary medications, and the agenda for the next session. This process is not only time-consuming but also inefficient, as doctors often need to search through patient files during subsequent sessions. Furthermore, the multitude of manually stored files in various formats makes it challenging to monitor each patient's progress effectively. This complexity extends to crucial records like X-ray images, which are at risk of being misplaced. The clinic also recognizes the benefits of providing a family discount but lacks a clear implementation plan. Additionally, they seek to enhance communication among staff by establishing more reliable reference materials to avoid issues related to forgotten discussions. Moreover, there are challenges in managing patients' financial records due to the manual process. This includes difficulties in tracking what patients owe and what they have paid, especially for patients who make payments in installments.

The clinic faces difficulties in promptly notifying inventory staff when supplies run low. Furthermore, the current practice of making reminder calls to patients about their upcoming appointments is time-consuming and not always effective in reaching patients.

We propose developing a customized clinic website that includes information about the clinic's operating hours, services with their prices, doctor profiles, available weekly appointment slots, contact details, patient access to book appointments, view payment details, and medication information.

As a software development company, our solution to the current system is to create software that integrates all employee tasks, streamlining their workflows by automating manual processes. Some of what we will do will simplify tasks for all. Employees will have their schedules on their system, continuously updated, and easy communication between them. Doctors will have access to patient's files at any time, while inventory staff will receive alerts for low supplies and doctor requests. Receptionists won't need to manually fill out patient files; patients can complete them on the website. Patients can also book appointments on that website, and appointment reminders will be sent automatically via text messages.

Overall, our comprehensive clinic management software is designed to simplify clinic management, regardless of its size, away from paper complications and many details. It offers efficient organization of patient-related data, reservation, and appointment management, visual representation of treatment plans, text messaging, staff management, account and payment management, inventory and medication control, invoice and report generation, and minimizes the risk of losing information with referring to them easily and controlling all its details at any time and in any place. Our software uses smart navigation features to save time and reduce errors, ensuring that you can manage all aspects of your clinic with ease, efficiency, and precision.

Features:

➤ Functional:

- **Website Features**
 1. **Website Development:** Based on your request, it's clear that your current website only displays your location, a portion of your services, and contact numbers. Therefore, we will work on enhancing it to incorporate more features that will facilitate patients' interactions with your clinic.
 - The website enables patients to utilize electronic booking, showcasing the clinic's services along with their respective prices and estimated durations which will be as a button that can be chose. After choosing the service, the patient then selects their preferred or available doctor, followed by a calendar displaying the open dates. Upon choosing a date, the patient is presented with suitable appointment slots that align with the required time and service.
 - The reservation is not confirmed until the patient logs in through his electronic account and phone number. Then he is asked to fill out a special form to collect the necessary information about him. After logging in again to the website, the same booking steps as before appear, except for requesting personal information. There is also the ability to cancel or edit the reservation details.
 - The patient's file is not created until after the first visit to the clinic, which is checked by the receptionist after verifying his information which are already filled through the website by the patient.
 - The website makes it easy for patients to access payment history and installment details through the financial history section.
- 2. **Treatment Planning:** On the website we are developing, there will be a dedicated section for treatment plans. A comprehensive treatment plan will be created and presented to the patient before the treatment commences. This plan will include detailed visuals, a comprehensive explanation of the patient's condition, the treatment process, the estimated treatment duration, as well as the presentation of videos and images from previous cases.
- The software will also showcase the approach for managing each treatment case that the clinic deals with, such as treatment of tooth loss, tooth repairs, tooth implants, dental cosmetics, as well as delta emergency services.

- Additionally, the website will provide post-treatment result presentations, enabling the patient to place complete trust in the clinic by visualizing the treatment process and expected outcomes. Furthermore, any medications prescribed by the doctor will be uploaded to the patient's file on the website.

• **System Features**

The clinic's website will be directly linked with the dedicated system, so that the patient's information is shown to the receptionist to place it in the patient's file in the system.

The patient can then book his appointments through the website, and the appointment will appear on the doctor's calendar and receptionist.

1. **Employee Login:** Employees are required to register for an account by providing their name, email address, and password to access the system's functionality. The easy-to-use interface that appears when you open the application request can be used to do this. After creating an account, employees can use the same login credentials to access their settings and features. Each employee has unique characteristics depending on the nature of the work he does in the clinic.
2. **Scheduling Appointments:** The program can include a weekly work schedule that is easy to edit by dragging and dropping employee names, this process is done by the receptionist. The names of employees are arranged in the table according to their working hours. This schedule is available to all relevant employees through a dedicated section in the software that displays the weekly schedule for each employee. Using this schedule, employees can click on their assigned shift to view the exact timing of their shift. If the employee is a doctor, they will also see details about the patients scheduled for that period, including information from the patient's file and the nature of the treatment to be performed. The duration of each patient's appointment is determined according to what was booked through the website, or by the receptionist, as it is possible to book by calling the clinic's numbers and arranging a suitable appointment, or coming to the clinic and booking an appointment if the patient does not know the clinic's website and its numbers, in addition to setting 5 minutes between appointments. Additionally, any modifications made to the schedule are immediately visible to all employees.

3. Communication Management:

- Employees Communication:**

Our dental clinic software provides a seamless communication system to enhance teamwork and streamline clinic operations. It simplifies communication and exchanges information with high security and reliability.

- ↳ Through a messaging platform for employees, messages are sent between them, and all these messages are saved securely and with high reliability.
- ↳ A special notification system has also been developed between doctors and the inventory employee. If the doctor needs a specific inventory item, a notification with the name of the item is sent to the inventory employee and thus sent to him as quickly as possible.

- Communication with Patients:**

In terms of patient communication, our software simplifies the process for reception staff. They can use automatic messages to send appointment reminders before the appointment with sufficient time, notify patients about a change in their chosen doctor, or send other messages easily through the "Send Messages to Patients" feature.

4. Inventory management:

- Our system manages inventory by categorizing items by name and displaying images, facilitating easy access to information regarding quantity and price. When an item's quantity falls below a certain threshold, the software immediately notifies the inventory clerk, enabling them to address shortages promptly. This approach allows for continuous inventory monitoring and daily checks to identify deficiencies, reducing the workload.
- Additionally, the system enables the inventory clerk to easily add or subtract specific quantities of items with automatic updates of item availability.
- The system also allows the employee to order a specific product through an inventory box, which presents a list of available items, along with their quantities, and provides a space for entering the required quantity.

5. Patients Files:

- One of the most important problems that we were interested in solving is the problem of patient files, where an employee can access any patient's file from the patients section of the system by searching for the patient's name to show him all the information authorized for this employee to identify the patient, such as general information, the patient's medical record, the financial file,

visit details and recommended medications and X-rays which all must be taken and recorded in a file for each patient at the first visit for him. This makes it particularly easy for the doctor to know any important information about the patient, such as the chronic or infectious diseases he suffers from, if any, or the presence of an allergy to a specific substance, which appears in the form of a warning when opening the file to draw the doctor's attention.

- Moreover, it simplifies the process of accurately documenting session details and treatment plans by showing the doctor a picture of the teeth. He identifies the teeth he worked on in the session and shows him a list of the services provided by the clinic so that he can choose what he did from them, or also shows him a place where he can write a special explanation if he wants, this information is saved for use in future sessions. When you click on the tooth, an explanation of what the doctor did previously appears, which saves time compared to writing and keeping records manually.
 - No more searching through paper files; Everything is organized in the patient's digital file. This system is also useful when another doctor needs to take over a patient's care, as all the necessary information is readily available. In addition, the file includes a section displaying all X-ray images that are added by the X-ray employee. Patients' financial accounts are also easily accessible, including payments, outstanding balances, and information about installment plans or discounts.
6. **Reports:** Reports are a crucial component of our system, featuring pre-designed templates for comprehensive reports related to patients and inventory. The employee responsible for creating the required report can easily gather the necessary information in a short time, making report preparation a straightforward process.
7. **Emergency Situations:** Emergency: An emergency button will be created in the system so that when an emergency comes to the clinic at a time when there is no empty appointment, all the receptionist has to do is specify the duration of the emergency in a designated place on the program and press the button to send automatic messages to patients stating that their appointment has been postponed for the specified period. Which is somewhat short and is determined by the doctor. This automatically moves the entire schedule with the same duration to all patients on that day, or identifies the patients whose appointments will be affected by the emergency and sends the message to them only and moves only their appointments in the schedule as well automatically.

8. **Payment Management:** After the doctor records what was accomplished in the session, the system automatically calculates the fees resulting from the session to the patient's financial file that appears to the receptionist, where the fees for each service are already registered in the system, and the receptionist only has to specify the payment method and record the payments.
9. **Financial Management:** Regarding financial matters, in the financial management section, we will create sections for salaries, payments, and expenses. Special tables will be created for both payments and expenses, in which payments could be entered, such as inventory items and salaries, for example, and expenses such as clinic rent, electricity bills, etc. could be entered. In the field of salaries, which are considered payments, the salaries of employees will be processed precisely according to the work of each of them. For example, the salary of each doctor differs from the other according to the number of patients and their cases that each of them treated separately. So that the system creates a report for each doctor separately on all that was accomplished during a period determined by the clinic, and according to equations determined by the clinic, the salary of each doctor is also determined.
10. **Family Discount:** Our system is based on creating family files that include the files of all patients from the same family, and rules for discounts are set based on rules determined by the clinic.
11. **Mobile App:** We will work to ensure that the program includes a mobile phone application that can be used by all clinic staff, starting from the doctor, down to the inventory clerk and reception staff, in addition to patients, where each user can access the features and characteristics of the program from their smartphones, and will have access to Program features and functions according to the permissions given to each user. This application will facilitate work, communication, and performing some required functions, even if the employee is outside the center.

➤ **Non-functional:**

- **Performance:** Our program is designed to be swift and efficient, tailored specifically to the clinic's requirements, focusing on improving performance and reducing the time and effort of

the clinic staff. To ensure successful user engagement, we will aim to make the system capable of supporting several concurrent users while maintaining suitable response times.

- **Usability:** Our commitment is to guarantee that our program is designed for ease of use, featuring an eye-catching and user-friendly design that supports smooth navigation and quick data access. The goal is to empower users to effortlessly browse and perform tasks through an intuitive interface, reducing the need for lengthy training.
- **Security:** Our focus on security involves establishing strong mechanisms within the system, including a complete set of measures to protect data. These measures will ensure that access is restricted to authorized users, thereby protecting sensitive information and preventing unauthorized access or breaches.
- **Scalability:** Our software will be built on a scalable platform that can easily grow and adapt so it can handle increasing data volumes and user loads without compromising performance.
- **Reliability:** In our system, we are committed to delivering uninterrupted access to all services, with a primary focus on high availability and minimal downtime. We'll make sure the system runs seamlessly on various employee devices, offering compatibility with diverse operating systems, web browsers, and devices to meet the users' varied needs. Our top priority is upholding data integrity and reliability, safeguarding the secure storage, processing, and transmission of information to prevent any loss or damage.
- **Data Privacy:** We will guarantee that the system adheres to relevant data privacy laws and safeguards user's personal information through efficient data anonymization and encryption techniques. Also, in terms of connections, the system will enable smooth data sharing and communication with other platforms, including email, social media, and related systems, to enhance collaboration and information exchange.

Software development process

The "I-Smile" project will follow an incremental development approach, enabling customers to engage with and offer feedback on newly introduced features. This incremental strategy enhances system stability by facilitating thorough testing of each feature before its final release, ensuring the system's proper functionality.

To achieve this approach effectively, it is recommended to divide the system into smaller components and progressively build, test, and present them to customers. This approach reduces the feedback gap between customers and developers since feedback is continuously captured and incorporated during the development process.

The term "release" refers to iterations of the software system that are provided to customers. Each release encompasses a set of tested features or end-user stories. The project is divided into four releases to facilitate systematic development. The initial release will focus on the development of the website and essential features, including scheduling and patient file management. The second release may introduce additional functionality, such as financial and communication management. The third release will encompass reports and inventory management, while the fourth release will focus on achieving full system performance and enhancing the user experience.

By breaking down the project into releases and delivering them progressively, the development team ensures that i-Smile promptly gains access to crucial features. This approach provides continuous opportunities for feedback and iteration, highlighting the iterative nature of the process. It is crucial to integrate input from i-Smile at each stage to ensure that the software solution meets their requirements and expectations.

In addition to the Incremental approach, we will incorporate prototyping, since clients should be able try out design options, and find out more about the problem to find its possible solutions to make the system usable, reliable and easy to use for users.



Figure 1: System's icon

Phase 2: UML diagrams and use cases

System UML

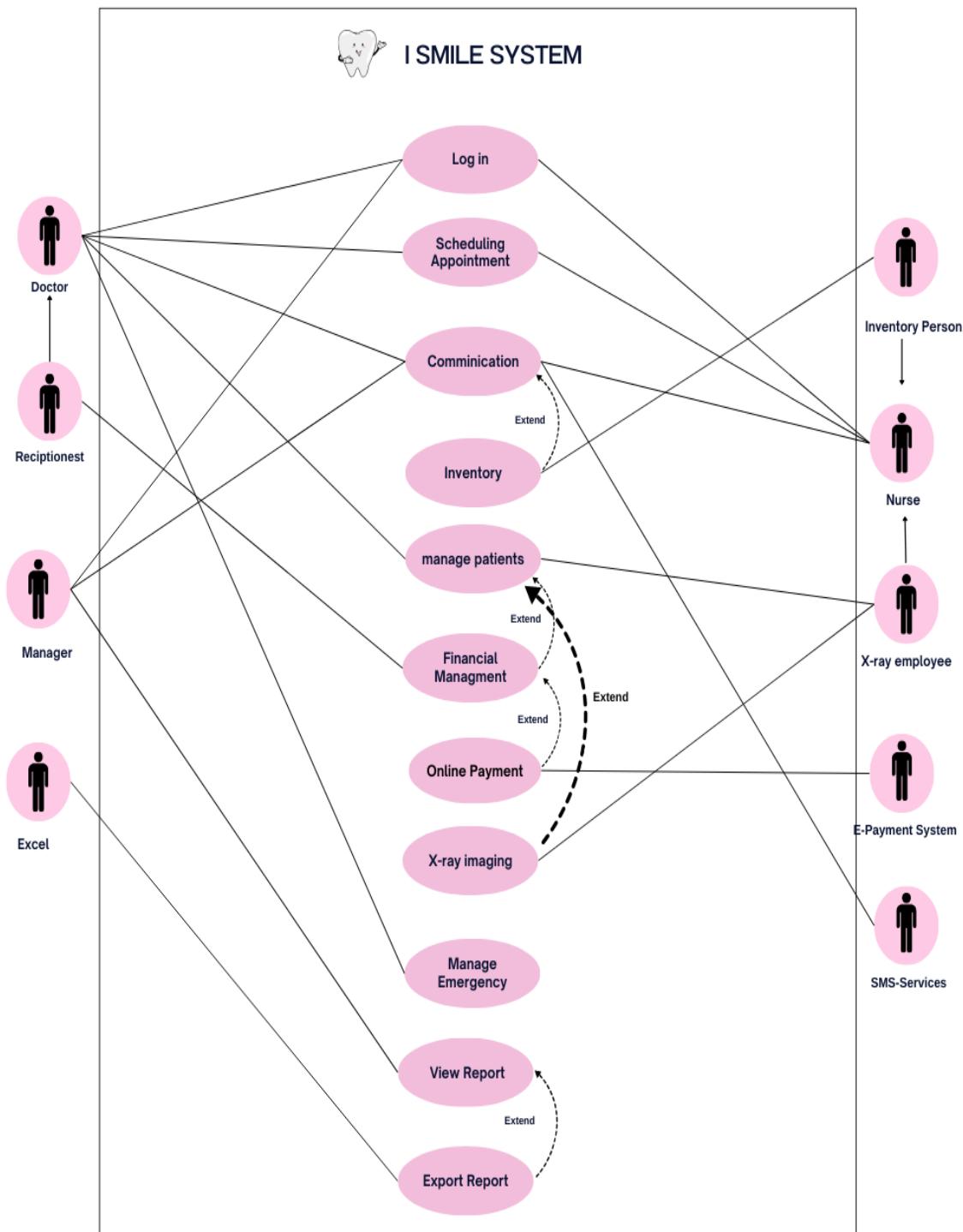


Figure 2: System UML.

Website and Application UML

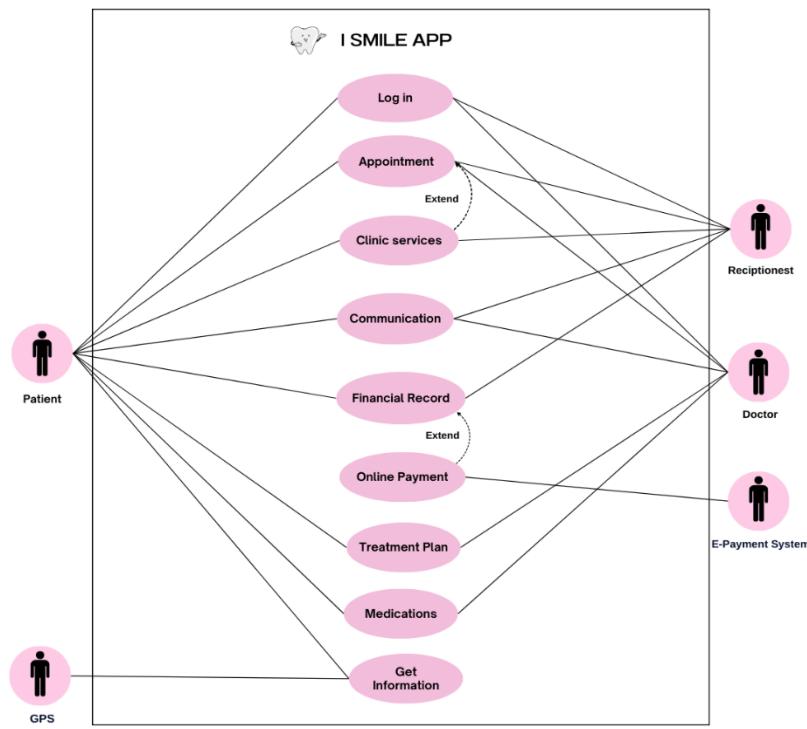


Figure 3:Application UML.

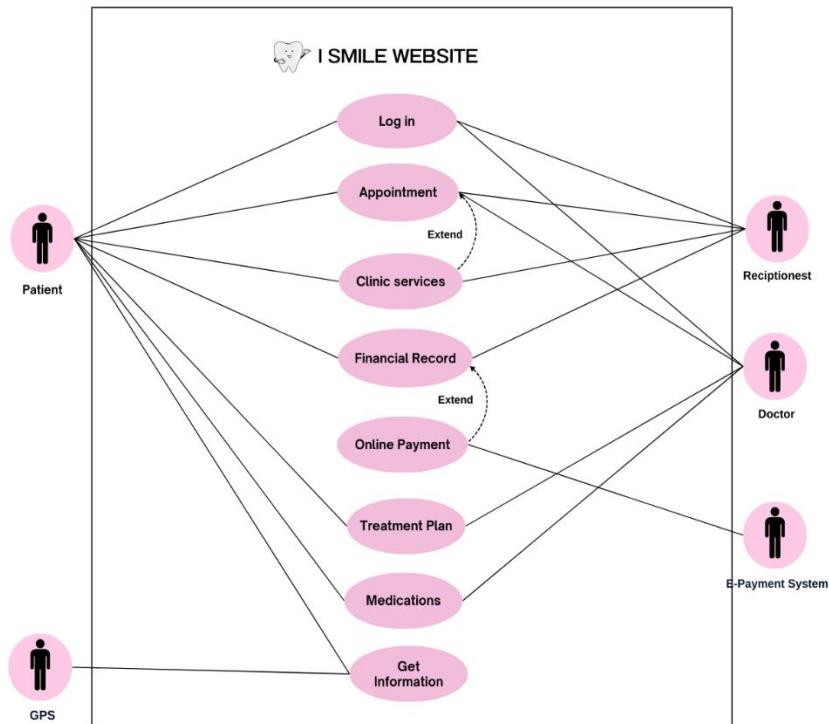


Figure 4:Website UML.

Use Cases

Use cases for the system

- **Login:** Login to the clinic system is only available to clinic employees, as it allows the employee to sign up using his name, email address, and password. Then he can register using the same data so that he can access the components and functions of the system according to the permissions given to him based on the nature of the work he is doing in the clinic.
- **Appointment scheduling:** The program will allow reception staff to create weekly schedules and working hours for clinic employees, and the possibility of modifying them easily, and making them available to all employees in addition to making important information available to each employee according to his schedule. In addition to the possibility of scheduling patient appointments either through electronic booking or through the receptionist.
- **Communication:** The system enables the employees to communicate with each other through a messaging platform for employees, in addition to a special notification system between doctors and the inventory employee. There is also the possibility of communicating with patients through automatic messages or other manual messages.
- **Inventory management:** enables the inventory employee to organize and monitor inventory on an ongoing basis and identify deficiencies by notifying him of any decrease in the quantity of inventory. This process also depends on an employee such as a nurse requesting products in certain quantities through the inventory box in the system.
- **Manage patients:** The doctor, receptionist, and X-ray employee can search for the name of a specific patient to access all of his information, details of his sessions, financial record, and X-ray images, each according to his permissions, with the ability to modify and add to the file.
- **Financial management:** The reception staff and manager can manage all payments and expenses, including many aspects of the clinic such as salaries, inventory items, etc. It also includes patients' financial records, what they pay and what remains, and their respective deductibles.
- **Manage Emergency:** The receptionist and doctor can handle emergency cases smoothly by notifying the doctor of the existence of an emergency so that he can estimate the duration of treatment for the case to delay the appointments of the following patients by the same estimated period.

- **View Reports:** The manager can follow up on the clinic by viewing the clinic's multiple reports, such as inventory reports, patient reports, and other reports. He can also request to see the reports using Excel.

Use cases for the website and application

- **Clinic Services:** Shows the clinic's services, their respective prices and estimated durations.
- **User registration and Login:** It allows users to create accounts in the website and provide necessary information. After creating the account, the patient's file will not approved until after the first visit to the clinic.
- **Financial Record:** The website and application make it easy for patients to access payment history and installment details through the financial history section.
- **Appointment:** The website and app enable patients to utilize electronic booking by choosing the service. Then, the patient selects their preferred or available doctor, followed by a calendar displaying the open dates.
- **Treatment plan:** Enabling patients to know the treatment plan that will be followed during the treatment period by doctors through the clinic's website and application.
- **Medications:** The names and timing of taking the medications will appear to the patient through the doctors' instructions.
- **Get information:** Enable patients to know the clinic's information, including the location, clinic numbers, services provided by the clinic, doctors' names, and working days and hours.
- **Enable Communication:** The ability to communicate between patients, doctors, patients and reception staff through the communication button available on the clinic' application.

Individual Works

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User and System Requirements

Financial Management – Use Case

UR 1: The receptionist, the clinic's accountant, can follow up on financial payments such as salaries and expenses from the clinic's costs such as rent, electricity bills, and inventory items. It also tabulates patients' financial records and processes their payments.

SR 1.1: The system enables the accountant to access several financial sections, including the section for showing, adding, deleting, and updating various financial records, including salaries and payment methods, tracking patient payments, paying employee salaries, inventory items, and other expenses, with the possibility of paying them online.

SR 1.2: The accountant searches for the name of the employee in the clinic by determining whether he or she is a doctor, nurse, X-ray employee, or inventory employee, or he can even search for a patient and then enter the full name of the employee or patient along with his or her identification number. The accountant can also determine whether he wants to see something specific from the financial record of the person concerned. Employees' financial records contain salaries, taxes, and costs. As for the patient, his payment records can be shown, the patient's remaining balance, or the discounts, if any.

SR 1.3: The result of the employee's general financial search must contain all of his personal information, such as his name, ID number, type of work in the clinic, address, and e-mail, attached to the employee's salary slip and the amount of taxes he owed, along with what was spent during a period determined by the accountant. As for the patient, his financial search results include details about him, including his full name, ID number, information about the type of services he benefits from at the clinic, the total amount of payments, method of payment, outstanding debts, and the amount of the family discount, if any.

SR 1.4: The system must show the result in no more than three seconds.

SR 1.5: To ensure that the financial process runs securely, you must ensure that information about employees and patients is complete and free of deficiency. The full name, number, email, and personal photo of the employees are verified. As for the patient, it must be ensured that his name, number, email, and the nature of treatment are in his file. The accountant, who is also the receptionist, takes this

information accurately when adding each new employee or patient file, and the system in turn verifies the accuracy of the entered data as well.

SR 1.6: If for some reason the entered data is unintentionally incorrect, which happens when some fields are completed incorrectly, the system indicates that there may be an error and provides a list of suggestions on how to re-enter the entered data correctly. The accountant then enters the potentially incorrect data field again and the system will be informed of any updates on the data.

SR 1.7: Within a maximum of three seconds, the system displays the modification.

SR 1.8: To make it easier for the accountant regarding the amount owed by the patient, the doctor details what was accomplished in the patient's session, and because the system stores within it the clinic's services, along with the cost of each of them, the amount he owes appears in the patient's record automatically, as the accountant only specifies the method of payment, the amount to be paid, the remainder of it, and a family discount deduction from the amount, if any.

SR 1.9: The accountant verifies whether there is a member of the patient's family who is also being treated at the clinic through the family files created in the system in order to make a discount for the patient. The amount of the discount is determined by the clinic management.

SR 1.10: The accountant performs financial closing operations regularly in accordance with the clinic, either monthly, quarterly, or annually. The accountant can also see the financial records for a specific period specified by him, and it is possible to make the required adjustments to the results. He also documents or ensures that all financial transactions are documented.

SR 1.11: The accountant maintains backup copies of financial records and stores them while respecting data security and privacy standards.

SR 1.12: The financial management system must have easy-to-use interfaces with direct operations that allow the accountant to easily and quickly access, enter, modify, and delete data. To ensure optimal use of the system, training should not take more than one hour. After this training, the number of errors that can occur should not exceed 2 per month of system use.

Manage Patients – Use Case

UR 2: The doctor, receptionist, and X-ray employee can search for the name of a specific patient to access all of his information, details of his sessions, financial record, and X-ray images, each according to his permissions, with the ability to modify and add to the patient file.

SR 2.1: When a patient registers for the first time at the clinic, the receptionist asks him to enter general information about him, such as his name, number, address, ID number, and his medical record, such as chronic diseases and infectious diseases, and whether he suffers from an allergy to certain substances or not.

SR 2.2: If for some reason the data entered is inadvertently incorrect, which happens when some fields are filled out incorrectly, the system indicates that there may be an error and provides a list of suggestions on how to re-enter the data entered correctly. The receptionist then enters the potentially incorrect data field again and any updates to the data are then reported to the system.

SR 2.3: Within a maximum of three seconds, the system displays the modification.

SR 2.4: Then a file is created for the patient with the information he entered, and with each visit, details of the treatment session entered by the doctor and medications are added to it. The receptionist in the patient's file also creates a financial record for the patient containing his financial data, including payments, debts, and deductions, if any. There are also x-rays that are entered by the radiology employee.

SR 2.5: The doctor, receptionist, and radiology employee can access patient files to modify, add to, or delete from them by entering the patient's full name and identification number if there is another patient with the same name. The system alerts the employee if there is more than one patient with the same name of the need to enter the identification number to identify the patient.

SR 2.6: The search result shows the patient's general information, in addition to other results that appear according to the permissions of the employee who is searching. The doctor shows him all of the patient's medical information, such as his complete medical record with details of the patient's previous sessions, medications that were previously prescribed to him, and special x-ray images. Infectious diseases and the patient's sensitivity to certain substances appear in the form of warnings for the doctor to pay attention to. As for the X-ray employee, the X-ray images section will be shown to

him so he can enter any new images. For the receptionist, the patient's financial record is shown to him so he can follow it up.

SR 2.7: The system must show the result in no more than three seconds.

SR 2.8: The process of recording the details of the patient's session by the doctor is done easily and simply, as an image of the human teeth has been programmed. The doctor clicks on the tooth that he worked on to show him a screen containing the clinic's services. He then chooses one of the services or another screen is shown to him on which he records what was done with this tooth.

SR 2.9: As mentioned in the financial management section, to facilitate the process of calculating the costs of the patient's sessions, after choosing the service provided to the patient in the session by the patient, the system shows the cost in the patient's financial record, and the receptionist only has to specify the amount of the family discount, if any, the method of payment and the amount paid and the system will calculate the remainder, if any.

SR 2.10: All modifications made by any staff member to any patient's file are saved instantly. Patient files are also backed up keeping in mind data security and privacy standards.

SR 2.11: The format of the patient file must be understandable and clear to employees, in addition to easy-to-use interfaces for modifying the file with direct operations that allow the employee to easily and quickly access the data. To ensure ease of use, training should not take more than 5 minutes.

Duaa Sulaiman 1200909

User and System Requirements

1) Communication– Use Case

UR1: Enabling communication between patients and reception staff on the one hand, and patients and doctors on the other hand, by sending messages between them by downloading the clinic application on their smartphones. This is to facilitate communication between them as much as possible.

SR1.1: If the patient wants to communicate or reach his doctors or reception staff to obtain any information, all he has to do is enter the clinic application and go to the (Enable communication) option.

SR1.2: After that, two options will appear to him, one for communicating with the doctors and another for communicating with the reception staff. If he wants to obtain information from the reception staff, all he has to do is click on the option to communicate with the reception staff. If he wants to communicate or inquire about something through his doctor, all he has to do is choose the option to communicate with doctors and choose the name of the doctor he wants to communicate with.

SR1.3: After the patient chooses who he wants to communicate with, a chat interface will appear to be able to send messages to enable communication between them. Then he will write what he wants, whether a specific question for the doctor or telling the receptionist if he wants to cancel his appointment.

SR1.4: After that, all he has to do is press (send), and what he wrote will be sent to the recipient he specified initially. The recipient receives a notification on his smartphone from the clinic's application stating that he has received a message, so he opens the application, reads the message, and then can respond to it.

SR1.5: This feature is available in two ways. It is not necessary for the patient to start the chat and communicate. Rather, it is possible for the doctor or receptionist to start the conversation, communicate, and send messages to the patients. In this way, the communication process is completed successfully.

SR1.6: The clinic application needs to ensure that patient information is kept secure. This will be done using strong encryption methods commonly used in medical software. Therefore, the confidentiality of information between patients and doctors must be ensured during the process of communicating, sending messages, and receiving notifications.

SR1.7: The clinic's website and application must be fast and effective, and specifically designed to meet the clinic's needs, with a focus on improving performance and reducing time, in addition to a response time of no more than 3 to 4 seconds. You must ensure that notifications are received immediately when messages are sent.

2)Treatment plan – Use Case

UR2: A complete and comprehensive treatment plan prepared by doctors will be displayed on the clinic's website and application. Through it, the patient will be able to know his medical condition and the method of treatment.

SR2.1: There will be a button on the clinic's website and application called (Treatment Plan).

SR2.2: When the button is pressed, the treatment services provided by the clinic will appear, which are treatment for tooth loss, tooth repair, dental implants, cosmetic dentistry, in addition to Delta emergency services.

SR2.3: After that, one of the services will be selected and clicked on, and a comprehensive treatment plan for the case will appear, including detailed pictures and a comprehensive explanation of the patient's condition, the treatment process, and the estimated duration for completing the treatment. Videos and photos from previous cases will also be shown.

SR2.4: Presentations of post-treatment results will be displayed, allowing the patient to have complete confidence in the clinic with his knowledge of the treatment plan and expected results.

SR2.5: A button called Medications is located in the treatment plan on the clinic's website and application. When the patient clicks on it, he will be shown every medication the doctor prescribed to him, along with the method of taking it and the time to take it.

SR2.6: After each treatment session, the completion of the treatment plan will be documented by showing a picture of the teeth to the doctor so that he can identify the teeth he worked on during the session and show him a list of the services provided by the clinic from which he can choose what he performed. He will then be shown a designated place where he can write a detailed explanation if he wants, and this information will be saved for use in future sessions.

- **Non-functional Requirements: (Duaa Suliman 1200909)**

1. Security: The clinic application needs to ensure that it keeps patient information secure. This will be done by using strong encryption methods commonly used in medical software. Thus, the confidentiality of information between patients and doctors must be ensured during the communication process and elsewhere.

2. Performance: The clinic's website and application must be fast and effective, and designed specifically to meet the clinic's needs, with a focus on improving performance and reducing time, in addition to a response time of no more than 3 to 4 seconds.

3. Usability: The clinic's app and website will be easy to use, with an attractive, user-friendly interface that makes scrolling and finding what you need easy. Users will be able to browse and perform tasks efficiently through an intuitive interface that does not require patient training to use the website and application.

4. Reliability: The clinic's website and application must always be available and work well and integrated, without technical problems or malfunctions in the application and website. Downtime should be so small that it is negligible

5. Scalability: The clinic's app and website will be able to handle more modifications the clinic needs. This must be dealt with growth without slowing down or becoming unstable, so that it continues to perform well. So that all patients can access the application at the same time. As numbers, at least 10,000 concurrent users.

Salwa Fayyad 1200430

User and System Requirements

1] Registration and login-Use Case

UR1: The system shall allow patients for registration and login.

SR1.1: The website allows the new patient to register his basic information, including name, phone numbers, and email, so that he can book an appointment.

SR1.2: The system checks whether the entered data (phone number, password, date of birth) is correct based on secure required.

SR1.3: The patient then chooses the appropriate service and books the appropriate appointment through the reservation mentioned previously.

SR1.4: The patient's data is transferred to the pending requests at the reception, as a file is not approved for the patient until after his first visit to the clinic. This happens so that large files are not opened for patients who book fake appointments via the website.

SR1.5: After that, patients can use the same login credentials to access their settings and features.

Non-Functional Requirements

- **Security:** The system should have a highly secure protection to protect patient data with strong password and ensure confidentiality.
- **Usability:** Design a user-friendly interface that anyone can use.
- **Reliability:** The system should have rules to be always work without interruption and avoid falling down.

2] Booking Appointment- Use case

UR2: The system shall allow patients for booking appointments.

SR1.1: The website and application allow the patient to book appointments at the clinic.

SR1.2: This is accomplished through displaying the clinic's services, along with the prices and duration of each, so the patient chooses the service he wants to be treated in the clinic.

SR1.3: Then, selects the doctor wishes to receive treatment from by presenting the names of doctors specializing in the service has requested.

SR1.4: Then the doctor's scheduling times during the week are displayed through slots, and the patient chooses the appropriate day and hour

SR1.5: The website is automatically linked to the system, so the patient's appointment with the doctor is booked and appears in the doctor's scheduling and reception.

SR1.6: If it is the first time for booking an appointment, the receptionist calls and communicates with patients who book their appointments to ensure that the appointment is confirmed and not fake.

SR1.7: Users should receive immediate confirmation of their booked appointments, along with relevant details such as date, time, and location.

SR1.8: the system notifies users of upcoming appointments through email or push notifications on the application.

Non-Functional Requirements

- **Usability:** Ensuring that the system, easy to navigate and accessible to users.
- **Reliability:** Implementing a system to minimize the risk of system failures and avoid system falling down.
- **Performance:** Ensuring that the system appointment booking is efficient and highly performance. And specify response time expectations.
- **Availability:** Define the required uptime to ensure that the appointment booking service is available to users whenever they need it.

Amal Butmeh 1200623

1) Employees Communication Management- Use Case

UR 1: Communication is one of the basics and most important characteristics of the program. Employees communicate with each other through the system, which provides a seamless communication system to enhance teamwork and simplify clinic operations.

SR 1.1: After entering the system, the employee selects the communication section in the system so that he can communicate with other employees.

SR 1.2: The employee chooses either to communicate with all employees in the clinic through a group chat for employees or to specify a specific employee he wants to communicate with.

SR 1.3: A notification appears to the other employee of the message he received, and he can respond through notifications quickly or enter the chat.

UR 2: Other employees communicate with inventory employees.

SR 2.1: The employee can also communicate with the inventory employee using the special message form for this type of communication, in which the employee simply selects the product he wants and enters the quantity he wants. Then, the inventory employee receives the form message containing the product and the required quantity.

Non-functional requirements:

Data Privacy: The system must ensure high privacy and reliability during the exchange of information and during communication between employees, and this includes maintaining the privacy of information about patients or the clinic itself. These procedures will ensure that access is limited to authorized users, and that no private conversations are visible to other employees.

Performance: Communication between employees must be fast, with the access time not exceeding two seconds, so that employees can exchange information and messages easily and quickly.

2)Inventory Management- Use Case

UR 1: The inventory employee is able to manage the inventory and arrange it according to the name and picture of the product, including the quantity and price of each product, within his own section in the system.

SR 1.1: The system asks the inventory employee to log in so that he can access the inventory section, which can only be accessed by the inventory employee.

SR 1.2: While we were working on the system, we will have added the materials and products used in the clinic, as needed, to the inventory section, which are added by name and picture and arranged in alphabetical order. The inventory employee adds and modifies the quantity and price of each product in boxes designated for each of them.

SR 1.3: The employee can search for the specific item using the search box at the top of the page which displays the entered item for the user.

SR 1.4: The inventory employee makes two operations either adding or taking from the inventory quantity. He chooses the button that specifies the operation which he wants to perform. Then, he fills a box to specify the quantity that was taken or added. Then the inventory quantity is automatically updated.

UR 2: The inventory clerk communicates with the companies supplying the materials and products needed for the clinic.

SR 2.1: If the quantity of inventory decreases below a certain limit determined by the clinic, a warning appears to the inventory employee that includes the product whose quantity decreased below the specified limit and the remaining quantity.

SR 2.2: The inventory employee sends messages to the supplying companies through the communication with suppliers' section, he simply specifies the type of product through the options shown to him with the names and pictures of the products, also enters the required quantity in a special

box, then he clicks on the “Request” button, so the request will be sent for companies previously added to the system that supply the specified product.

SR 2.3: Inventory employee can add new suppliers to the Suppliers field by adding the email address, phone number for each, and the type of products it supplies.

UR 3: Other clinic staff request products from the inventory.

SR 3.1: Other clinic employees request a specific product through the inventory box in the system, and a list of available items and their quantities is shown to them. The employee selects the product, clicks on it, and then enters the quantity he wants, then he clicks on “Request” button.

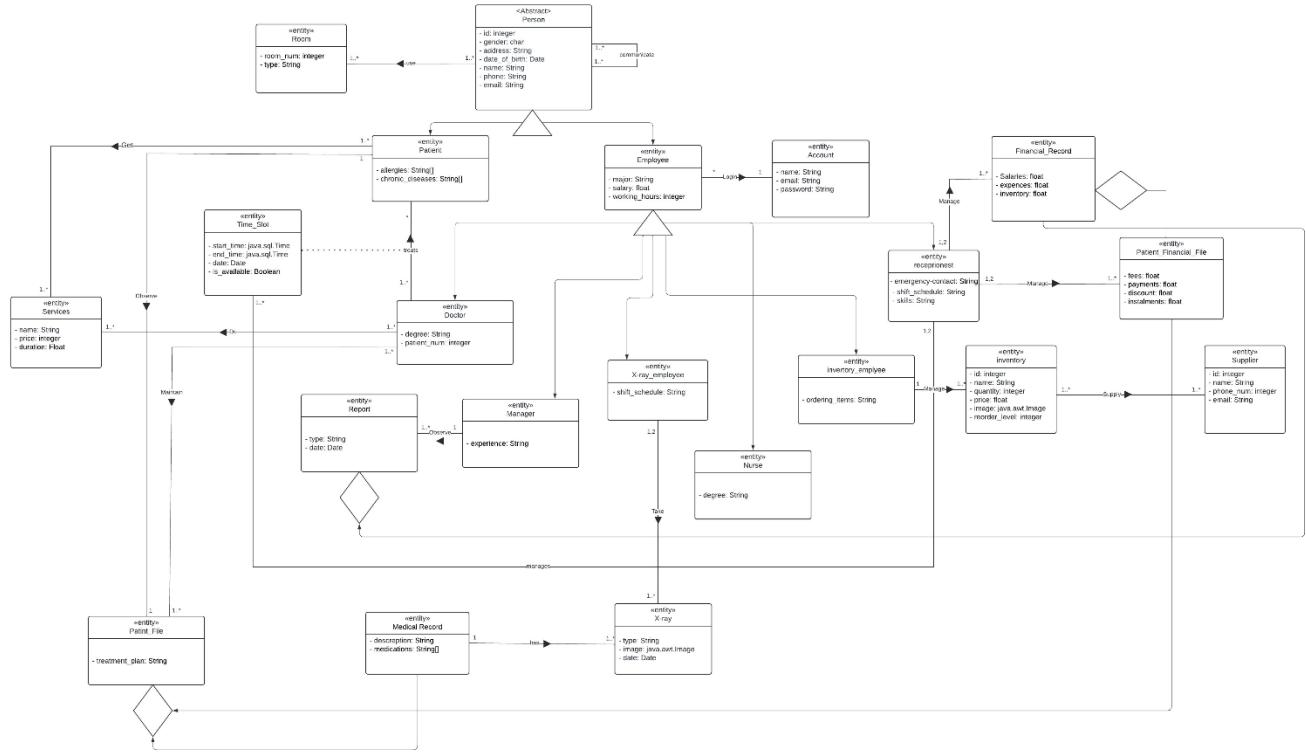
SR 3.2: A notification appears to the inventory employee of the request sent by another clinic employee, and the inventory employee provides the requested item for the other employee.

SR 3.3: After the employee orders a specific product, the system automatically adjusts the quantity of the product that appears in the inventory section of the system according to the quantity requested by the employee.

Non-functional requirement:

Usability: Inventory management is a precise process that requires a lot of effort, focus, and time, so it requires a user-friendly interface so that the inventory employee can enter data easily and also modify it smoothly.

Phase 3: Use-Case Specification and UML class diagram:



Layan Shoukri 120225

Maintain Session Record and Prescription Use Case

Use-Case Specification

Version 0

Revision History

Date	Version	Description	Author
10/Jan/2023	Draft	Draft version	L.Shoukri

Maintain Session Record and Prescription Use Case

1. Brief Description

This use case allows the doctor to add, modify, delete a session record or a prescription. In the addition process, it allows the doctor to write down what was accomplished in the patient's session along with the medical prescription in detail during the session with ease.

The actor for this use case is the doctor.

2. Flow of Events

This use case begins when the Doctor selects “Manage Patients” from the main page and enters the specified patient’s ID number then select session records and prescriptions.

2.1 Basic Flow – Add session record and the prescription

1. The doctor selects the “Add session record and prescription” option from the Session record and prescription page in the manage patient page.
2. The system shows a session record form which having a picture of human teeth as options can be chosen to record what was done with them.
3. The doctor chooses the tooth at which he works and then enters the full details of the session along with the patient’s current condition and diagnosis. Then the doctor selects the “Save” option.
4. The system saves the entered record with the date by creating a new session record and shows the prescription form.

5. The doctor inserts the prescribed medication, when to take it, and in what manner. Then the doctor selects the “Save” option.
6. The system checks whether the medicine contains substances found in the patient's file that cause allergies to him. If the medicine does not cause allergies to the patient, the system saves what was entered with the date by creating a new prescription and then displays a form for the next appointment.
7. Depending on the patient's condition, the doctor may have to book another appointment for the patient as soon as possible, so the doctor enters the desired date, and an appointment is scheduled for the patient on this date. Then the doctor clicks on the “Save” option.
8. The system saves the entered date by creating the next appointment.
9. Steps 1-8 are done for all patient sessions. When the doctor is finished, the use case ends.

2.2 Alternative Flows

2.2.1 Delete session records or prescription

1. The Doctor selects "Delete Session record or prescription" from the patient page.
2. The system retrieves the patient's session records and prescriptions file and displays it.
3. The doctor selects "Delete" for everything he wants to delete.
4. The system displays a delete verification dialog confirming the deletion.
5. The doctor selects "Confirm"
6. The patient's session record or prescription is deleted from the system.
7. Steps 1-6 are repeated for each patient's session record or prescriptions deleted from the system.
When the doctor is finished deleting the use case ends.

2.2.2 Modify session records or prescription

1. The Doctor selects "Modify Session record or prescription" from the patient page.
2. The system retrieves the patient's session records and prescriptions file and displays it.
3. The doctor selects a session record, or a prescription then click on "Modify"
4. The doctor modify what he wants then select the "Save option".
5. The system displays a modify verification dialog confirming the modification.
6. The doctor selects "Confirm"
7. The system saves the modifications and now the patient's session record or prescription is modified.
8. Steps 1-7 are repeated for each patient's session record or prescriptions that need to be modified.
When the doctor is finished modifying the use case ends.

2.2.3 *The Treatment was done*

If this session is the last session for the patient, he enters the details of the session along with the prescription as done in Basic Flow as usual, then chooses the “Treatment Complete” option. Then an interface appears for the doctor to confirm that the patient’s medical record has been deactivated.

2.2.4 *The patient is allergic to the medication*

If the doctor forgets or does not pay attention to the substances to which the patient is allergic and prescribes a medicine containing this substance, the system notifies the doctor of the necessity of changing the prescribed medicine.

2.2.5 *Late Patient*

If there is an appointment for the patient, whether he booked it himself or the doctor booked it for him and he does not adhere to it, his medical record will be deactivated.

2.2.6 *Cancel option*

The doctor can use the “Cancel” option in any of the above-mentioned flows to cancel any operation that he does not want so that the system returns to the patient’s record after canceling the operation.

2.2.7 *Next option*

In the process of adding the session record and prescription, it is possible that the doctor does not need to add a prescription or even book a next appointment, so he clicks on the “Next” option next to the “Save” option.

3. Special Requirements

- When searching for a patient, the system shall retrieve the patient record in no more than 3 seconds.
- All modifications made by the doctor to any patient's file are saved instantly. Patient files are also backed up keeping in mind data security and privacy standards.
- The format of the patient file must be understandable and clear to the doctor, in addition to easy-to-use interfaces for modifying the records with direct operations that allow the actor to easily and quickly access the data.
- To ensure ease of use, training should not take more than 5 minutes.

4. Entry Conditions

4.1 Log In

Before this use case begins the doctor has been logged onto the system.

4.2 Search for a patient file

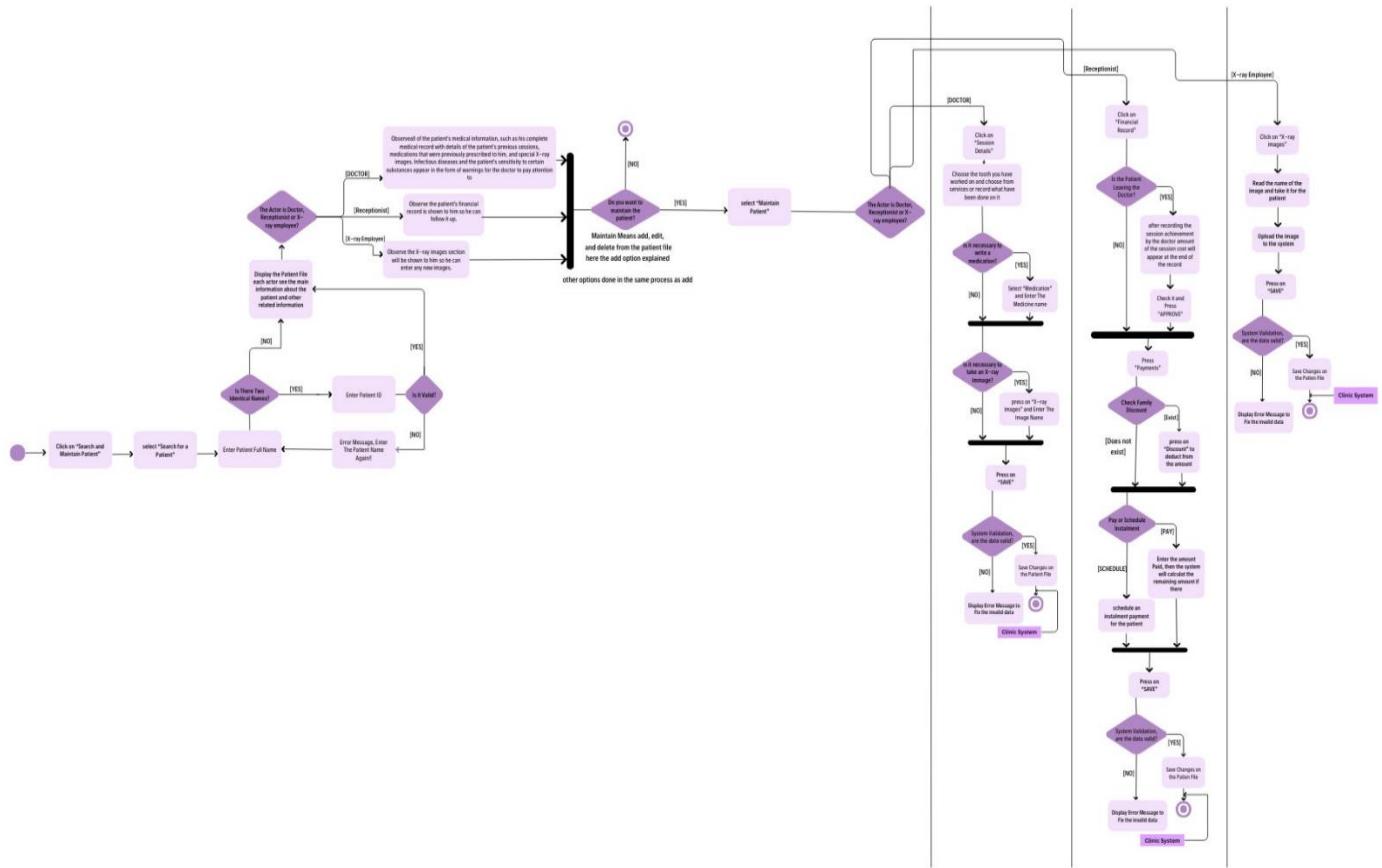
After the doctor logs in, he must search for the desired patient's file by entering its ID number by clicking on the 'Manage Patients' option in the main page then choose the "Session Record and Prescription" option.

5. Exit Conditions

A notification is sent to the doctor as approval of what has been done in the patient's file.

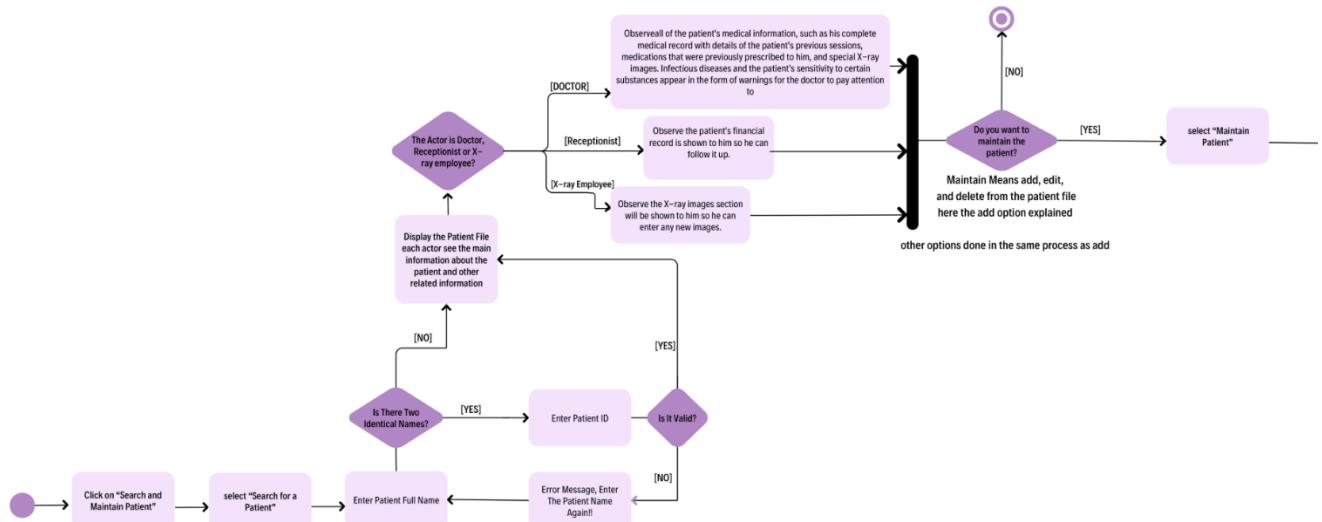
Activity Diagram

This diagram is for the “search and Maintain Patient” process which include three actors which are the doctor, receptionist and the X-ray employee.



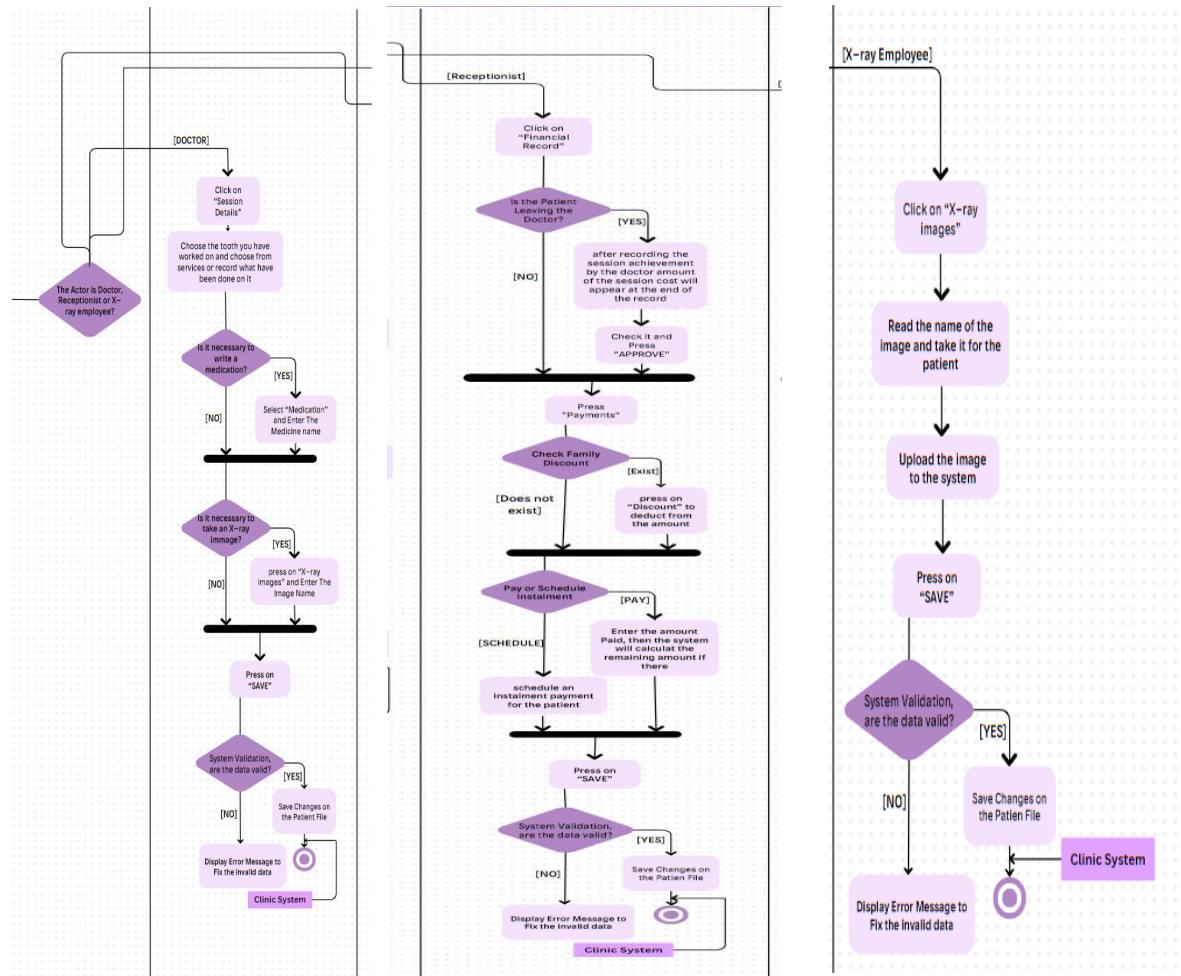
For more clear snippets, the search and maintenance parts are shown below in a separate figure.

The search part activity diagram.



The figure above shows how each actor can search for a patients file. It also shows what each actor sees from the patient file according to its permissions.

The maintenance part for each actor is shown below in three screens, each screen for an actor.



The figures above show what each actor can do in the patient file according to its permission.

2.Reserve an appointment Use Case {Salwa Fayyad 1200430}

Use-Case Specification

Version 0

Revision History

Date	Version	Description	Author
January 15,2024	V0	First Draft	Salwa.F
January 29,2024	V1	Second Draft	Salwa.F

1. Brief Description

This use case allows the patients to book an appointment from the website or the application—this includes adding, modifying, and deleting appointments from the system.

The actor for this use case is the patient and receptionist.

2. Flow of Events

Use case begins when the patient selects the "Reserve an appointment" activity from the main form.

2.1 Basic Flow – Booking Appointment

1. The patient has selected the "Reserve an appointment" option.
2. The clinic's website displays a list of services offered, along with their prices and durations.
3. The services include treatment of tooth loss, tooth repairs, tooth implants, dental cosmetics, as well as delta emergency services.
4. The patient can choose the service or examination they want.
5. The patient can select a doctor to receive treatment by choosing from a list of doctors who specialize in the service they have requested.
6. Then the available appointment times are displayed as slots for the patient to select a suitable date and time for the appointment with the doctor, then select the "Reserve" option.

7. The system verifies the validity of the reservation and then prints a message on the screen with the content "Dear, you have been booked successfully, please do not be late for your appointment."
8. The website is automatically linked to the system, so the patient's appointment with the doctor is booked and appears in the doctor's scheduling and reception.
9. Both the doctor and the receptionist receive notification of the patient's appointment reservation by day and hour immediately.
10. If it is the first time for booking an appointment, the receptionist calls and communicates with patients who book their appointments to ensure that the appointment is confirmed and not fake.
11. If the patient can't make the reservation by himself, either because of his old age or his emergency appearance or when calling, the receptionist can do it because they have access to all patients, so he can repeat steps 1-6 to make an appointment for a patient.
12. Users should receive immediate confirmation of their booked appointments, along with relevant details such as date, time, and location.
13. Our system sends appointment reminders to patients one day before via email, push notifications on the app and SMS message.
14. Steps 2-6 are repeated for each patient who wants to make an appointment in the system. When the patient's reservation to the system is finished, the use case ends.

2.2 Emergency Booking

1. The patient clicks on the "Emergency Booking" option.
2. The website/app instantly evaluates and displays the schedule for the earliest and most appropriate time slots on a particular day.
3. The patient must write and explain the emergency reason to allow the receptionist to schedule the appointment on the specified day.
4. The patient chooses the appropriate time.
5. Confirming the appointment booking is done by clicking on 'Confirm'.
6. Once the request is reviewed and confirmed by the receptionist, the system sends an immediate confirmation message to the user that confirms the details of the emergency appointment through email, SMS, and app.
7. The doctor and the receptionist receive notification of the patient's appointment reservation by day and hour immediately.

2.3 Alternative Flows

2.3.1 Modify appointment

1. The patient begins the process by selecting the “Show my appointments” option on the website or the App.
2. The system responds by displaying a list of upcoming appointments booked for the patient, detailing the date and hour of each appointment.
3. The patient selects the appointment to be updated and chooses the “Update” option.
4. The system displays all appointments available for booking on the screen within the same doctor.
5. The option to switch to a different doctor is displayed as "Change Doctor" if desired.
6. The patient has the option to select the right date for their updated appointment using the same booking appointment steps as previously mentioned. Once done, they can save the changes by clicking on the "save" button.
7. The system performs a verification check to ensure the accuracy of the reservation. Upon successful verification, a confirmation message appears on the screen: "Dear [Patient's Name], your reservation has been successfully updated due to [new date and time]. Please ensure you keep the appointments scheduled."
8. At the same time, the system updates the periods in the doctors' schedules to reflect the changes made by the patient.
9. If the patient decides to update the appointment by calling the receptionist, she has the authority to change the patient's appointment from the system.
10. Both the doctor and the receptionist receive notification of the patient's modifying appointment reservation by day and hour immediately
11. Steps 1 through 6 are repeated for each patient who needs an update. Once all modifications are completed, the use case ends.

2.3.2 Delete appointment

1. The patient begins the process by selecting the “Show my appointments” option on the website or the App.
2. The system responds by displaying a list of upcoming appointments booked for the patient, detailing the date and hour of each appointment.
3. The patient chooses the appointment to be deleted
4. The patient selects the “Delete” option.

5. The system displays the Verify Deletion dialog box to confirm the deletion process.
6. The patient chooses the “Yes” option.
7. The patient's appointment is deleted from the system. The system deletes the appointment from the doctor's time slots as well.
8. Both the doctor and the receptionist receive notification of the patient's delete appointment by day and hour immediately.
9. Steps 2 through 6 are repeated for each patient who wants to delete an appointment. When deletion is complete, the use case ends.

2.3.3 The patient did not find a suitable appointment

If the patient cannot find a suitable appointment during the booking process, he or she can select the “Another Appointment” option. This enables the patient to enter the preferred day and date for the appointment.

The system then makes several smart choices, as it saves this patient's preferred request, places it on the waiting list, and notifies him if the appointment is canceled by the other patient. Or the request is sent to the receptionist for review. The receptionist will consider the possibility of switching the appointment with another patient and will contact both patients to coordinate the change.

2.2.4 More than one patient try to booking the same appointment at the same time

The system uses methods and strategies to prevent conflicts when two patients try to book the same appointment at the same time. Using real-time synchronization, appointment availability can be constantly updated and synchronized, via a locking mechanism that allows the first patient to initiate the booking. The system immediately notifies both patients of any conflict and directs them to choose an alternative time. By combining these strategies, the system can better manage scheduling conflicts and provide a fair booking experience for all patients.

3. Special Requirements

- When requesting an appointment, the system retrieves all available times in a period not exceeding 2 seconds.
- All modifications made by any actor to booking an appointment are saved instantly.
- All changes that occur to the doctor's schedule while booking appointments are automatically saved in the system
- The format of booking an appointment must be understandable and clear to patients, in addition to easy-to-use interfaces for adding new appointments, modifying and deleting an appointment with direct operations that allow the actor to easily and quickly access the data.
- To ensure ease of use, the website must be a clear and user-friendly interface for customers.

4. Entry Conditions

4.1 Log In

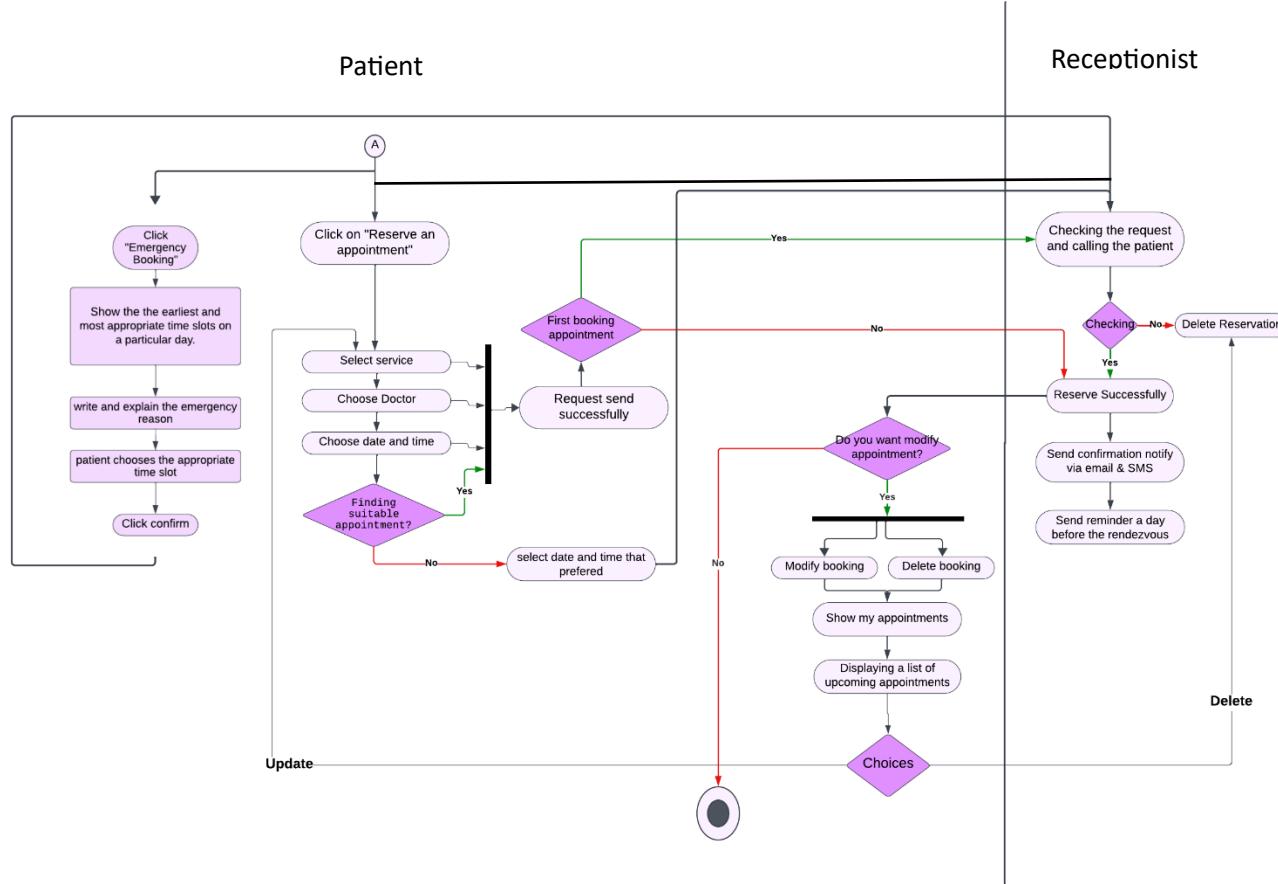
Before this use case begins the patient has logged onto the system.

5. Exit Conditions

A notification is sent to the doctor and receptionist when booking, modifying and delete appointment by patient.

Activity Diagram

This diagram is for the sub-flow “Booking appointment”



The image above represents the activity diagram for patients when choosing to book an appointment on the system. The site allows patients to book the appointment and modify or delete it. Also, it represents what each actor can do the specific requirement with some conditions that must be met.

Duaa Suliman 1200909

3. Communication Use Case

version 0

Revision History

Date	Version	Description	Author
January 15, 2024	Draft	Draft version	Suliman

1. Brief Description:

This use case enable communication between employees by sending messages between themselves. On the other hand, the communication between receptionists and patients and communication between doctors and patients.

2. Flow of Events:

The use case starts when the registrar selects the “Communicate” activity from the main form.

2.1 Basic Flow-Communication among Employees:

(The employees are: Receptionists, doctors, nurses, X-ray staff, inventory employee and the manager)

1. The registrar selects "Communicate".
2. The system displays a list containing all employees.
3. The registrar chooses the employee he wants to communicate with.
4. The system displays a page through which employees can communicate with each other by writing messages.
5. The registrar writes down what he wants to inquire about or inform the other employee about, and chooses the “Send” option. This includes sending pictures or X-ray, files, or an audio recording.
6. The system sends the message to the employee who was previously selected through the registrar, and the system also sends a notification to notify him. If an error occurs in sending the message, it will be displayed to the registrar (Error in sending message) and then the option (Resend) will be displayed.
7. The employee receives a notification from the system to read the message and then he can respond through the "Reply" option.
8. Steps 1-7 are repeated when an employee wants to communicate with another employee in the system. This use case ends when clicking on the "Close communication page" option.

2.2 Alternative Flows:

2.2.1: Communication between Receptionists and Patients:

1. The registrar (receptionist) chooses the option "Communicate with Patients" from the main form.
2. The system displays a search box for the receptionist to enter the name or number of the patient he wants to contact.
3. The registrar writes the patient's name or number in the search box and then presses "Enter."
4. The system shows some of the default messages that the receptionist can send (For example: I want to remind you of your appointment today, your appointment has been postponed). In addition to displaying a writing box in which the receptionist can write whatever he wants to inform the patient of any developments, any condition, or anything he wants.
5. The registrant chooses what he wants to send or writes what he wants in the text box and then chooses "Send."
6. The system sends the message to the patient with a notification that the patient can know the situation as quickly as possible.
7. Steps 1-6 are repeated when the receptionist wants to communicate with any patient. This use case ends by choosing the "Exit" option.

2.2.2: Communication between doctors and patients:

1. The registrar (doctors) chooses the option "Communicate with Patients" from the main form.
2. The system displays a search box for the registrar to enter the name or number of the patient he wants to contact.
3. The registrar writes the patient's name or number in the search box and then presses "Enter."

4. The system displays options for the registrar, which are: { 1) Emergency Information. 2) Sending the name of the medication to the patient. 3) Sending pictures. 4) Sending a summary and the results of the treatment session. 5). Recommendations after the treatment session.6) Care tips and follow-up Checkups. }
5. The registrar chooses what he wants to send to the patient, adds whatever notes he wants, and then chooses the “Send” option.
6. The system sends the message to the patient with a notification entitled (Message from the doctor) so that the patient can quickly obtain recommendations, important messages, medication names.
7. Steps 1-6 are repeated when the doctors want to communicate with any patient. This use case ends by choosing the "Close communication page" option.

2.2.3: Patient not found:

If the patient cannot be found by his name or number when typing the name or number in the search box, the system will display an error message, “Patient not found.” The registrar can then type a different name or patient number into the search box or cancel the operation, at which point the use case ends.

3.Special Requirements:

- When searching for a patient through the registrar, whether the registrar is a receptionist or a doctor, the system displays the communication page designed as required in a time not exceeding 3 seconds.
- If the communication is between employees, and after a list of employee names appears, when the name of any employee is chosen by another employee, the system must display the communication page within two seconds, no more than that.

4.Entry Conditions:

4.1 Log In

Before this use case begins, the registrant has logged into the system to be able to access the communication option.

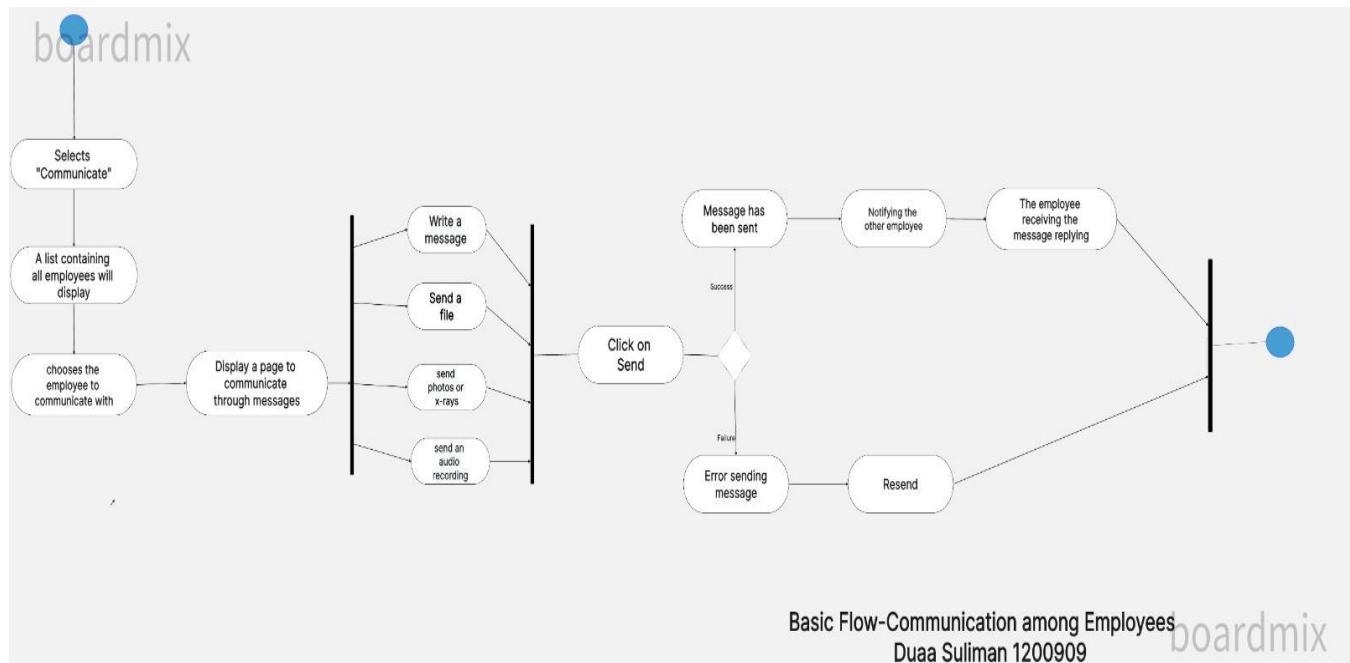
5.Exit Conditions

There are no postconditions associated with this use case.

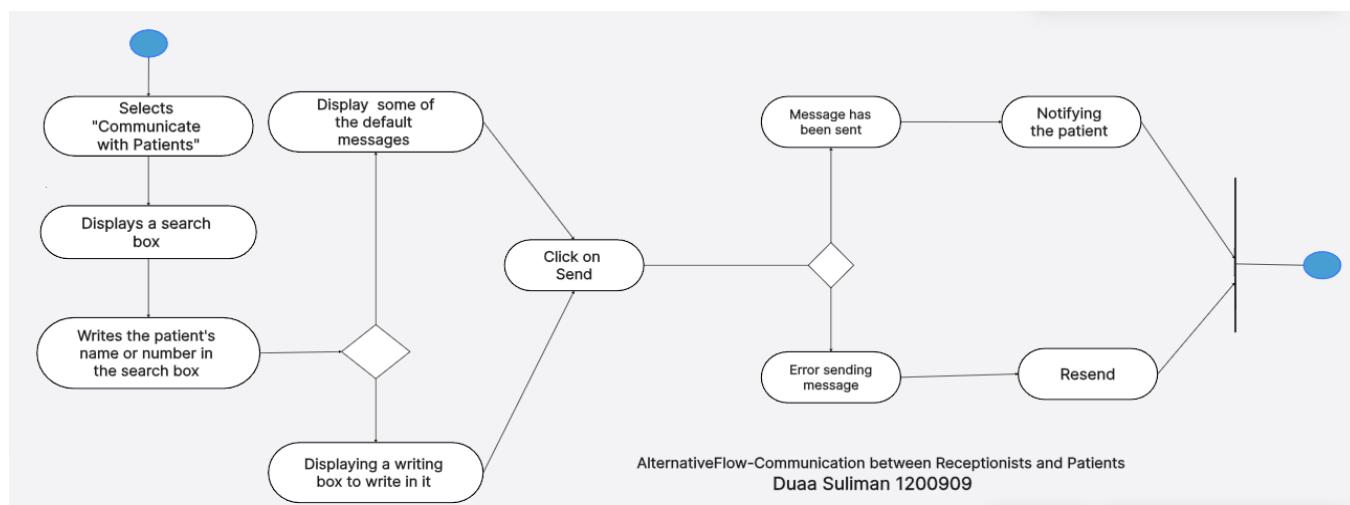
Activity Diagrams: (Duaa Suliman 1200909)

12. Communication among Employees:

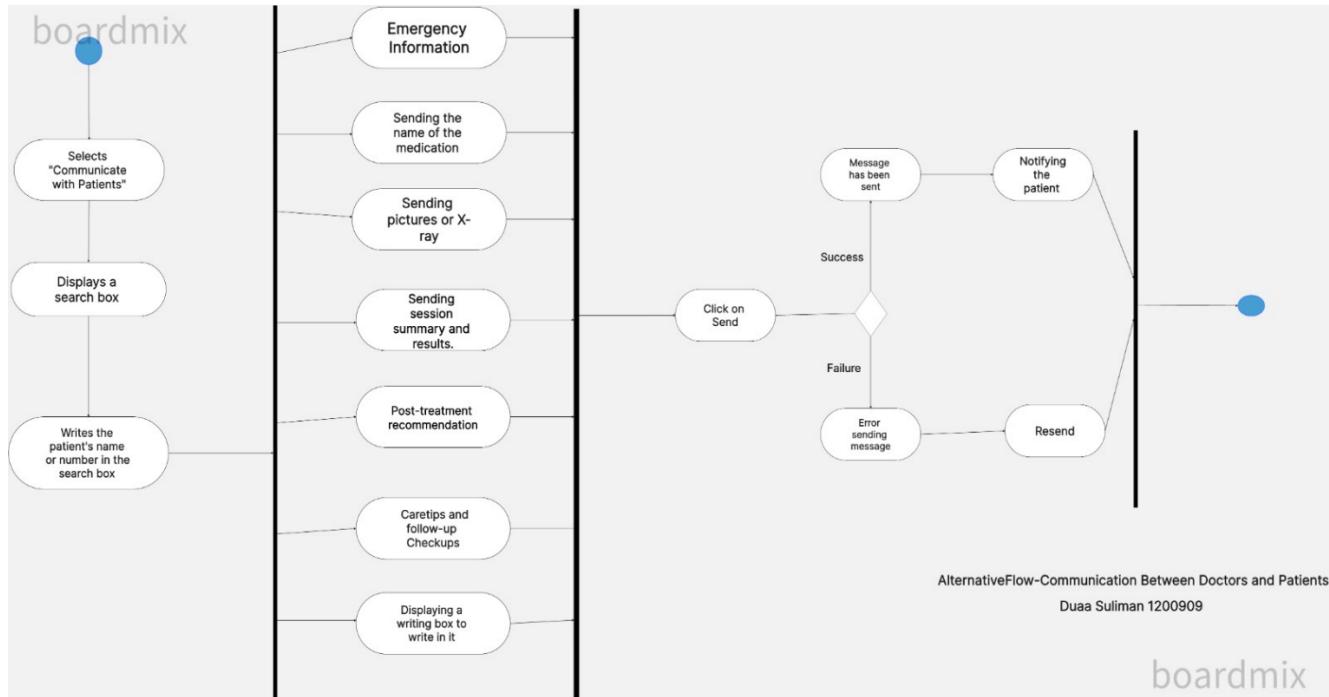
The following activity diagram shows the communication process between the employees, who are doctors, nurses, receptionists, inventory clerk, x-ray staff, and the manager.



2. Communication between Receptionists and Patients:



3. Communication between doctors and patients:



Note: Patients do not have the ability to use the clinic's system, so I did not explain the patient's response process to the doctor and receptionist. The patient can respond and communicate through the clinic's application.

Use-Case Specification

Amal Butmeh 1200623

Inventory Management Use Case

Revision History

Date	Version	Description
12/Jan/2024	Draft	Draft version

1. Brief Description

This use case allows the inventory employee to manage the inventory in i-Smile system. This includes adding new products to the system, modifying and searching for the existed products in the system, and adding, modifying and communicating with products' suppliers using the system.

The actor for this use case is the inventory employee.

2. Flow Events

This use case will be available only if the user is the inventory employee, and it begins when the Inventory Employee selects the “Inventory Section” activity from the Main Form.

2.1. Basic Flow-Add a product

1. The system displays “Manage product”, “Manage supplier” options
2. The inventory employee selects “Manage product”.
3. The system displays “Add a product”, “Search for a product”, “Modify a product” and “Order a product” options.
4. The inventory employee selects “Add a product”.
5. The system displays a blank product form.
6. The inventory employee enters the following information for the product: name, quantity, price, expired date, reorder level and an image for the product, then selects “save” option.
7. The system makes sure that the data is valid and entered according to the proper format, and it is not already existed in the system by searching for the entered name. If the data

is valid and not already existed, then the system creates new product with the entered data and it assigns the new product a unique id number.

8. Steps 4-7 are repeated for each product added to the system. When the inventory employee is finished adding products to the system, he/she selects “Save All” option and the use case ends.

2.2. Alternative Flows

2.2.1. Search for a Product

1. The system displays “Manage product”, “Manage supplier” options
2. The inventory employee selects “Manage product”.
3. The system displays “Add a product”, “Search for a product”, “Modify a product” and “Order a product” options.
4. The inventory employee selects “Search for a product”.
5. The system displays “Search by ID” and “Search by name” options.
6. The inventory employee selects one option to use.
7. The system displays a blank search space.
8. The inventory employee types in the ID or name according to which option he/she chooses.
9. The system validates the input to ensure the proper type. If the type is valid and the product is existed, then the system displays the full information about the searched product.
10. Steps 4-9 are repeated for each search for a product operation. When the inventory employee is no more want to search, the use case ends.

2.2.2. Modify a Product

1. The system displays “Manage product”, “Manage supplier” options
2. The inventory employee selects “Manage product”.
3. The system displays “Add a product”, “Search for a product”, “Modify a product” and “Order a product” options.
4. The inventory employee selects “Modify a product”.
5. The system displays a blank product form.
6. The inventory employee types in the product ID he/she wants to modify.

7. The system returns the product information and displays it on the screen.
8. The inventory employee modifies the data he/she wants on the information fields: name, quantity, price, expired date, reorder level and the image of the product.
9. When the inventory employee completes the modification of the product, he/she selects “Save” option.
10. The system validates data, then updates the product information.
11. Steps 5-10 are repeated for each product modification the inventory employee wants to do. When all edits are complete, the use case ends.

2.2.3. Add a supplier

1. The system displays “Manage product”, “Manage Supplier” options
2. The inventory employee selects “Manage Supplier”.
3. The system displays “Add a supplier” and “Modify a supplier” options.
4. The inventory employee selects “Add a supplier”.
5. The system displays a blank supplier form.
6. The inventory employee enters the following information for the supplier: name, email address, phone number, and the type of products it supplies, then selects “save” option.
7. The system makes sure that the data is valid and entered according to the proper format, and it is not already existed in the system by searching for the entered name. If the data is valid and not already existed, then the system creates new supplier with the entered data and it assigns the new supplier a unique id number.
8. Steps 5-7 are repeated for each supplier added to the system. When the inventory employee is finished adding suppliers to the system, he/she selects “Save All” option and the use case ends.

2.2.4. Modify a supplier

1. The system displays “Manage product”, “Manage Supplier” options
2. The inventory employee selects “Manage Supplier”.
3. The system displays “Add a supplier” and “Modify a supplier” options.
4. The inventory employee selects “Modify a supplier”.
5. The system displays a blank supplier form.

6. The inventory employee types in the supplier ID he/she wants to modify.
7. The system returns the supplier information and displays it on the screen.
8. The inventory employee modifies the data he/she wants on the information fields name, email address, phone number, and the type of products it supplies.
9. When the inventory employee completes the modification of the supplier, he/she selects “Save” option.
10. The system validates data, then updates the supplier information.
11. Steps 5-10 are repeated for each supplier modification the inventory employee wants to do. When all edits are complete, the use case ends.

2.2.5. Order a product

1. The system displays “Manage product”, “Manage supplier” options
2. The inventory employee selects “Manage product”.
3. The system displays “Add a product”, “Search for a product”, “Modify a product” and “Order a product” options.
4. The inventory employee selects “Order a product”.
5. The system displays products options.
6. The inventory employee selects the product he/she want to order.
7. The system displays the remaining quantity of the product with a blank.
8. The inventory employee types in the quantity of the product he wants to order, then he/she selects “Order” option.
9. The system validates the input, then sends message includes the information about the required product, to the supplier that supplies the chosen product.
10. Steps 5-9 are repeated for each order the inventory employee wants to do. When ordering products is complete, the use case ends.

2.2.6. Product already exists

If in the "Add Product" sub-flow the system finds an existing product with the same name an error message is displayed "Product Already Exists". The inventory employee can either try another name, or cancel the operation at which point the use case ends.

2.2.7. Product not found

If in the "Modify a product " or “Search for a product” sub-flows the product name or ID is not located, the system displays an error message, "Product Not Found". The inventory employee can then type in a different ID or name, or cancel the operation at which point the use case ends.

2.2.8. Supplier already exists

If in the "Add Supplier" sub-flow the system finds an existing supplier with the same name an error message is displayed "Supplier Already Exists". The inventory employee can either try another name, or cancel the operation at which point the use case ends.

2.2.9. Supplier not found

- If in the "Modify a supplier " sub-flow the supplier ID is not located, the system displays an error message, "Supplier Not Found". The inventory employee can then type in a different ID, or cancel the operation at which point the use case ends.
- If in the “Order a product” sub-flow there is no supplier that supplies the required product, the system displays an error message, “Supplier Not Found”. The inventory employee can select “Add supplier” option to add a supplier for the chosen product, or cancel the operation at which point the use case ends.

3. Special Requirements

Each operation in the system, such as add, modify, search and communicate should take no more than 2 seconds in responding and operating.

4. Entry Conditions

4.1 Log In

This use case begins when the inventory employee has logged onto the i-Smile system.

4.2 Open the inventory section

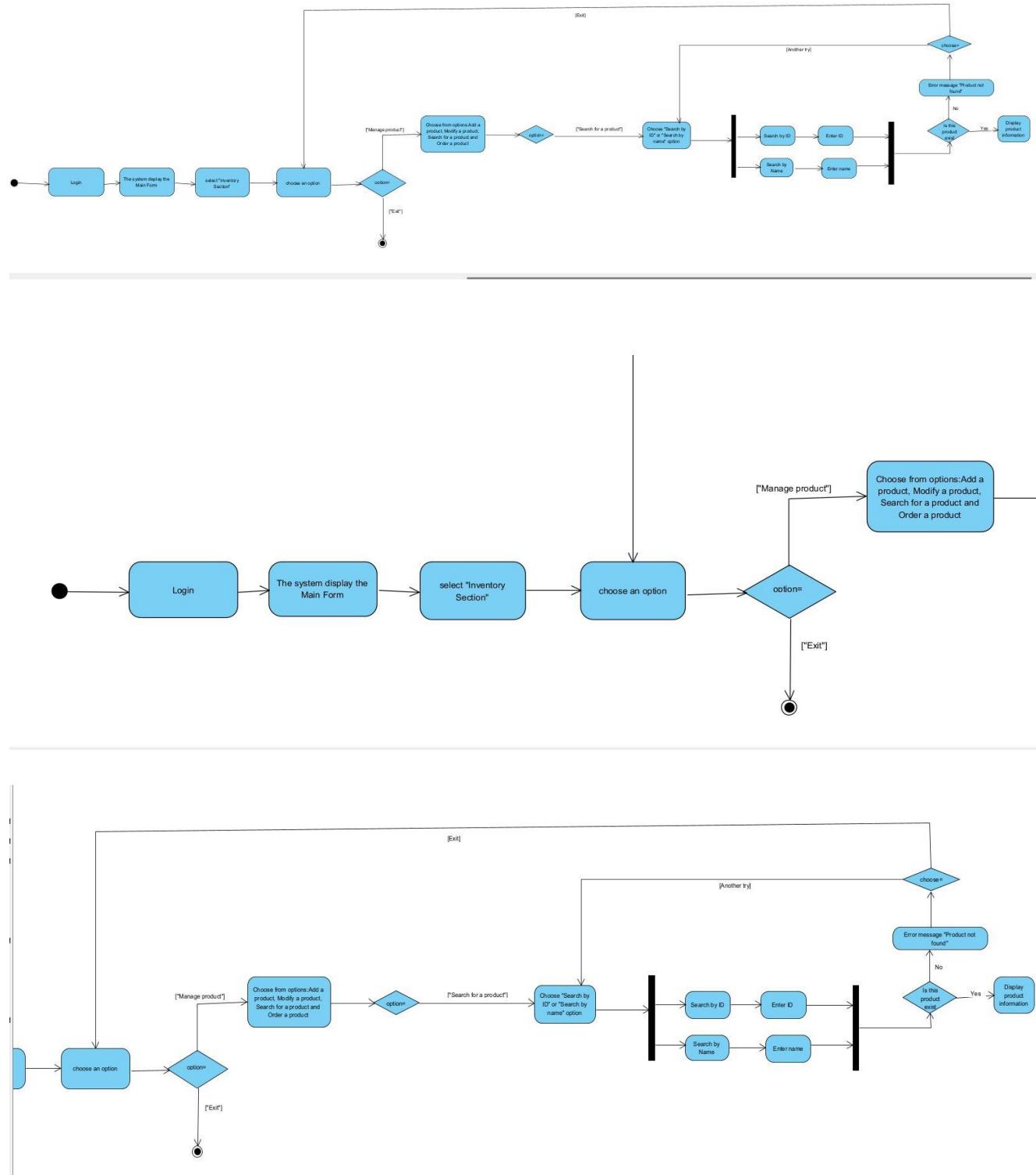
Inventory Employee selects the “Inventory Section” activity from the Main Form

5. Exit Conditions

After each operation, the system displays a success notification.

Activity Diagram

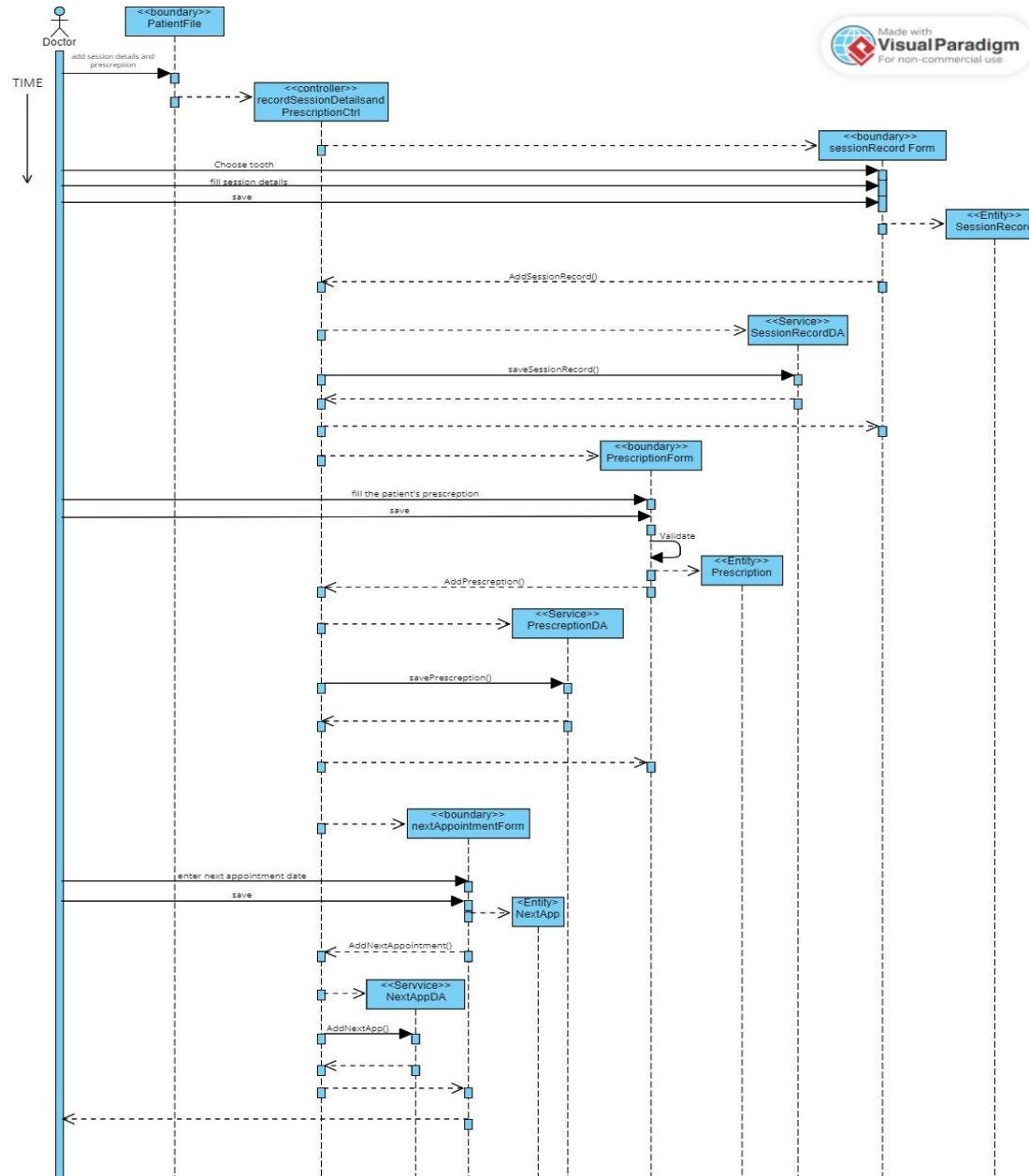
Search for a product



- Sequence Diagrams

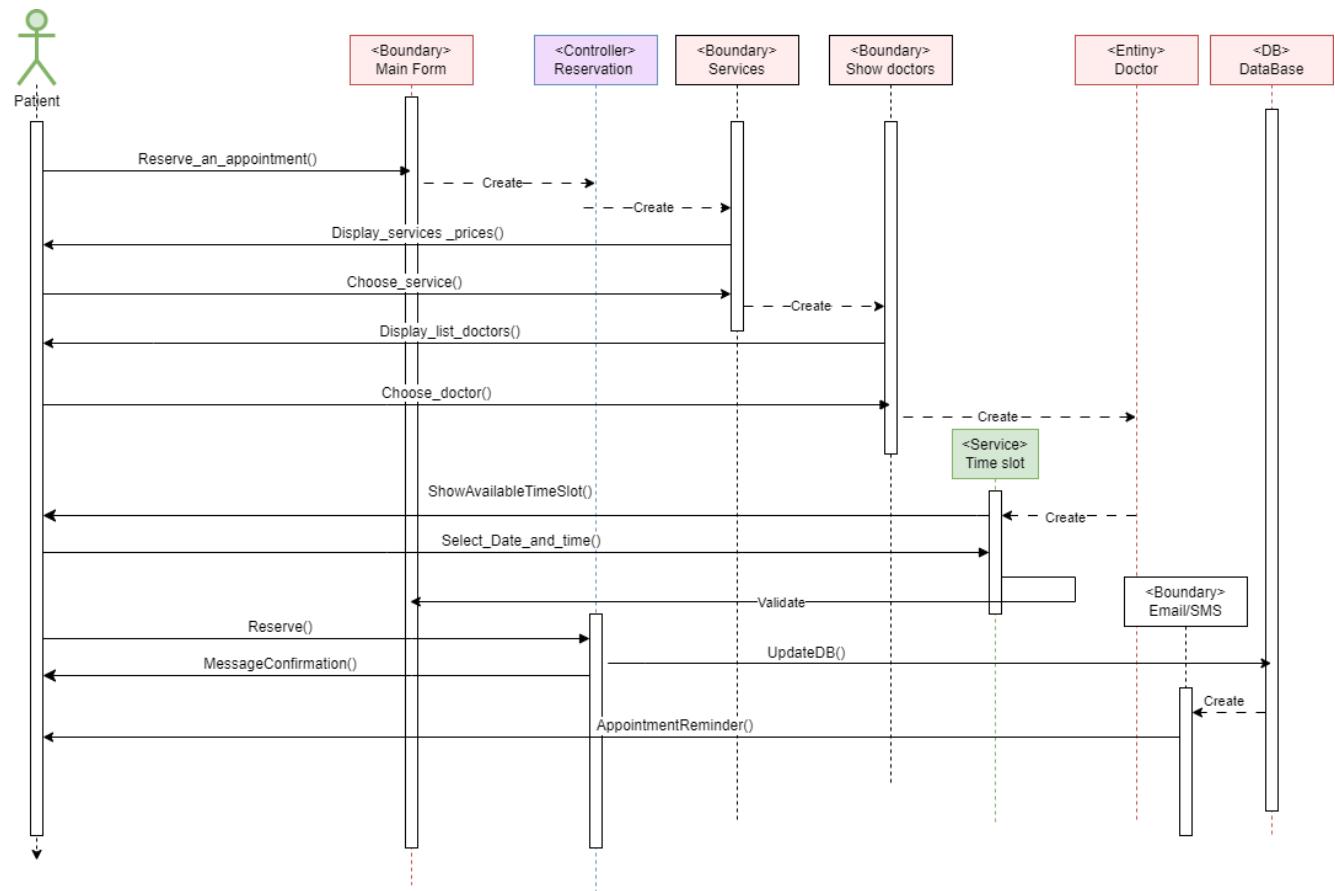
Layan Shoukri 1201225

Add the session record and the prescription sequence diagram



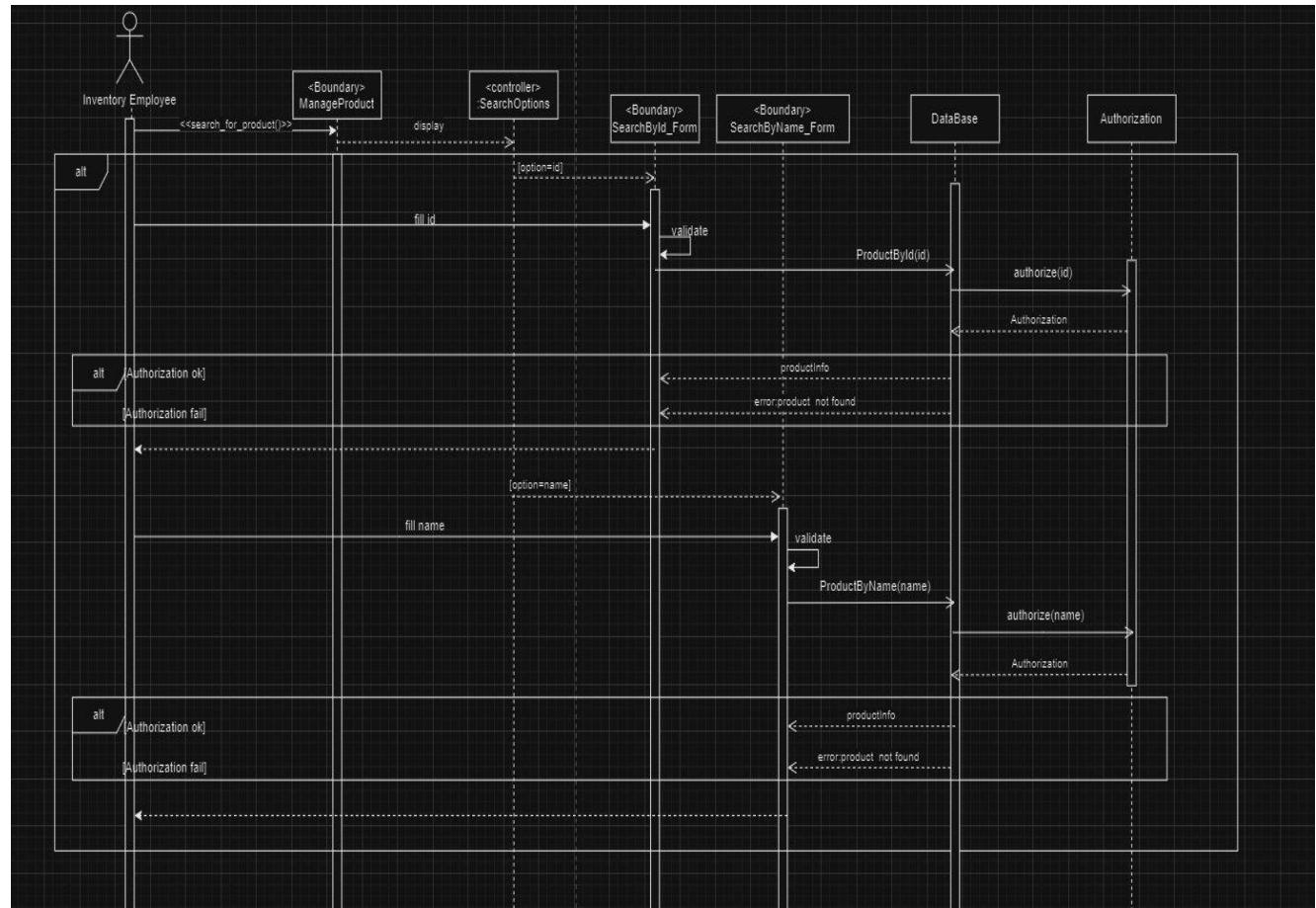
Salwa Fayyad 1200430

Booking Appointment



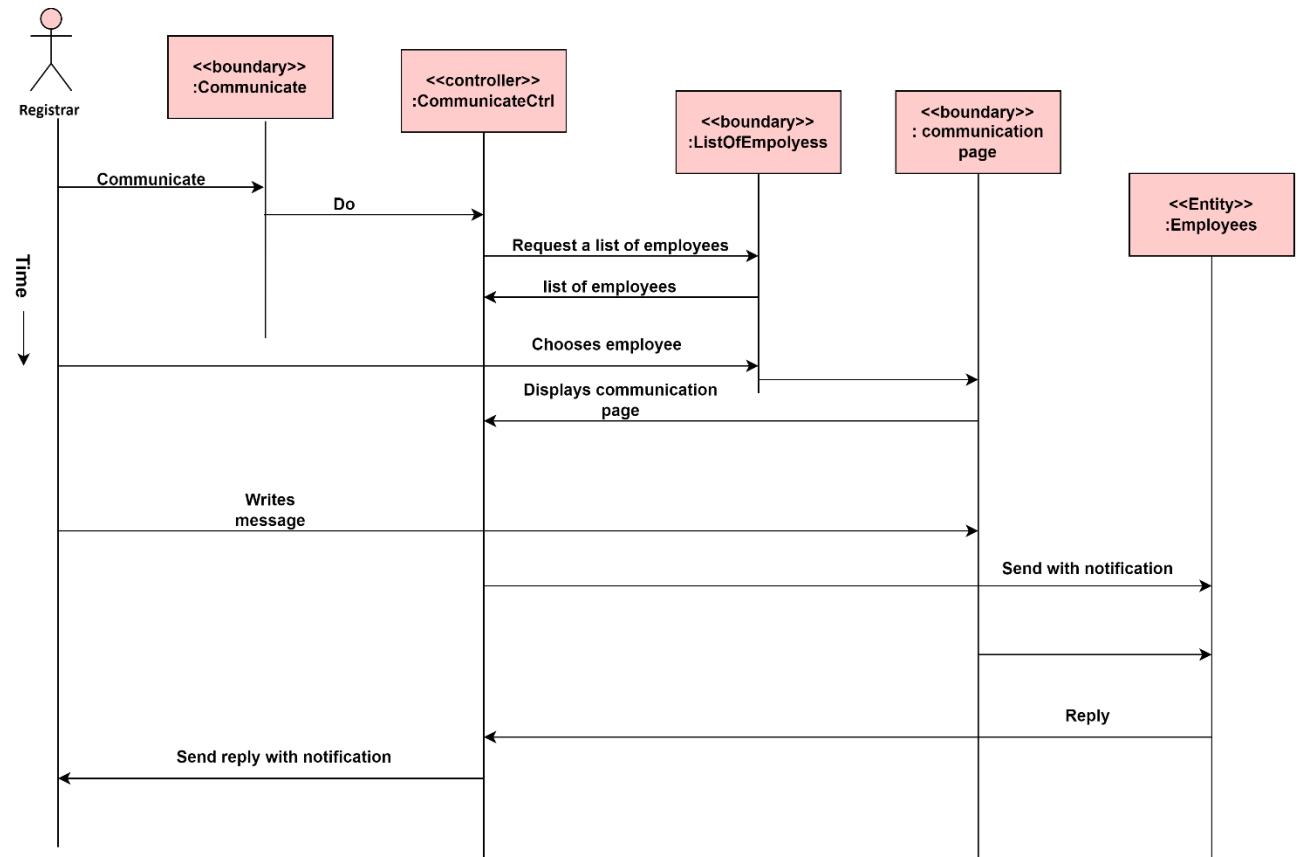
Amal Butmah 1200623

Inventory Management - Search for a product



Duaa Suliman 1200909

Communication among Employees



Phase 4

- **Software Architecture Design Goals**

- **Specific Goals:**

1- Usability: Our system will be easy to use and suitable for all employees, including the manager, doctors, nurses, receptionists, radiology staff, and inventory clerk, so that they will not need training before using it. Our website and the clinic's application will also be easy to use to suit whoever will be using it, especially patients, regardless of their age.

2- Reliability: Our system will maintain data integrity and reliability, protect the secure storage and processing of information by having backup copies to prevent any loss in case of any malfunction in the system, which will be automatically turned on within a few minutes.

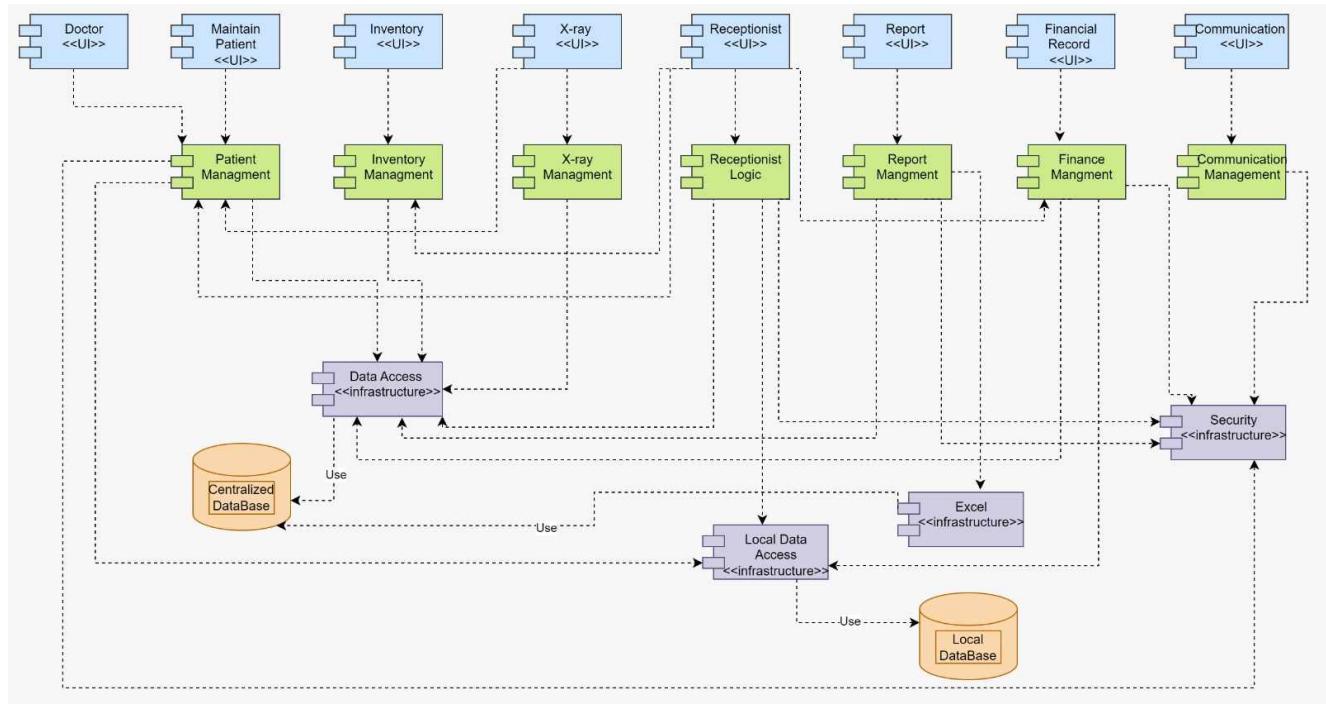
3- Security: Our system deals with sensitive data related to patients and their privacy, so a high level of security is provided to keep all data safe and ensure that it is not easily hacked.

- **General Goals:**

1- High cohesion: Our goal is to ensure that subsystem objects have related functions and perform similar tasks. We will organize our system into components, each of which focuses on specific tasks.

2- Low coupling: Our system will be organized into components that are independent of each other to reduce interdependence, where any change in one component will have almost no impact on the others, to enable flexibility and ease of maintenance.

- Component Diagram



Communication Management: Services for each communication process are provided to the communication interface, whether between employees, doctors and patients, or reception staff and patients so that different options appear for each communication process in the interface that suits the purpose of this process.

Report Management: Provides services to the report interface, so that a detailed report on the clinic and financial details is created to be managed by the manager.

X-Ray Management: Provide services for x-ray interface, it is an advanced diagnostic tool designed for detailed examination of dental structures. This is essential for diagnosing, treatment planning, and monitoring various dental conditions, enhancing the overall care provided in dental practices.

Inventory Management: Provides services to the interface related to the inventory clerk and the receptionist. It includes processes for managing inventory, including ordering, exporting, quantity of tools, their prices, and everything related to inventory.

Patient Management: This system provides services for each doctor interface and patient interface maintenance. It helps schedule appointments efficiently and allows easy storage and access to patient's records, including medical history and treatment plans. With this system, dental staff can effortlessly update patient information, track treatment progress, and manage patient interactions. It supports billing and payment processing, Improving the financial workflow of the clinic.

Financial Management: A component of the financial record interface, which provides all of a clinic's financial records, including tracking inventory consumption, managing employee payroll, and processing patient payments. This system simplifies financial workflows, ensuring accuracy and compliance with accounting standards for bill payments and account adjustments.

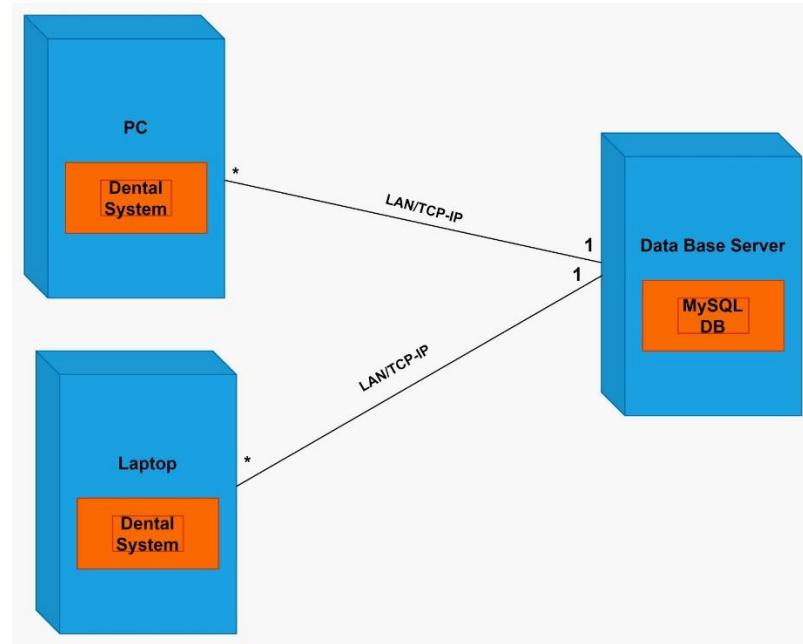
Receptionist Logic: Provides services to the receptionist interface, and plays a critical role in managing front desk operations. They are the primary point of contact with patients and are responsible for scheduling appointments, handling check-ins and check-outs, and managing patient records. They ensure accurate information, assist with forms, handle calls, and manage appointments and financial records to maintain an organized and efficient environment.

All logic components are connected to the data access which is used to write and read from the centralized database. Also, Excel eases the report management process and it is connected with the centralized database to provide the required information for the reports.

Receptionist logic, finance management, and patient management are also connected to the local data access which is connected to the local database to have a backup copy in case of any failure of the system to ensure the reliability of the system.

- UML Deployment Diagrams

- UML Deployment diagram for “i-Smile” Dental Desktop Application.



- Deployment Diagram for “i-Smile” Dental Web Application.

