



Ayadi | أيدی

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ABSTRACT

Raising children is challenging---parents sometimes struggle to understand and manage children's learning difficulties, social issues, and family problems. This struggle increases the need for a trusted specialist's advice, where the specialist might not be easy to find and communicate. Motivated by that, Ayadi application is designed to facilitate the communication between parents and specialists by providing a convenient and efficient connection channel, regardless of the location of both the parents and specialists. This connection will benefit not only the parent but also the specialists by offering their services through the app and making an additional source of income. This report presents the planning, analysis, design, development, and test phases of Ayadi, in addition to future work.

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1. Introduction

1.1 Context and motivation

Raising children is crucial in shaping society's future and ensuring that children grow up to be productive, responsible, and successful adults. However, it is a difficult and challenging process, as children have their own ways of expressing their thoughts, emotions, fears, and needs. These ways can be difficult for adults to understand.

A study conducted by the ZERO TO THREE organization in 2016 found that parents have a significant gap in understanding their children's capabilities and developmental milestones. The study, which surveyed 2,200 parents, revealed that 71% of parents believed their children were capable of certain milestones earlier than they actually were [1]. This lack of understanding may lead to the inability of parents to provide the right support, guidance, and discipline for their children, making parenting a challenging journey. Therefore, many parents need support and guidance to understand their children's needs and provide effective care.

Unfortunately, many parents cannot always find reliable support and guidance. This lack of availability and reliability of support and guidance raises more challenges for the parents. Despite there are numerous online resources (such as articles and videos) to guide parents in raising their children, few are reliable and sufficient. A study done by Buteau Poulin (2020) on 42 non-English parenting websites found that even though the internet is a valuable resource for parents, 67% (28/42) of these parenting websites were regarded as insufficiently understandable and actionable, and 57% (24/42) of these websites had information that was not reviewed by professionals or experts prior to publication which means these are unreliable and untrustworthy [2].

As a result, many parents struggle without proper guidance or accurate information. Even if the resources are accurate, they are often general information---not considering each child's unique circumstances, such as their environment, abilities, and their parents' specific situation. This can lead to incorrect diagnoses and ineffective solutions or advice, causing further difficulties for parents and their children.

To sum up the above, parents encounter challenges in understanding their children's needs and offering adequate support throughout their developmental stages due to difficulties to access accurate and comprehensive information that caters to all their children's needs.

These struggles are particularly intensified for those who do not speak English as their first language, as online resources predominantly favor English-speaking individuals.[3]

1.2 Problem definition

One of the possible solutions to fully understand the children's situation and parents' needs is to conduct a one-one session with a parenting specialist, where the specialist can understand the context of their children's problem, suggest solutions, and propose a follow-up plan. To the best we know, here in Saudi Arabia, most of these sessions are conducted individually, where each parent contacts the specialist individually to arrange the session either online or in person.

Although these sessions can help to correctly diagnose and address children's issues, they pose challenges to both specialists and parents. For the parents, it might not be easy to find the appropriate specialist. While for the specialist, such sessions need to be organized and prepared, which produces extra work. Furthermore, in-person sessions are not always feasible since these sessions require a visit to where the specialist works (clinic, hospital, etc.). This may result in a less continuous follow-up process which can actually impede expected and desired improvement.

To gain a better understanding of the need for parental consulting and guidance, we conducted a survey of 32 parents in Saudi Arabia (as seen in Appendix 1 - 6). Our analysis of the results showed that 65.6% (21 out of 32) of the parents would like assistance in correcting their child's behavior. Many parents encounter difficulties in finding the right help, with 50% (16 out of 32) of the surveyed parents indicating that they struggle to find the appropriate specialist. Additionally, the survey revealed that 59.4% (19 out of 32) of parents might face challenges that prevent them from attending appointments, which could negatively impact their child's progress.

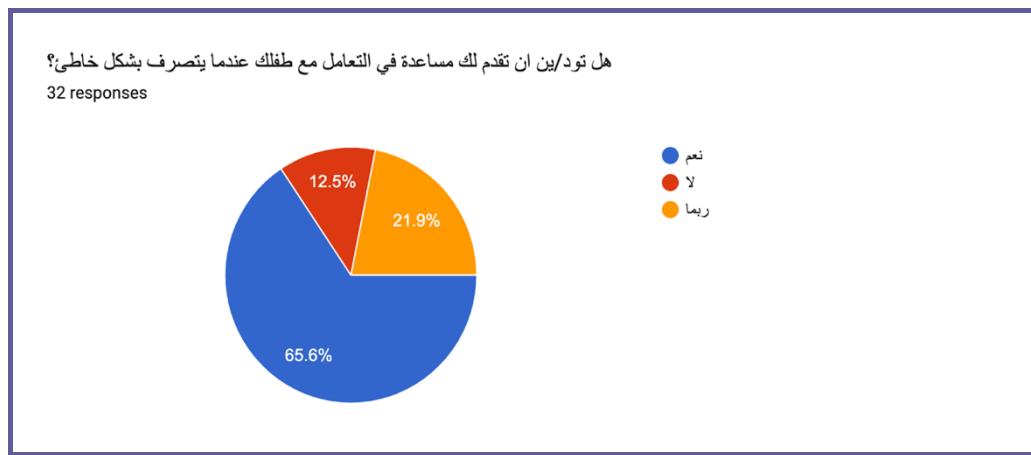


Figure 1 survey question 1 results

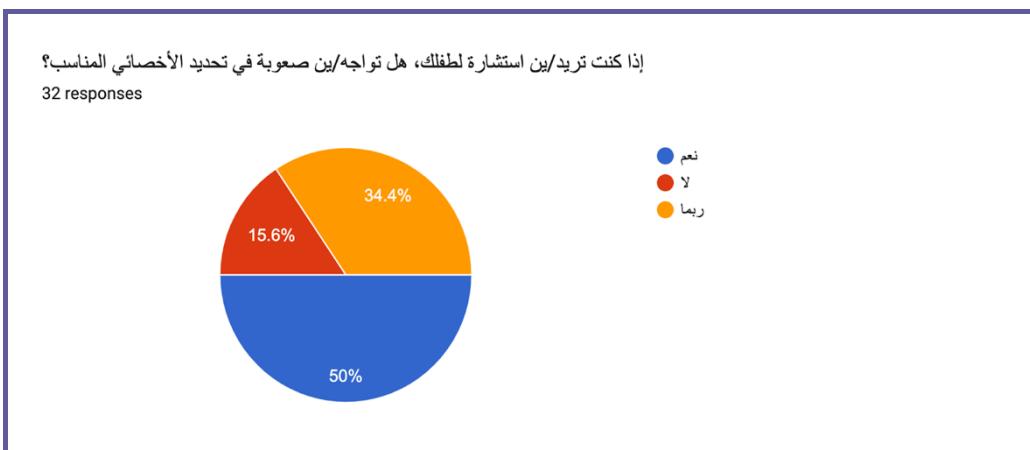


Figure 2 survey question 4 results

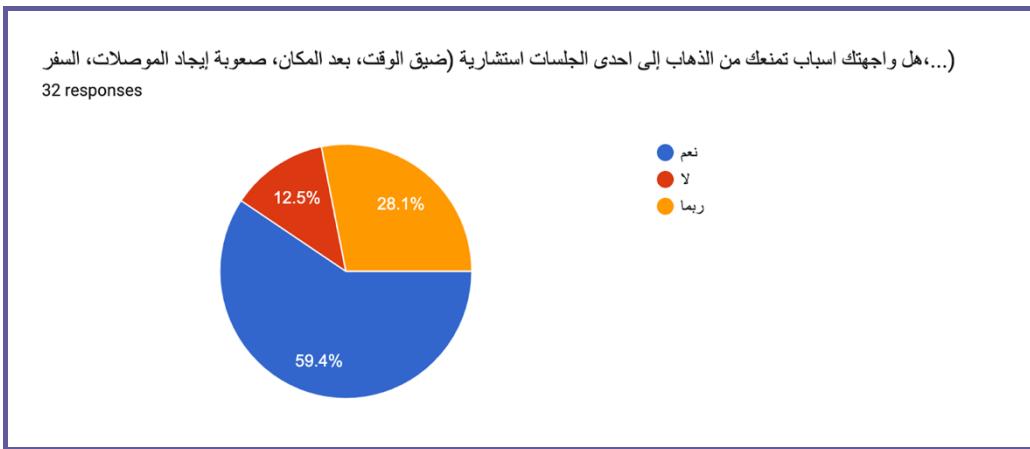


Figure 3 survey question 6 results

1.3 Proposed solution

Motivated and inspired by the above, we propose "Ayadi", a mobile-based application for iOS devices. Ayadi is designed specifically for the Arabic-speaking community in Saudi Arabia. This virtual platform offers a range of services to meet the needs of parents by offering services that include consulting a variety of specialists in many fields; starting from Behavior analysts to speech pathologists. Ayadi also offers the support the parents need to follow -up on their children's improvement.

Moreover, to ensure the comfort of parents, Ayadi offers multiple options for communication, including video/audio calls and messaging. This allows parents to easily connect with their specialists, even if they are unable to attend a live session, and ensures the continuity and improvement of the therapy.

1.4 Aim and objectives

The aim of Ayadi is to provide an effective communication channel between specialists and parents for solving child-rearing problems from anywhere and at any time. To achieve this aim, we have set several objectives:

1. To identify parents' needs by understanding their current issues and challenges in addressing their children's problems.
2. To understand the traditional method of conducting children consulting sessions to provide a suitable alternative in Ayadi.
3. To survey and review existing similar systems to ensure that Ayaudi provides unique features in addition to the good features that are provided by others and expected by the users.
4. To design and develop a mobile-based application that can support both specialists' and parents' needs.
5. To provide a user-friendly and intuitive interface for a better user experience.
6. To test and evaluate the application.

2. Domain Analysis

This chapter provides our understanding and analysis of the domain of Ayadi, which is particularly in the intersection of parenting, children, and specialists. In other words, it is under the umbrella of educational and health science.

2.1 Terminology and Definition

To enhance this document's understandability, a list of terms associated with this field is provided in this subsection. This list consists of the following:

- **Parent:** A father or a mother or protector or guardian (*Definition of Parent / Dictionary.com*, n.d.).
- **Specialist:** A medical practitioner who devotes attention to a particular class of diseases, patients, etc (*Definition of Specialist / Dictionary.com*, n.d.).
- **Consulting:** professional service that involves providing expert advice and guidance to individuals, organizations, or businesses in a particular field or industry (*What Is a Consultant?*, 2023).
- **Parenting:** The methods, techniques, etc., used or required in the rearing of children (*Definition of Parenting / Dictionary.com*, n.d.).
- **Account:** An account typically includes information you need to share with the company for them to provide you services. It usually contains details of transactions and the business relation with a customer (Kostadinov, 2018).
- **Profile:** A profile typically includes information about you that is displayed publicly (Kostadinov, 2018).
- **API:** Application Programming Interface (*Definition of API / Dictionary.com*, n.d.).

2.2 Customers and Users

Our potential customers and users of Ayadi are specialists, parents and system managers. They mainly do the following:

- Managing the system through a website will be done by system managers.
- Booking appointments, conducting sessions and following a child's progress will be done through the app by specialists and parents.

Ayadi will also be of interest to the Ministry of Human Resources and Social Development and the Ministry of Health of Saudi Arabia.

2.3 Competing Systems

We conducted a search for apps aimed at raising children and advising their parents. This search seeks to understand what similar systems provide, what they do not, and where the gap is. We found that there are a number of apps, most of which have ratings above 2.5 out of 5. However, some of these apps have never been evaluated, and many seem to be unpopular due to the lack of reviews. Below is a list of the applications we identified, along with our analysis and comparison

of these apps with Ayadi. Our comparison highlights Ayadi as a superior parenting consulting service.

2.3.1 Related Applications

1. Nurabi



Figure 4 Nurabi Application

Nurabi is a platform which supports five languages, providing different fields such as education, psychology, behavior, and society. It is an environment for communication with all parties to the educational process (parents, children, teachers, educational and psychological advisers, trainers, educational organizations). It offers educational consultations with experts and specialists; Sessions are held through a video call only. It also provides educators with statistics about what has been worked on and measures progress in educational performance. It also provides educational and psychological advice and guidance on the nature of the personality, which is identified through internationally approved personality analysis tests[4].

2. Parent Guide from Lasting



Figure 5 Parent Guide from Lasting Application

Parenting Guide from Lasting helps parents raise healthy, resilient kids through self-guided sessions and live classes, it provides topics like anxiety in kids, whining, sibling conflict, and much more. It also provides tools to increase self-awareness, teach kids to regulate emotions. All users get free access to Foundations series-four sessions covering the basics of healthy parenting. **Parenting Guide from Lasting** unlocks the entire app for two and allows you to take hundreds of sessions and access live, therapist-led classes every week on multiple topics. It allows a 7-day free experience and supports English language only [5].

3. Little Otter



Figure 6 Little Otter Application

Little Otter provides personalized therapy for kids 0-14 who are struggling with big feelings and tough challenges. Little Otter's evidence-based therapy includes a "whole family" approach. It enables users to schedule video sessions and follow-up continuously through chat and personal support. It is ensured that parents have the tools and coaching they need to help too. Little Otter supports the English language only[6].

4. MyMiniHero



Figure 7 MyMiniHero Application

MyMiniHero is an online platform that provides one to one online psychological counseling and physical health consultations with parenting specialists through video chat system. Also address guidance and educational topics for parents through parenting programs/ workshops in which parents will be more qualified and aware on how to deal with children struggling with behavioral, communication or comprehension issues, specialists also have online courses about different topics for young people of all ages.

5. Faserly



Figure 8 Faserly Application

Faserly is an online platform which enables users to request direct consultation from experts from the Arab world in the disciplines of mental health, marital and emotional life, family and child education, human development, self-development, career development, sport and weight loss, and others chat or video[8].

6. FamCare



Figure 9 FamCare Application

FamCare is a virtual platform about psychiatric clinics and matrimonial counseling centers as licensed specialists to provide consultancy services. It is offering conducting a session through the assistant specialist. It also allows the user to join session either by video call or chat[9].

7. Refd



Figure 10 Refd Application

Refd is a platform that enables users to request home visits from Saudi specialists and teachers to establish and teach primary classes. Complementary services for persons with disabilities in the fields (development of academic skills, behavior modification, psychological support, occupational therapy, physiotherapy, speech, and communication). It supports English and Arabic languages only [10].

8. Ad Astra Therapy



Figure 11 AD ASTRA Application

Ad Astra Therapy is an application that enables parents to book sessions with specialists based on different specializations such as (pronunciation, speech, behavioral therapy, life skills development, academic skills development, physiotherapy, functional therapy at home) and follow up their children's progress [11].

2.3.2 Comparison Table

Here, we have identified six features that will be applied in Ayadi and based on these features we compared our system with the above-mentioned systems in the following table.

App name	Arabic language	Video call	Chatting	Variety of specialization	Rating and Reviews	user-friendly interface
نُرَبِي Nurabi	✓	✓			✓	
Parenting Guide from Lasting				✓	✓	
Little Otter Health		✓	✓	✓		✓
Ad Astra Therapy	✓		✓	✓	✓	
أرجون Refd	✓				✓	
فَسْرَلِي Faserly	✓	✓	✓	✓	✓	
فَامْكِير FamCare	✓		✓	✓		✓
MyMiniHero	✓	✓	✓		✓	
أَيْدِي Ayadi	✓	✓	✓	✓	✓	✓

Table 1Proposed system VS Existing system

Upon reviewing the above table and comparing it to other applications, it is evident that Ayadi application offers all of the listed features, while the other applications only contain some of them.

3. Risk/Constraints

Identifying and managing both risks and constraints is a critical task during software project development, as the success or failure of a project often depends on it. Table 2 lists the key risks and limitations that we have identified in developing Ayadi.

No.	Risk	Type	Severity	Likelihood	Risk management strategy
1	Conflict of deliverables deadlines	Project	High	High	Organize the Work between team members
2	Team members have limited knowledge of required technologies	Product	High	Medium	taking courses about the language that we are going to use, and reading up to date articles.
3	The project domain is not well understood due to insufficient knowledge.	Project	High	Medium	Improving knowledge by doing extensive research and asking specialists and parents
4	The idea may not have the attention of users	Product	Medium	Low	Fully understand users to add features that attract the users
5	The project process is challenging to manage.	Management	High	Medium	We will make a group due date before the actual due and use <i>notion</i> management tool to help us.

Table 2 Risk/Constraints

4. Project Plan

Our project aims to create a link between parents and specialists through two platforms: an iOS mobile application and a website. By the end of the project, we aim to successfully deliver a solution that fulfills our goal. To achieve this without delay, we designed our work plan, by assigning tasks to each member. shown in Figure 12&13.

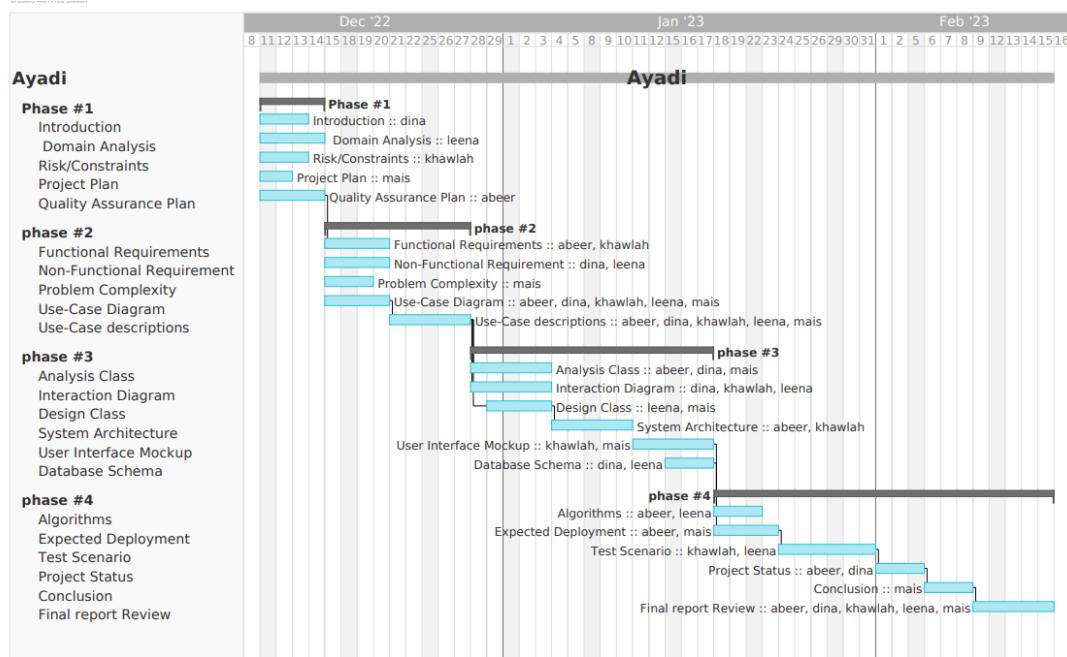


Figure 12 Ayadi Project Plan Part I [11]

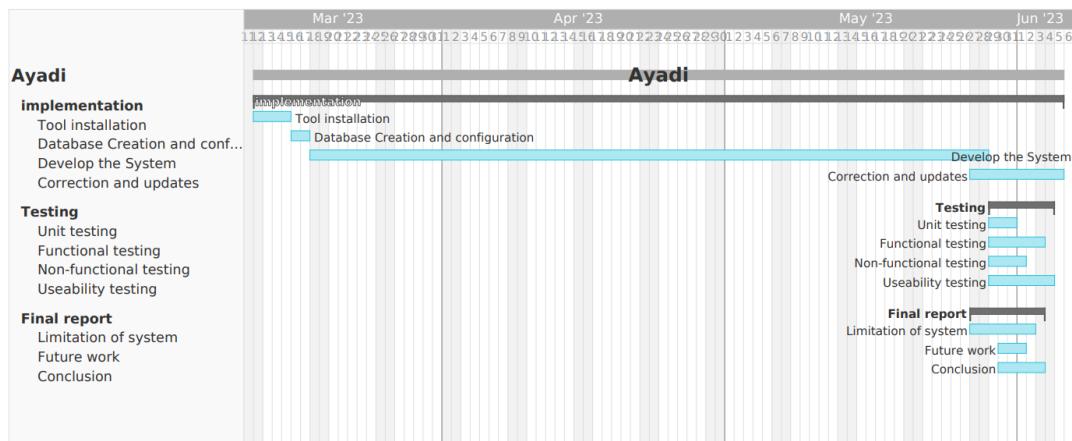


Figure 13 Ayadi Project Plan Part II [11]

5. Quality Assurance Plan

Several quality assurance activities are performed during the development lifecycle to enhance the overall quality of *Ayadi*. These activities are as the following:

Walkthrough

The team members will conduct a walkthrough of each other's deliverables in an informal manner. Each individual or group will share their deliverables by sharing documents, and other team members will be assigned to review them either by adding comments or having face-to-face meetings. The main purpose of this step is not only to detect errors and provide suggestions early on, but also to ensure that all team members have a better understanding of each other's work and can suggest improvements. Table 37 in Appendix section shows a summary of this step.

Inspection

In *Ayadi*, a formal review with the supervisor is conducted periodically and continuously. This review helps the team members to improve their work after obtaining the supervisor's feedback. Table 38 in Appendix section shows a summary of this step.

Checklist

We will follow the checklist provided by the Graduation Project Committee (GPC) to ensure that all the requirements have been met.

Testing

To ensure that the software application meets the requirements and specifications, as well as the needs and expectations of the end-users, the following tests will be performed:

- **Unit testing**

The team will perform unit testing by testing individual units or components of the software application in isolation from the rest of the system. This is done to verify that each unit of the software application is working as expected and meets the functional requirements and specifications [12].

- **Functional testing**

Functional testing is a software testing method that assesses the functionality of a software application by comparing it to its specifications or requirements. The primary goal of functional testing is to verify that the software application functions correctly as intended and fulfills the desired functional requirements. [13].

- **Usability testing**

To evaluate the ease of use and effectiveness of our system from the perspective of its users, the team will conduct usability testing. The goal of this testing is to measure users' level of satisfaction and ease of use, and to ensure that the product is not only functional, but also easy and intuitive to use [14].

- **Non-Functional testing**

Nonfunctional testing is a crucial phase of software testing that focuses on evaluating the non-functional aspects of an application or system. Its primary goal is to assess the performance, usability, security, reliability, and scalability of the software. This comprehensive examination will ensure that our system adheres to the necessary standards and performs optimally in real-world situations. By meticulously analyzing these non-functional attributes, we can improve the overall quality and user experience of our software products. [15].

- **Performance testing**

The team plans to conduct Performance testing in order to assess the system's performance under specific conditions and workload. The aim is to measure different aspects of system performance, including response time, throughput, resource usage, and scalability. Additionally, this type of testing aims to uncover any potential bottlenecks, limitations, or weaknesses in our system that may affect its performance and user experience. [16].

6. Requirements

This section presents the method we applied to elicit the requirements of *Ayadi* and the requirements specifications. The requirements are the functional requirements the end user requires as essential facilities to be provided by the system and the non-functional requirements that determine how the system performs and the quality restrictions that the system must meet.

6.1 Requirements Elicitation

We use three key techniques to collect *Ayadi* requirements. These techniques are summarized in the following subsections.

6.1.1 Brainstorming

The process of requirements elicitation begins with brainstorming. It is a collective technique aimed at generating a lot of ideas and finding a solution to a particular problem. It is the best way to get a huge amount of data right away and it helps prevent future problems [17], as well as capturing needs you were unaware of. For *Ayadi*, we have given each member of our team enough time to express all her thoughts and views on the system through sessions. All ideas were written so everyone could see them. We then analyzed and organized ideas by compiling convergent ideas and excluding ideas that do not support the system or ideas that are not applicable in our system.

6.1.2 Reviewing Existing Systems

In Chapter 2, we reviewed eight existing systems in the same domain and provided a brief description of each system. We used this review to identify the advantages that should be in our system, avoid the weaknesses of other systems, and clearly list the requirements of our system. We then compared our system to the other systems, identifying the competitive advantages our system has over others.

6.1.3 Interviews

To ensure that our application properly provides the features that parents and specialists need, we conducted interviews with three specialists who have more than four years of experience in a similar field to our main focus. We interviewed specialists from different fields to cover all the information parents may need through our app. Table 3 summarizes the interview details and the information of the specialists who contributed to this stage.

Based on the Specialist 1 interview, we collected useful and enriching information for educational consulting that will help *Ayadi* application to provide the appropriate services for the target users. For example, specialist 1 suggested providing a report for each child after each appointment for follow-up purposes. This report will help other experts to easily continue contributing to the child's development. She also suggested cooperation with some specialists and centres specializing in the

field of children to conduct examinations that require the child's presence to help specialists draw up a remediation plan. Specialist 1 also raised the need of rewarding after each success a child made with a specialist. Such rewards help the specialist to obtain the results they require.

The second interviewer emphasised the need for a system that fulfills both parents' and specialists' needs. for specialists, such a system will provide them with an additional income source, and for parents, it will help them reach therapies easier. She suggested offering three types of services: behavior therapy, educational therapy, and speech and language therapy. She emphasised the need for specialists to communicate with parents via video meetings, as it will improve the understandability of the problem to reach to the best solution. In addition, she said that based on the therapy type, the specialist might need to have primary information about the child.

During the third interview, Specialist 3 discussed common behavioral and occupational performance issues that children face, such as ADHD, oppositional defiant disorder, anxiety, and language or speech disorders. She mentioned her observations of some of these issues during sessions conducted online due to COVID-19. She was surprised to find that her young patients actually enjoyed taking online sessions and continued to show progress in completing their treatment plan goals. As a result, she encouraged the use of a virtual approach in some cases and suggested that behavioral and speech-language problems would be well-suited for an online app with parental involvement.

Furthermore, Specialist 3 emphasized the importance of parental and family involvement in the treatment plan, and the need for a holistic approach that includes therapy and lifestyle changes within the family. However, she noted that the current approach of conducting sessions with only the presence of the child suffers from a lack of family participation and support. To address this, she suggested providing guidance sessions for parents with specialists to include them in the process. She also recommended that parents should be involved from the beginning of the process by providing all necessary information about their child and working with the specialist to track their child's progress. Such progress can be charted for faster analysis by the specialist.

#	Interview	Specialization	Experience	Approximate Time (minutes)	Location
1	Malak Alhamad	Educational Consulting	<ul style="list-style-type: none"> • Founder and leader of the Aazer team for children. • expert in educational consulting for more than 4 years. 	<ul style="list-style-type: none"> • Introduction and Permission (2 minutes). • Background about Ayadi application (3 minutes). • interview questions (10 minutes). • Discussing the parents needs (6 minutes). 	In person
2	Amani Aldous	Speech and language therapy	<ul style="list-style-type: none"> • 9 years of experience in special education in the field of learning difficulties 	<ul style="list-style-type: none"> • Introduction and Permission (1 minute). • Background about Ayadi application (2 minutes). • Discussing the Specialists needs (10 minutes). • Discussing the parents needs (7 minutes). 	Zoom meeting
3	Hanan Almazrua	Special Needs (Mental Retardation)	<ul style="list-style-type: none"> • 23 years of experience in disability treatment and parents education in how to treat disability cases 	<ul style="list-style-type: none"> • Introduction and Permission (4 minutes). • Background about Ayadi application (5 minutes). • Discussing the Specialists needs (10 minutes). • Discussing the parents needs (8 minutes). 	In person

Table 3 Interviews' Information and interview details

6.2 Requirements Specification

6.2.1 Functional Requirements

Parents Requirements

- FQ1.** The parent shall be able to register to the system using first name, last name, phone number, and email.
- FQ2.** The parent shall be able to log in using their phone number.
- FQ3.** The parent shall be able to log out from their account.
- FQ4.** The parent shall be able to delete their account.
- FQ5.** The parent shall be able to view their profile.
- FQ6.** The parent shall be able to view their wallet amount.
- FQ7.** The parent shall be able to edit their profile (first name, last name, phone number).
- FQ8.** The parent shall be able to add their child(ren) profile under his/her account.
- FQ9.** The parent shall be able to view their child(ren) profile under his/her account.
- FQ10.** The parent shall be able to view their child(ren) sessions reports.
- FQ11.** The parent shall be able to edit their child(ren) profile under his/her account.
- FQ12.** The parent shall be able to delete their child(ren) profile under his/her account.
- FQ13.** The parent shall be able to view the list of specialists.
- FQ14**The parent shall be able to view specialist profile.
- FQ15.** The parent shall be able to view the available times for an appointment.
- FQ16.** The parent shall be able to book an appointment.
- FQ17.** The parent shall be able to pay PayPal.
- FQ18.** The parent shall be able to view previous appointments.
- FQ19.** The parent shall be able to view upcoming appointments.
- FQ20.** The parent shall be able to edit upcoming appointments.
- FQ21.** The parent shall be able to delete upcoming appointments.
- FQ22.** The parent shall be able to rate the specialist after the appointment.
- FQ23.** The parent shall be able to review the specialist after the appointment.
- FQ24.** The parent shall be able to join the session via video call.
- FQ25.** The parent shall be able to chat with specialist.

Specialist Requirements

- FQ26.**The Specialist shall be able to register to the system using first name, last name, email, session price and phone number, specializations, and cv.
- FQ27.**The Specialist shall be able to log in using their phone number.
- FQ28.**The Specialist shall be able to log out from their account.
- FQ29.**The Specialist shall be able to delete their account.
- FQ30.**The Specialist shall be able to view his/her profile.
- FQ31.**The Specialist shall be able to edit his/her profile (first name, last name, email, session price, phone number, specializations)
- FQ32.**The Specialist shall be able to add his/her bank information.
- FQ33.**The Specialist shall be able to schedule his/her working hours.
- FQ34.**The Specialist shall be able to view the appointment schedule.
- FQ35.**The Specialist shall be able to view upcoming appointments.
- FQ36.**The Specialist shall be able to view previous appointments.
- FQ37.**The Specialist shall be able to upload a report after each appointment.
- FQ38.**The Specialist shall be able to view the child's profile.
- FQ39.**The Specialist shall be able to view the child's report.

Admin Requirements

- FQ40.**The admin shall be able to log in using their email and password.
- FQ41.**The admin shall be able to log out from their account.
- FQ42.**The admin shall be able to view a list of parent/specialist accounts.
- FQ43.**The admin shall be able to delete parent/ specialist accounts.
- FQ44.**The admin shall be able to view the specialist cv.
- FQ45.**The admin shall be able to view the list of specialist's registration requests.
- FQ46.**The admin shall be able to accept/reject a specialist request.
- FQ47.** The admin shall be able to view the specialist's ratings.
- FQ48.**The admin shall be able to view the specialist's reviews.

6.2.2 Non-Functional Requirements

- **Usability:**

- NFR1.** The user shall be able to successfully complete a task in under one minute.
- NFR2.** Average Time of Booking an appointment shall be no longer than 10 minutes.
- NFR3.** The system's minimum Customer Satisfaction (CSAT) score of the system shall be 77%.¹

- **Reliability:**

- NFR4.** The system shall be available 90% of the time.²
- NFR5.** The average Mean-Time-To-Repair (MTTR) shall be 8.85 hours.³

- **Performance:**

- NFR6.** The system's average response time (ART) shall be less than 1 second.⁴

- **interoperability:**

- NFR7.** The system must be backwards compatible with IOS devices older than 15.7 IOS versions.

- **Localization:**

- NFR8.** The date format must be as follows: DD/MM/YY.
- NFR9.** The system should support right-to-left direction.

6.2.3 Design Constraints

DC1. The system shall be developed on IOS platform for parents and specialists.

DC2. The system shall be developed on website for the admin.

DC3. The system shall support Arabic language.

DC4. The system shall store its data on firebase firestore database.

DC5. The system shall use pay-pal API as payment method.

¹ Based on a study by Jeff Sauro. [18]

² Based on experts' world-class system availability measures. [19]

³ Based on Industry data from MetricNet's global benchmarking database. [20]

⁴ Based on Jakob Nielsen's response time limits. [21]

7. Problem Complexity

In this section, we outline the challenges encountered during the development of the project. Initially, we encountered issues in assessing the need for our solution among the target users. To address this, we carried out questionnaires (detailed in the introduction section) with parents to determine the usefulness of our system and its potential benefits to users. Another challenge was in gathering requirements, particularly in defining the various parenting specializations due to a lack of expertise and experience in parenting consulting. To overcome this, we conducted interviews (discussed in more detail in the requirement gathering section) to visualize and form a clear understanding of the system's requirements that align with the needs of our target users. It is worth noting that these difficulties were compounded by the time constraint, as the project was completed in less than 6 months.

8. System Use-Cases

8.1 Use-Case Diagram

8.1.1 Parent Use-Case Diagram

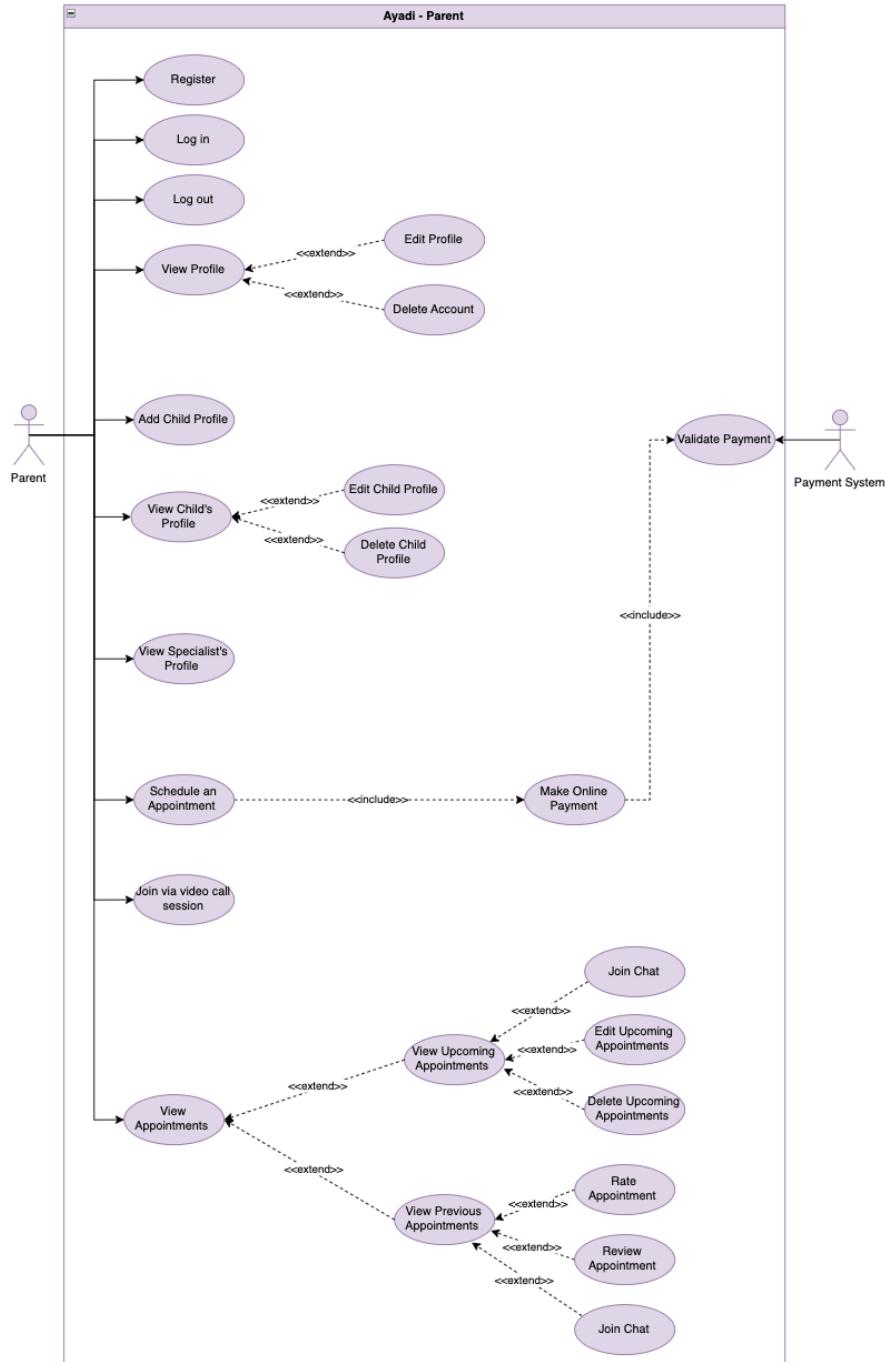


Figure 14 parent use case

8.1.2 Specialist Use-Case Diagram

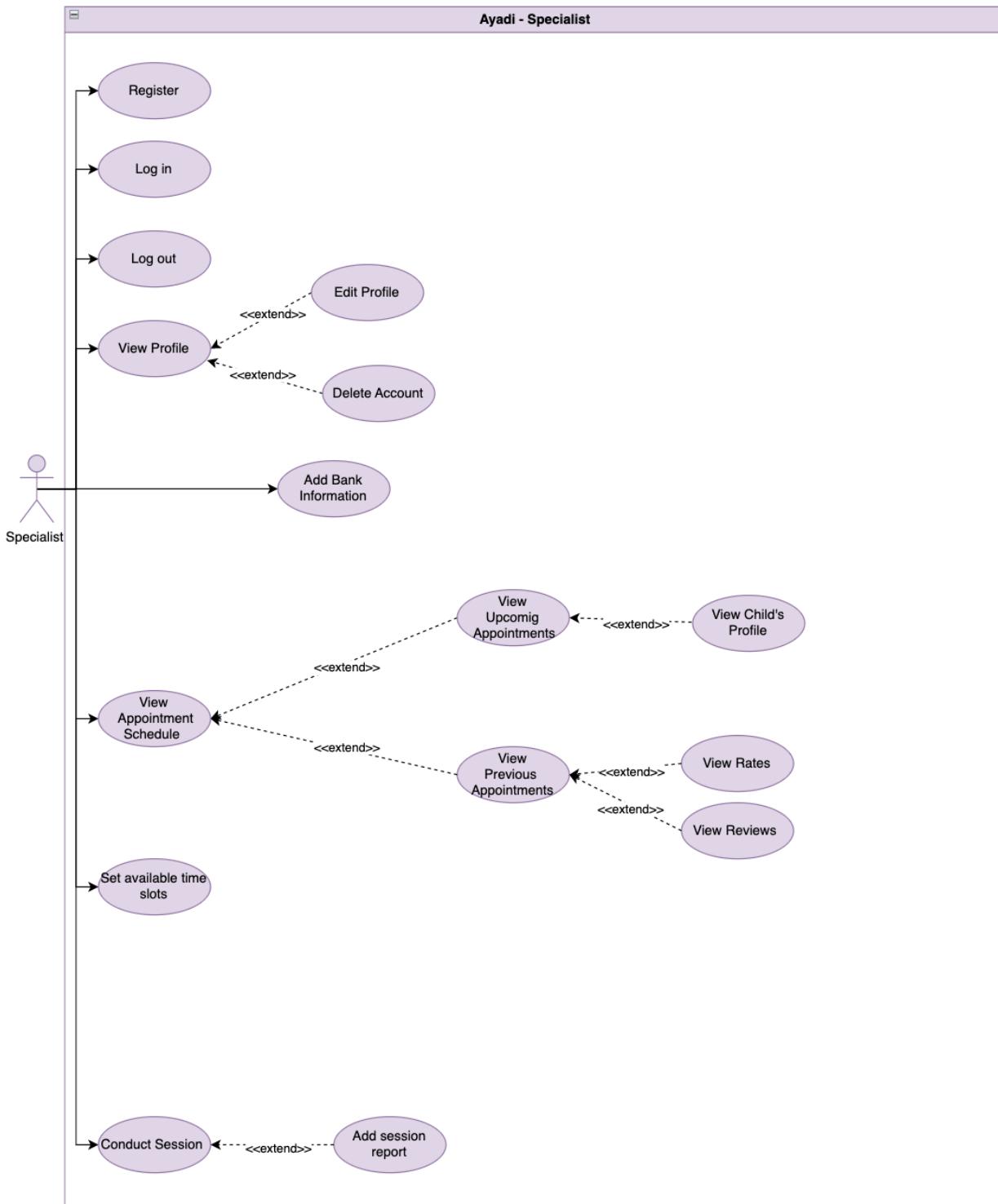


Figure 15 Specialist Use Case Diagram

8.1.3 Admin Use-Case Diagram

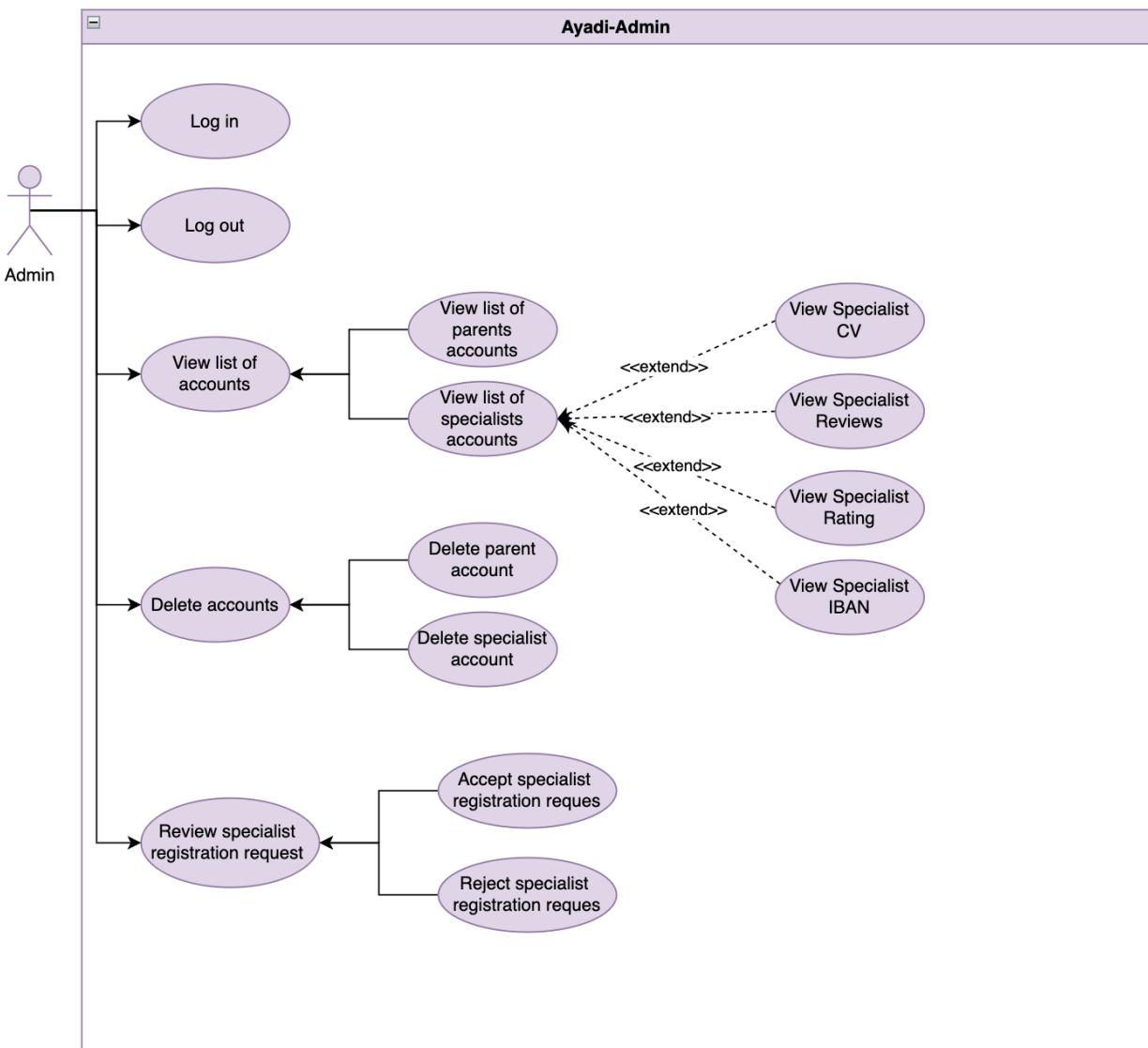


Figure 16 admin Use Case Diagram

8.2 Use-Case Description

8.2.1 Add child profile

Use-Case Description		
System Ayadi System		
Use-Case Name Add child profile		
Primary Actor Parent		Secondary Actors None
Description This use case allows parents to add new child's profile.		
Relationships <ul style="list-style-type: none"> ● Extends: None. ● Includes: None. 		
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must have logged in successfully. 		
Basic Flow		
Primary Actor Parent	System	Secondary Actor
1. This use case begins when the parent selects add a new child's profile. 3. The parent fills the form. 4. The parent submits the form. 6. The parent confirms the order.	2. The system displays add new child form include the following required information: <ul style="list-style-type: none"> ● Child's name ● Child's date of birth ● Child's gender 5. The system displays a message requesting the parent to confirm the order. 7. The system displays the success message to the parent.	None

Alternative and Exceptional Flows |

3.1 Missing field / invalid format

If the parent misses entering the required fields or fills them with invalid format in step 3, then:

- 3.1.1 The system displays an error message indicating misses or invalid field(s).
- 3.1.2 Resuming step 3.

6.1 Operation canceled

If the parent cancels the operation at step 6 or earlier, then:

- 6.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The child profile has been added successfully.
- **Failure Condition:** No child profile added.

Table 4 Add child profile use-case description

8.2.2 Delete upcoming appointment

Use-Case Description		
System Ayadi System		
Use-Case Name Delete upcoming appointment		
Primary Actor Parent		Secondary Actors None
Description This use case allows parents to delete their upcoming appointment.		
Relationships <ul style="list-style-type: none"> ● Extends: None. ● Includes: None. 		
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must have logged in successfully. 3. The parent must have upcoming appointment. 		
Basic Flow		
Primary Actor Parent	System	Secondary Actor
1. This use case begins when the parent selects delete upcoming appointment. 3. The parent confirms the order.	2. The system displays a message requesting the parent to confirm the order. 4. The system displays the success message to the parent.	None
Alternative and Exceptional Flows <ol style="list-style-type: none"> 3.1 Operation canceled <p>If the parent cancels the operation at step 3 or earlier, then:</p> <ul style="list-style-type: none"> 3.1.1 The use-case ends with a failure condition. 		
Post-Conditions <ul style="list-style-type: none"> ● Successful Condition: The appointment has been deleted successfully. ● Failure Condition: No appointment deleted. 		

Table 5 Delete upcoming appointment use-case description

8.2.3 Accept specialist registration request

Use-Case Description				
System Ayadi System				
Use-Case Name Accept specialist registration request				
Primary Actor Admin	Secondary Actors None			
Description This use case allows admins to accept a specialist registration request.				
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 				
Pre-Conditions <ol style="list-style-type: none"> 1. The admin must have logged in successfully. 2. The admin must have specialist registration request. 				
Basic Flow				
Primary Actor Admin	System	Secondary Actor		
1. This use case begins when the admin selects registration request option. 3. The admin selects a specialist. 6. The admin accepts the selected specialist. 8. The admin confirms the acceptance.	2. The system displays all specialist registration request. 4. The system displays the specialist's CV. 5. The system asks the admin to accept the specialist. 7. The system displays a message requesting the admin to confirm acceptance. 9. The system displays the success message to the admin.	None		

Alternative and Exceptional Flows |

6.1 Operation canceled

If the admin rejects the selected specialist instead in step 6, then:

6.1.1 The use-case ends with a failure condition.

8.1 Operation canceled

If the parent cancels the operation at step 8 or earlier, then:

8.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The specialist's registration request has been accepted successfully.
- **Failure Condition:** No specialist's registration request is accepted.

Table 6 Accept specialist registration request use-case description

8.2.4 Review Appointment

Use-Case Description				
System Ayadi System				
Use-Case Name Review Appointment				
Primary Actor Parent	Secondary Actors None			
Description This use case allows parents to add a review about the specialist after the appointment.				
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 				
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must have logged in successfully. 3. The parent must have finished the appointment. 				
Basic Flow				
Primary Actor Parent	System	Secondary Actor		
1. This use case begins when the parent selects review the specialist. 3. The parent enters his/her review about the specialist. 4. The parent submits his/her review. 6. The parent confirms the submission.	2. The system displays a text field for reviewing. 5. The system displays a message requesting the parent to confirm the submission. 7. The system displays the success message to the parent.	None		
Alternative and Exceptional Flows 3.1 Missing field				

If the parent misses entering a review in step 3, then:

- 3.1.1 The system displays an error message indicating that the text field is empty.
- 3.1.2 Resuming step 3.

6.1 Operation canceled

If the parent cancels the operation at step 6 or earlier, then:

- 6.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The review of the specialist has been submitted successfully.
- **Failure Condition:** No review of the specialist submitted.

Table 7 Review previous appointment use-case description

8.2.5 Set available time slots

Use-Case Description				
System Ayadi System				
Use-Case Name Set available time slots				
Primary Actor Specialist	Secondary Actors None			
Description This use case allows specialists to set their available time slots.				
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 				
Pre-Conditions <ol style="list-style-type: none"> 1. The specialist must have an account. 2. The specialist must have logged in successfully. 				
Basic Flow				
Primary Actor Specialist	System	Secondary Actor		
1. This use case begins when the specialist selects the time settings. 3. The specialist selects time slots and submits. 5. The specialist confirms changes.	2. The system displays scheduling form 4. The system displays a message requesting the specialist to confirm changes. The system displays the success message. 6. The system displays the success message.	None		
Alternative and Exceptional Flows 3.1 Missing selection				
If the specialist misses to select the time slots in step 3, then: <ol style="list-style-type: none"> 3.1.1 The system displays an error message indicating misses selection. 3.1.2 Resuming step 3. 				

5.1 Operation canceled

If the specialist cancels the operation at step 5 or earlier, then:

- 5.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The available time slots has been set successfully.
- **Failure Condition:** The specialist time slots will not be set.

Table 8 Set available time slots use-case description

8.2.6 Schedule an appointment

Use-Case Description				
System Ayadi System				
Use-Case Name Schedule an appointment				
Primary Actor Parent	Secondary Actors Payment System			
Description This use case allows parents to schedule a new appointment.				
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: Make online payment. 				
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must have logged in successfully. 				
Basic Flow				
Primary Actor Parent	System	Secondary Actor Payment system		
1. This use case begins when the parent selects a specialist to schedule an appointment with. 3. The parent fills the form. 4. The parent submits the form. 6. The parent confirms process.	2. The system displays a form to schedule an appointment include the following required information: <ul style="list-style-type: none"> • Selects the child for whom the appointment is going to be scheduled. • Selects an available day and time. • Payment information 5. The system displays a message requesting the parent to confirm process.	7. Payment system validates the provided payment information.		

	8. The system displays the success message to the parent.	
--	---	--

Alternative and Exceptional Flows |

3.1 Missing selection

If the parent misses to select the required field in step 3, then:

- 3.1.1 The system displays an error message indicating misses or invalid field(s).
- 3.1.2 Resuming step 3.

6.1 Operation canceled

If the parent cancels the operation at step 6 or earlier, then:

- 6.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The appointment has been scheduled successfully.
- **Failure Condition:** No appointment scheduled.

Table 9 Schedule an appointment use-case description

8.2.7 View session report

Use-Case Description				
System Ayadi System				
Use-Case Name View session report				
Primary Actor Parent	Secondary Actors Payment System			
Description This use case allows parents to view session report.				
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 				
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must have logged in successfully. 				
Basic Flow				
Primary Actor Parent	System	Secondary Actor		
1. This use case begins when the parent selects session report for specific completed sessions. 3. The parent views the session's report.	2. The system displays the selected session report including (Diagnosis, treatment episode, observation, session assessment).	None.		
Alternative and Exceptional Flows <ol style="list-style-type: none"> 1.1 Empty session report <ol style="list-style-type: none"> 1.1.1 The use-case ends with a failure condition. 				
Post-Conditions <ul style="list-style-type: none"> • Successful Condition: Session report has been displayed successfully. • Failure Condition: No appointment displayed. 				

Table 10 View session report use-case description

8.2.8 Add session report

Use-Case Description		
System Ayadi System		
Use-Case Name Add session report		
Primary Actor Specialist		Secondary Actors None
Description This use case allows specialists to add session report.		
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 		
Pre-Conditions <ol style="list-style-type: none"> 1. The specialist must have an account. 2. The specialist must have logged in successfully. 		
Basic Flow		
Primary Actor Parent	System	Secondary Actor
1. This use case begins when the specialist selects add session report after session finish. 3. The specialist fills the form. 4. The parent submits the form. 6. The parent confirms order.	2. The system displays session report form include the following required information: <ul style="list-style-type: none"> • Diagnosis • Treatment episode • Observation • Session assessment 5. The system displays a message requesting the parent to confirm order.	None

Alternative and Exceptional Flows |

3.1 Missing field / invalid format

If the parent misses entering the required fields or fills them with invalid format in step 3, then:

- 3.1.1 The system displays an error message indicating misses or invalid field(s).
- 3.1.2 Resuming step 3.

6.1 Operation canceled

If the parent cancels the operation at step 6 or earlier, then:

- 6.1.1 The use-case ends with a failure condition.

Post-Conditions |

- **Successful Condition:** The session's report has been added successfully.
- **Failure Condition:** No session's report added.

Table 11 Add session report use-case description

8.2.9 edit upcoming appointment

Use-Case Description	
System Ayadi System	
Use-Case Name edit upcoming appointment	
Primary Actor Parent	Secondary Actors
Description This use case allows Parent to edit their upcoming appointment.	
Relationships <ul style="list-style-type: none"> • Extends: View Upcoming Appointment. • Includes: None. 	
Pre-Conditions <ol style="list-style-type: none"> 1. The parent must have an account. 2. The parent must be logged in successfully. 3. The parent must have an upcoming appointment. 	
Basic Flow	
Primary Actor Parent	System
1. This use case begins when the parent selects "تعديل الموعد" "تعديل الموعد" for specific upcoming appointment. 3. The parent selects his/her available time slots. 4. The parent submits his/her selection. 6. The parent confirms the order.	2. The system displays available time slots for the specialist. 5. The system displays a message requesting the parent to confirm changes. 7. The system displays a success message to the parent.
Alternative and Exceptional Flows 3.1 Missing field If the parent misses a required fields in step 3, then: <ul style="list-style-type: none"> 3.1.1 The system displays an error message indicating misses' field(s). 3.1.2 Resuming step 3. 6.1 Operation canceled If the parent cancels the operation instead in step 6, then: <ul style="list-style-type: none"> 6.1.1 The use-case ends with a failure condition. 	
Post-Conditions <ul style="list-style-type: none"> • Successful Condition: The appointment has been edited successfully. • Failure Condition: No appointment edited. 	

Table 12 edit upcoming appointment use-case description

8.2.10 join to the current appointment via chat

Use-Case Description		
System Ayadi System		
Use-Case Name join chat		
Primary Actor Parent		Secondary Actors Specialist
Description This use case allows parents to join via chat to their current appointment.		
Relationships <ul style="list-style-type: none"> • Extends: Upcoming appointment, previous appointment. • Includes: None. 		
Pre-Conditions <ol style="list-style-type: none"> 1. The specialist must have an account. 2. The parent must have logged in successfully. 3. The parent must have a current scheduled appointment 		
Basic Flow		
Primary Actor Parent	System	Secondary Actor Specialist
1. This use case begins when the parent selects joining the current appointment. 3. The parent selects join via chat. 5. The parent confirms joining the session via chat.	2. The system displays two options to join either via chat or video. 4. The system displays a message requesting the parent to confirm. 6. The system displays the success message to the parent. 7. System displays a dialog to the parent to start the chatting session.	8. Specialist receive a notification informing him/her that the parent has joined now.
Alternative and Exceptional Flows 5.1 Operation canceled If the parent cancels the operation at step 5 or earlier, then: 5.1.1 The use-case ends with a failure condition.		
Post-Conditions <ul style="list-style-type: none"> • Successful Condition: The appointment has been joined via chat successfully. • Failure Condition: No appointment has been joined via chat. 		

Table 13 join via chat to the current appointment use-case description

9. Analysis Class

9.1 Add child profile

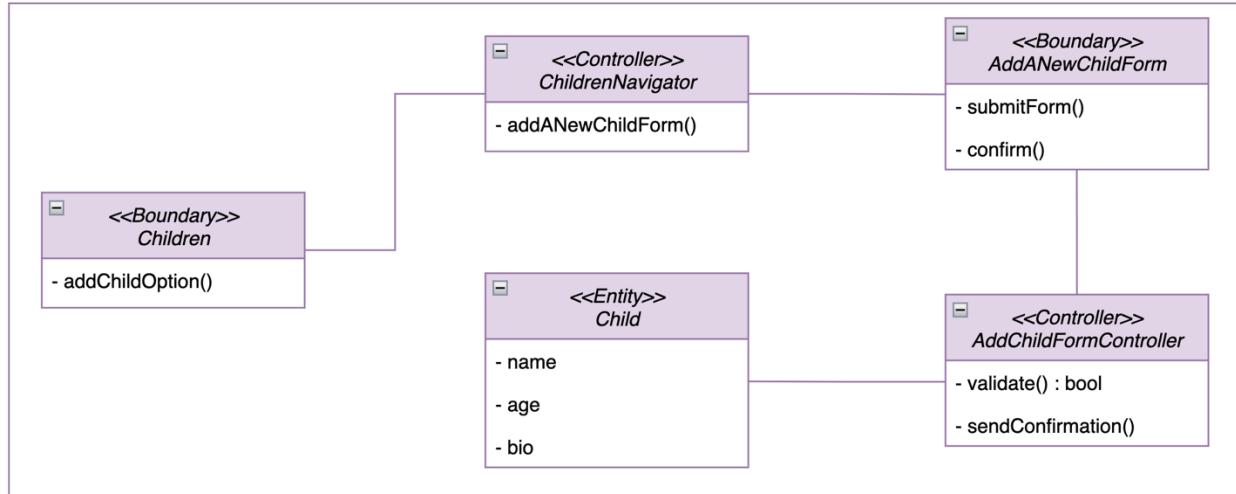


Figure 17 Add child profile analysis class diagram

9.2 Delete upcoming appointment

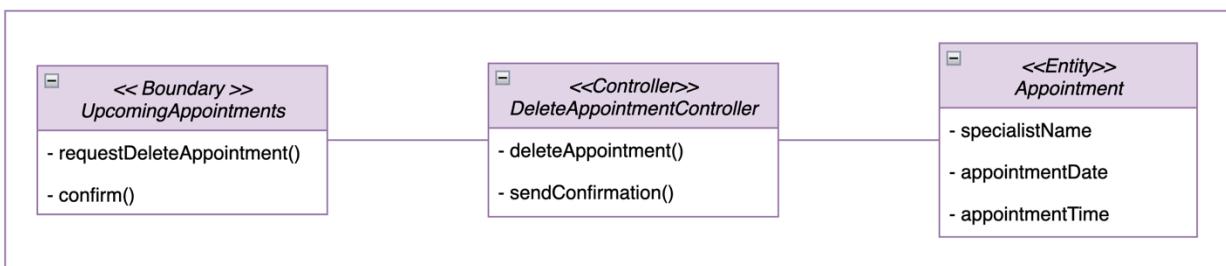


Figure 18 Delete upcoming appointment analysis class diagram

9.3 Accept specialist registration request

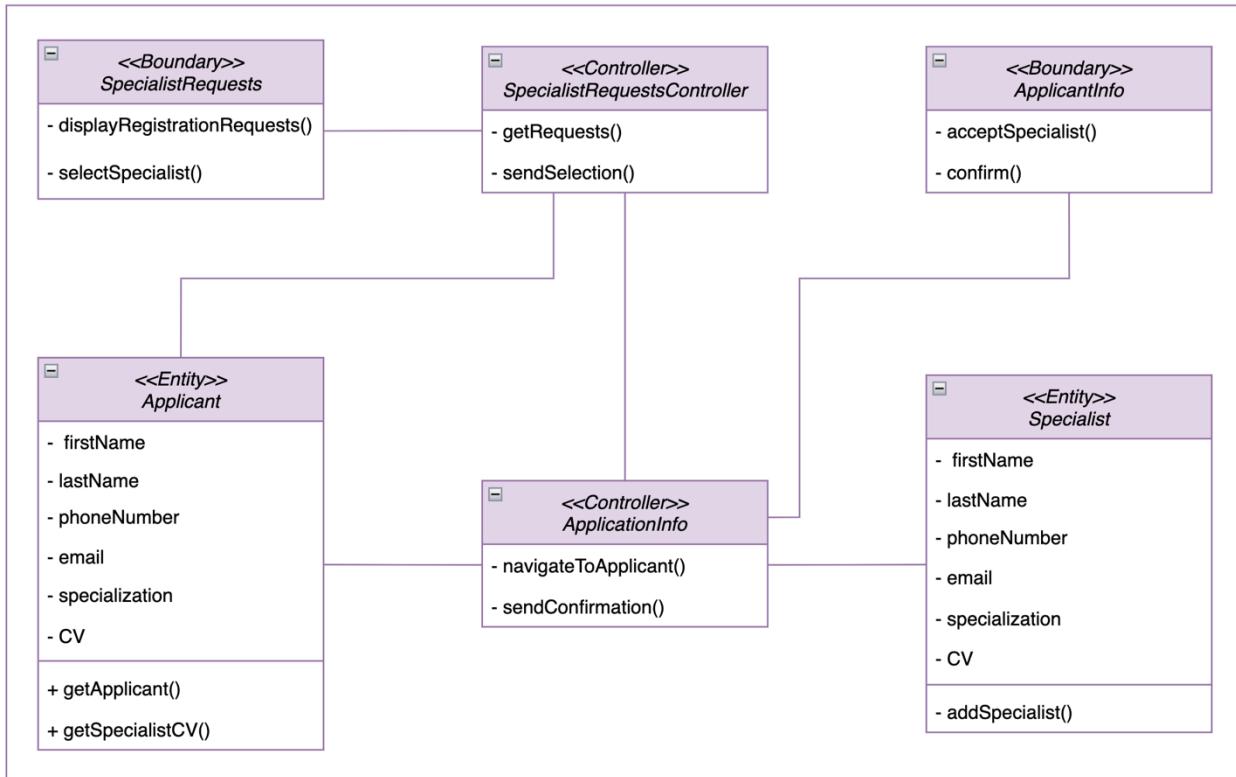


Figure 19
Accept specialist registration request analysis class diagram

9.4 Review previous appointment

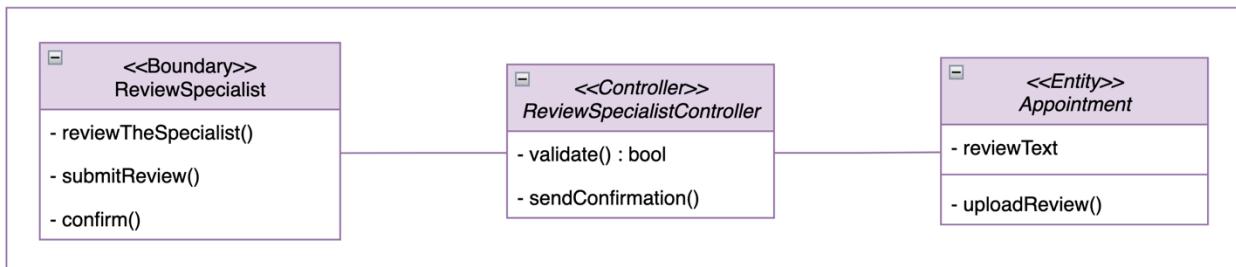


Figure 20 Review previous appointment analysis class diagram

9.5 Set available time slots

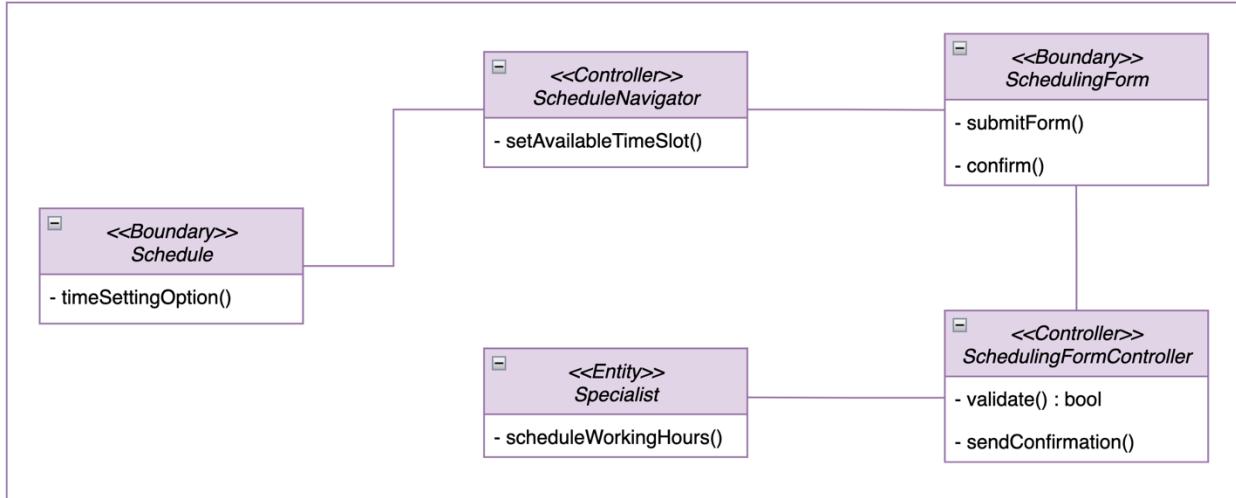


Figure 21 Set available time slot analysis class diagram

9.6 Schedule an appointment

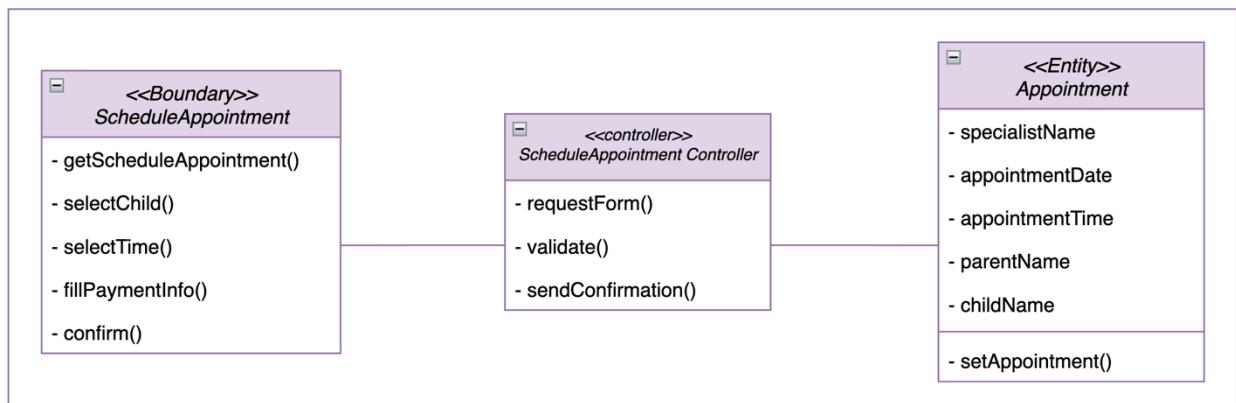


Figure 22 Schedule an appointment analysis class diagram

9.7 View session report

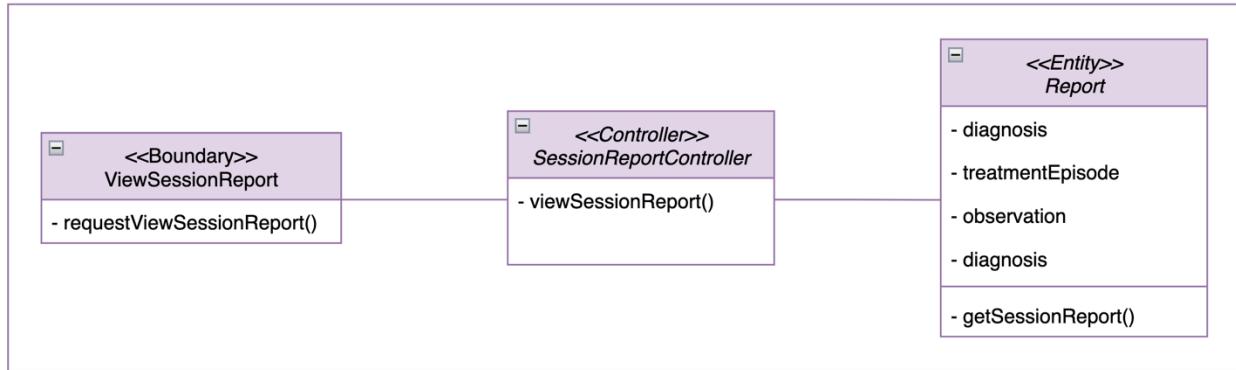


Figure 23 View session report analysis class diagram

9.8 Add session report

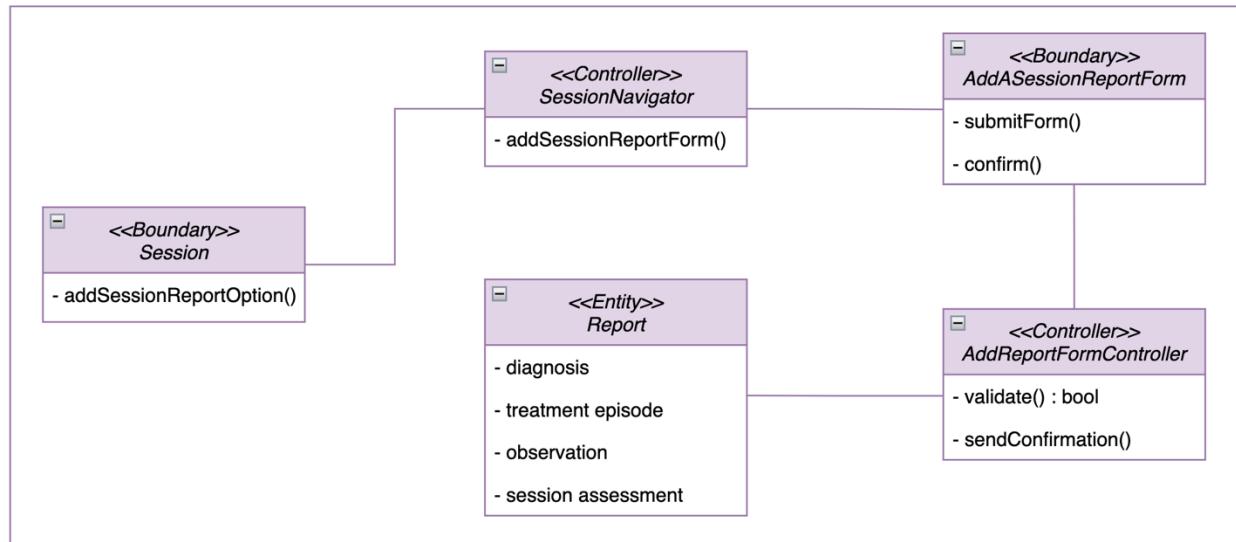


Figure 24 Add session report analysis class diagram

9.9 edit upcoming appointment

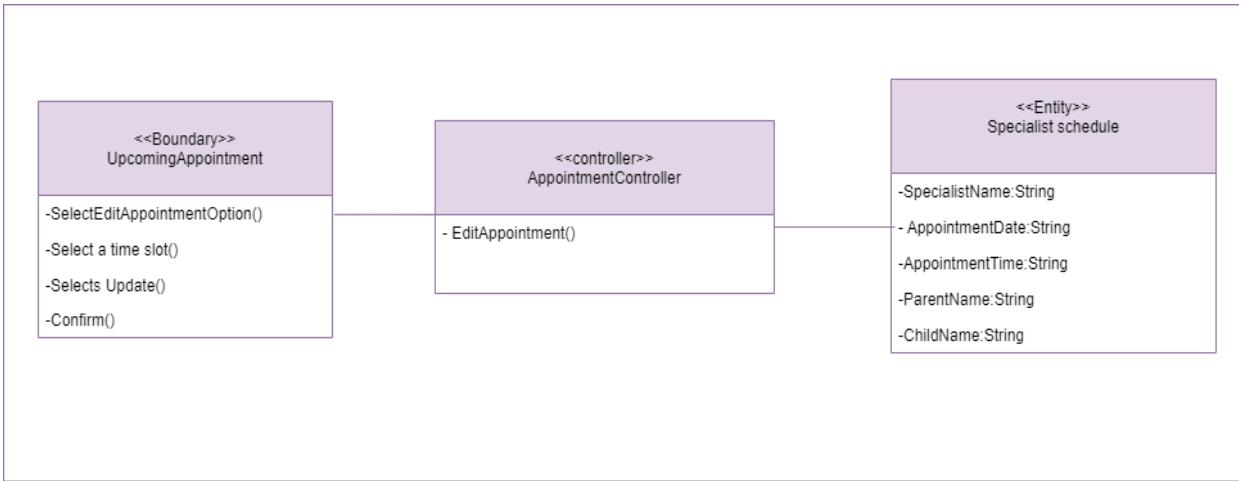


Figure 25 edit upcoming appointment analysis class diagram

9.10 Join via chat to the current appointment

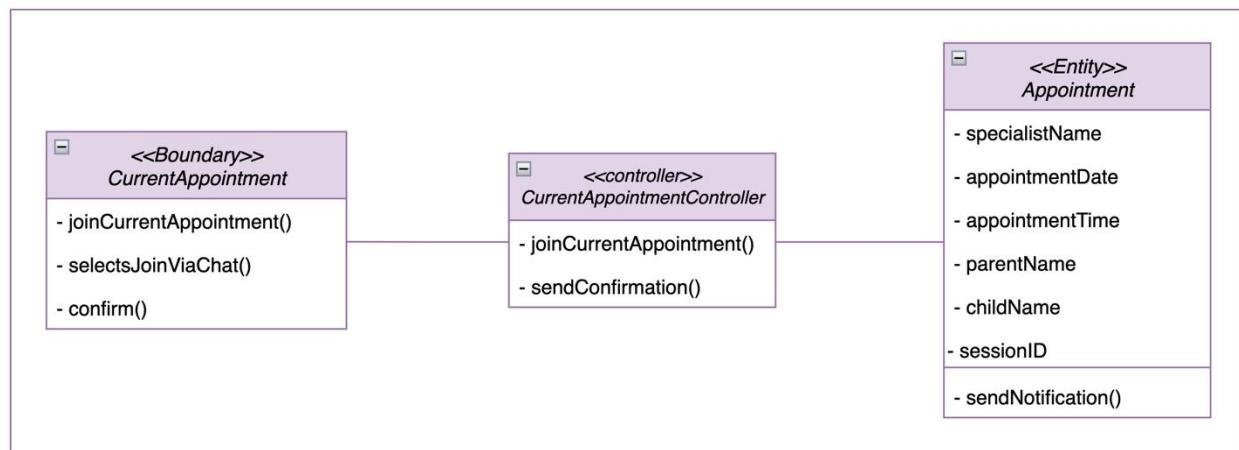


Figure 26 Join via chat to the current appointment analysis class diagram

10. Interaction Diagram

10.1 Add child profile

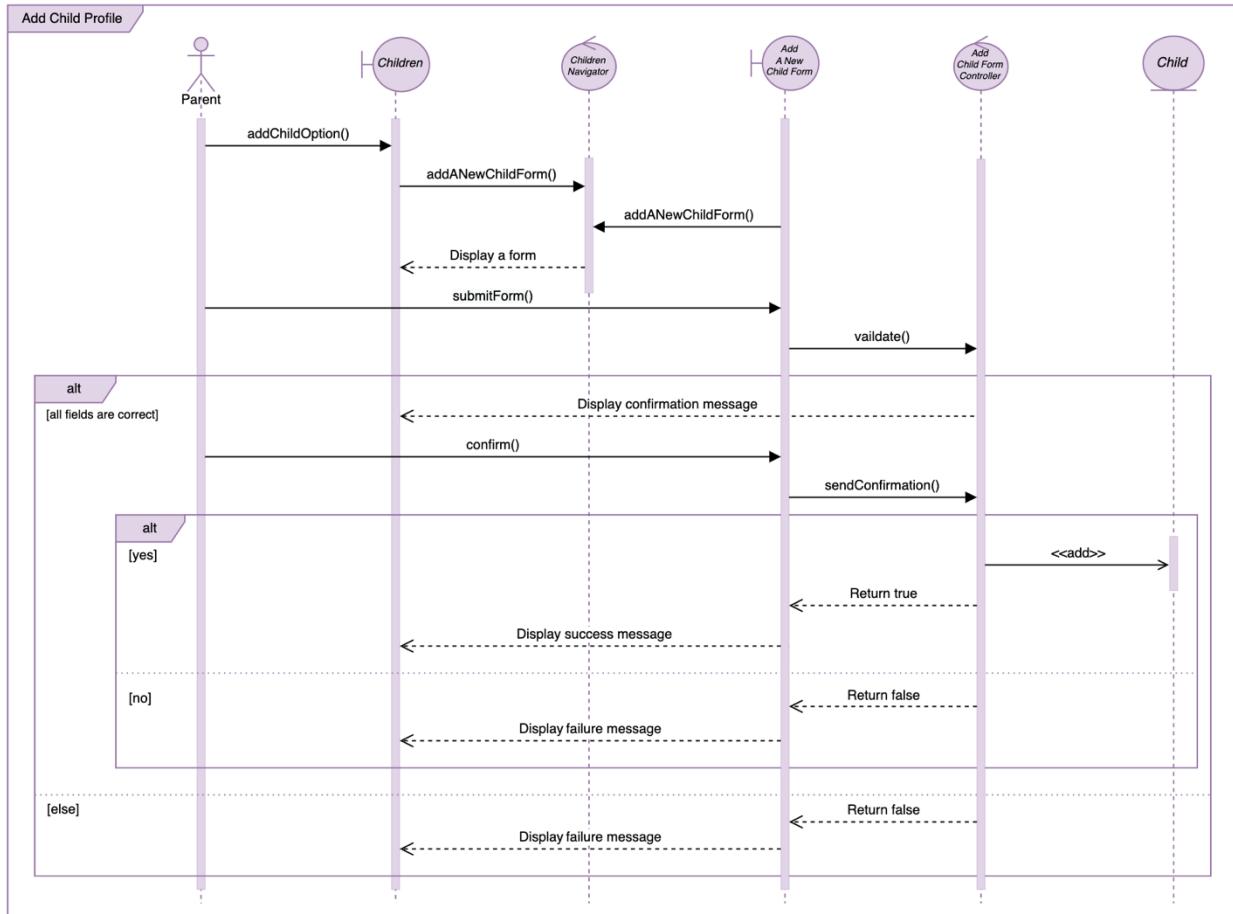


Figure 27 Add child profile interaction diagram

10.2 Delete upcoming appointment

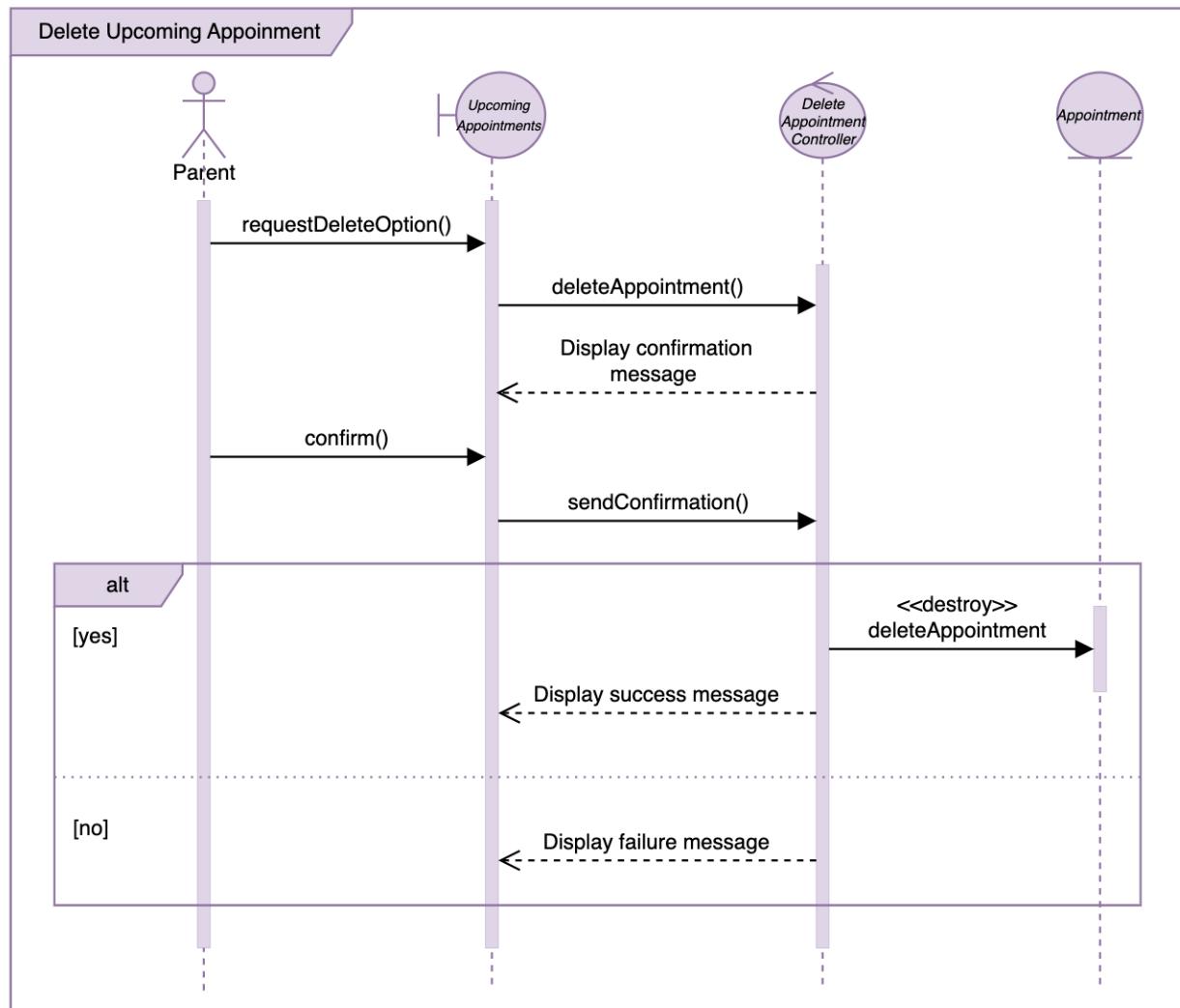


Figure 28 Delete upcoming appointment interaction diagram

10.3 Accept specialist registration request

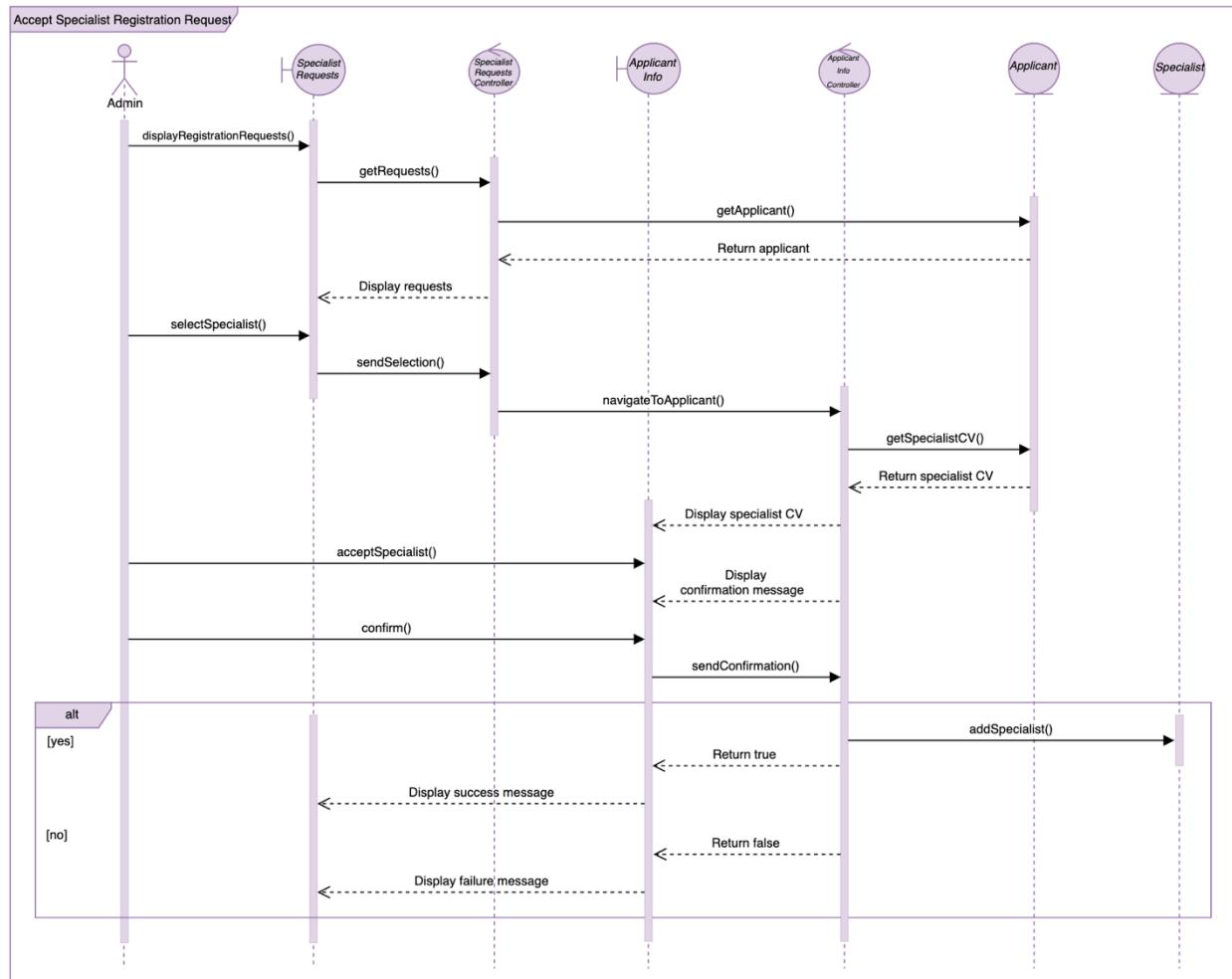


Figure 29 Accept specialist registration request interaction diagram

10.4 Review previous appointment

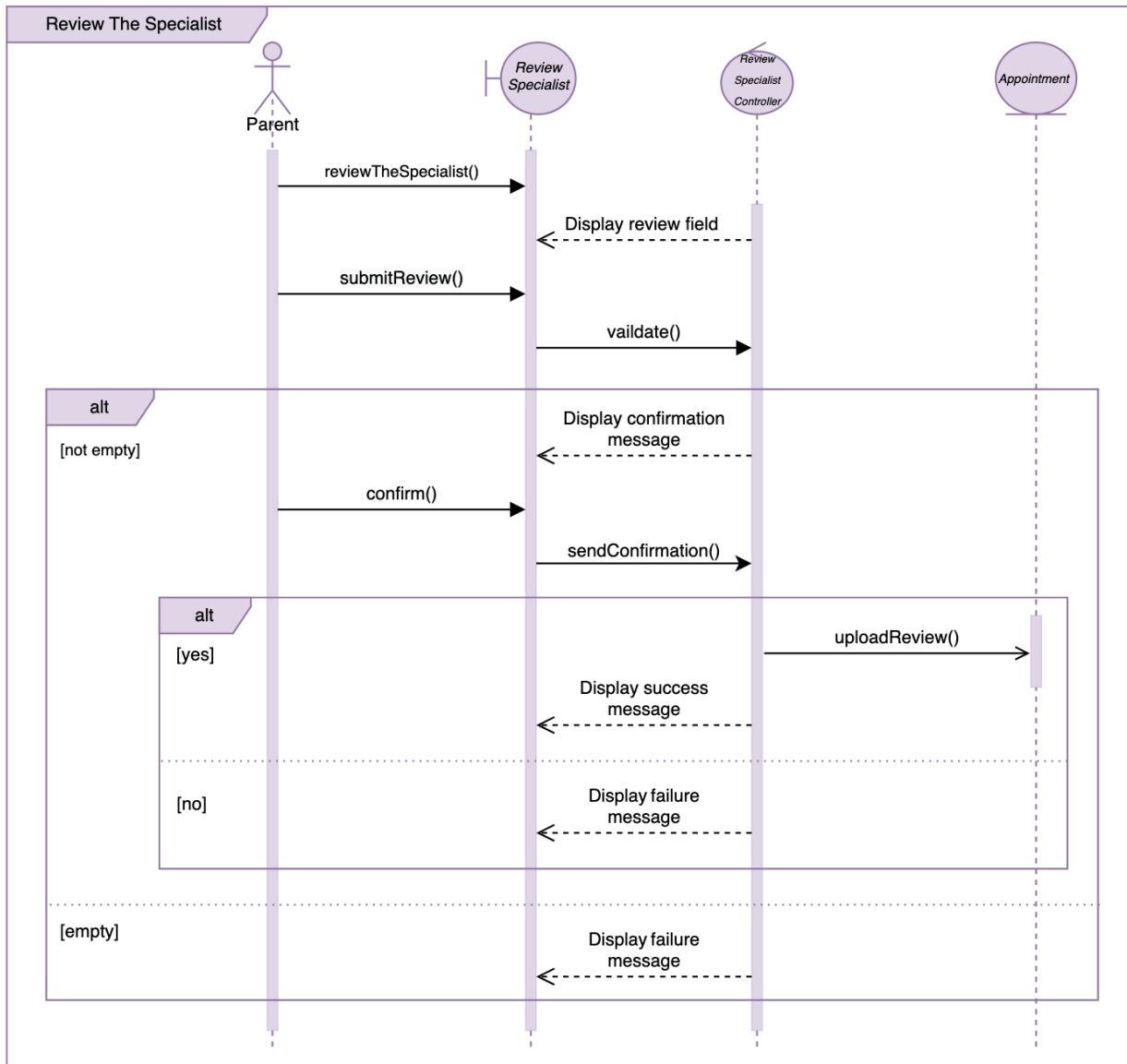


Figure 30 Review previous appointment interaction diagram

10.5 Set available time slots

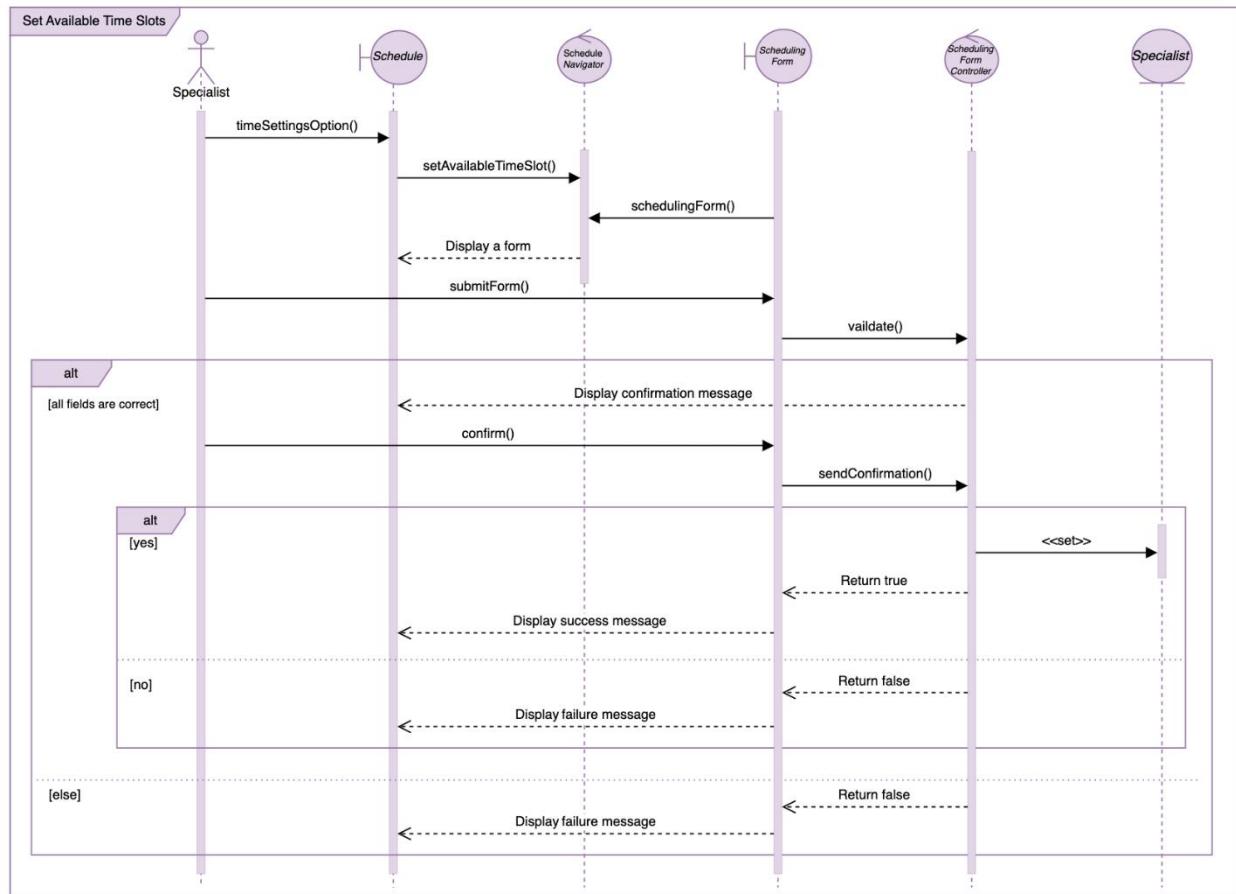


Figure 31 Set available time slots interaction diagram

10.6 Schedule an appointment

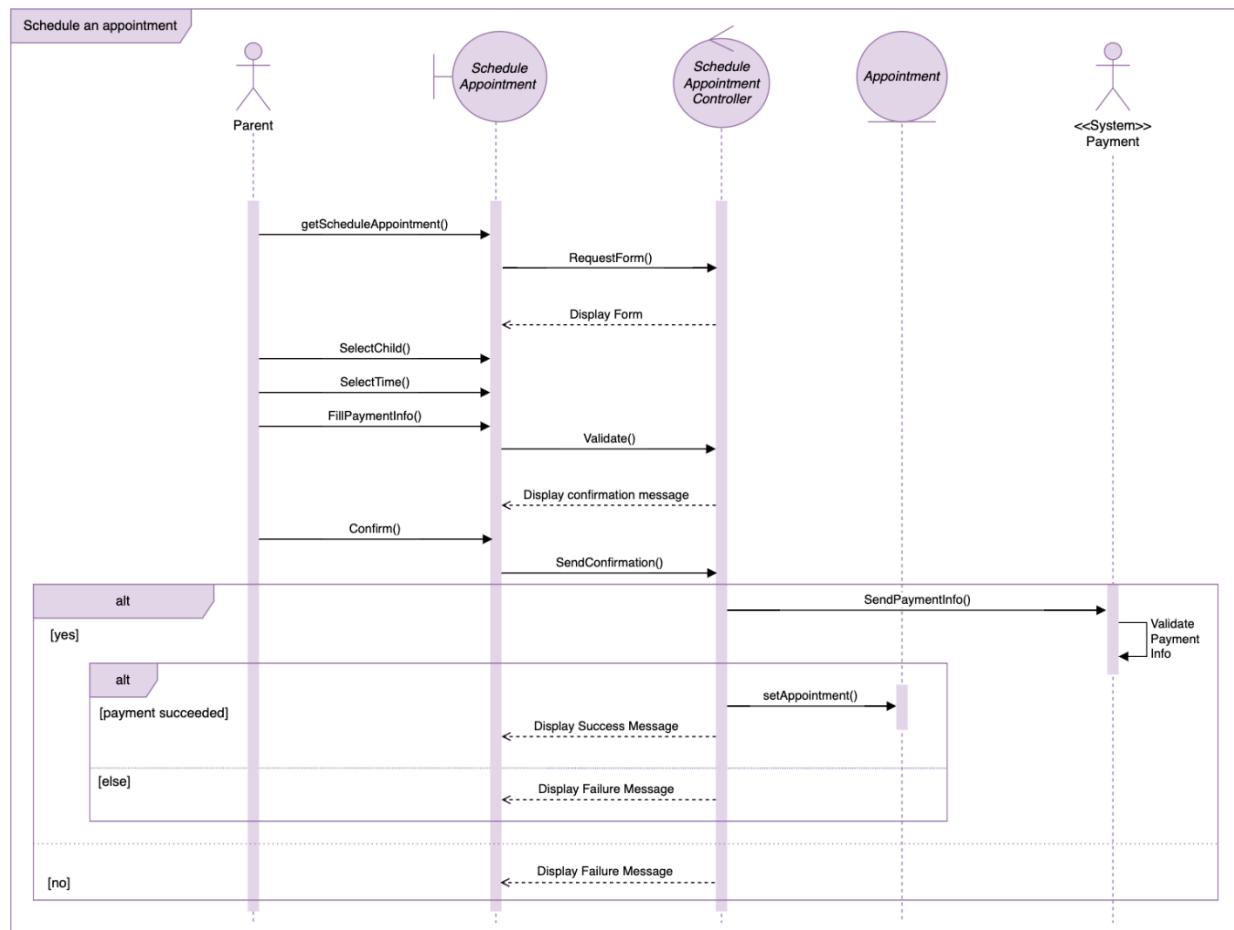


Figure 32 Schedule an appointment interaction diagram

10.7 View session report

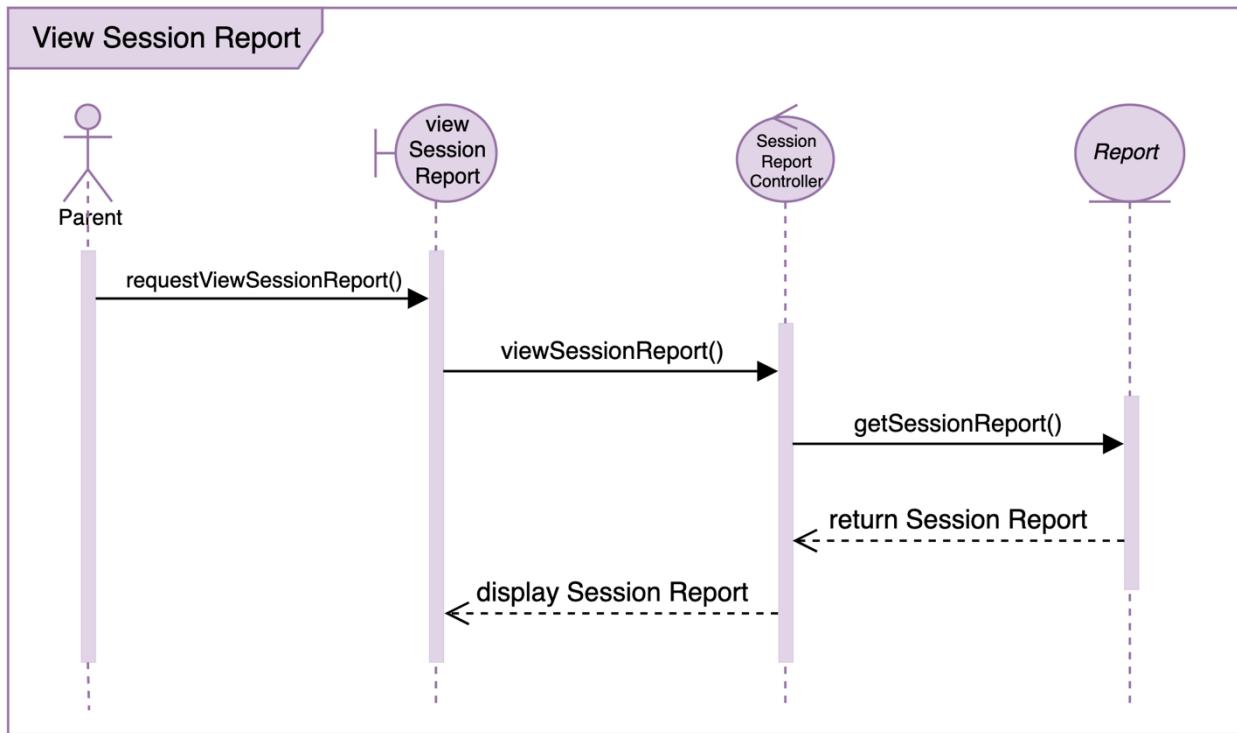


Figure 33 View session report interaction diagram

10.8 Add session report

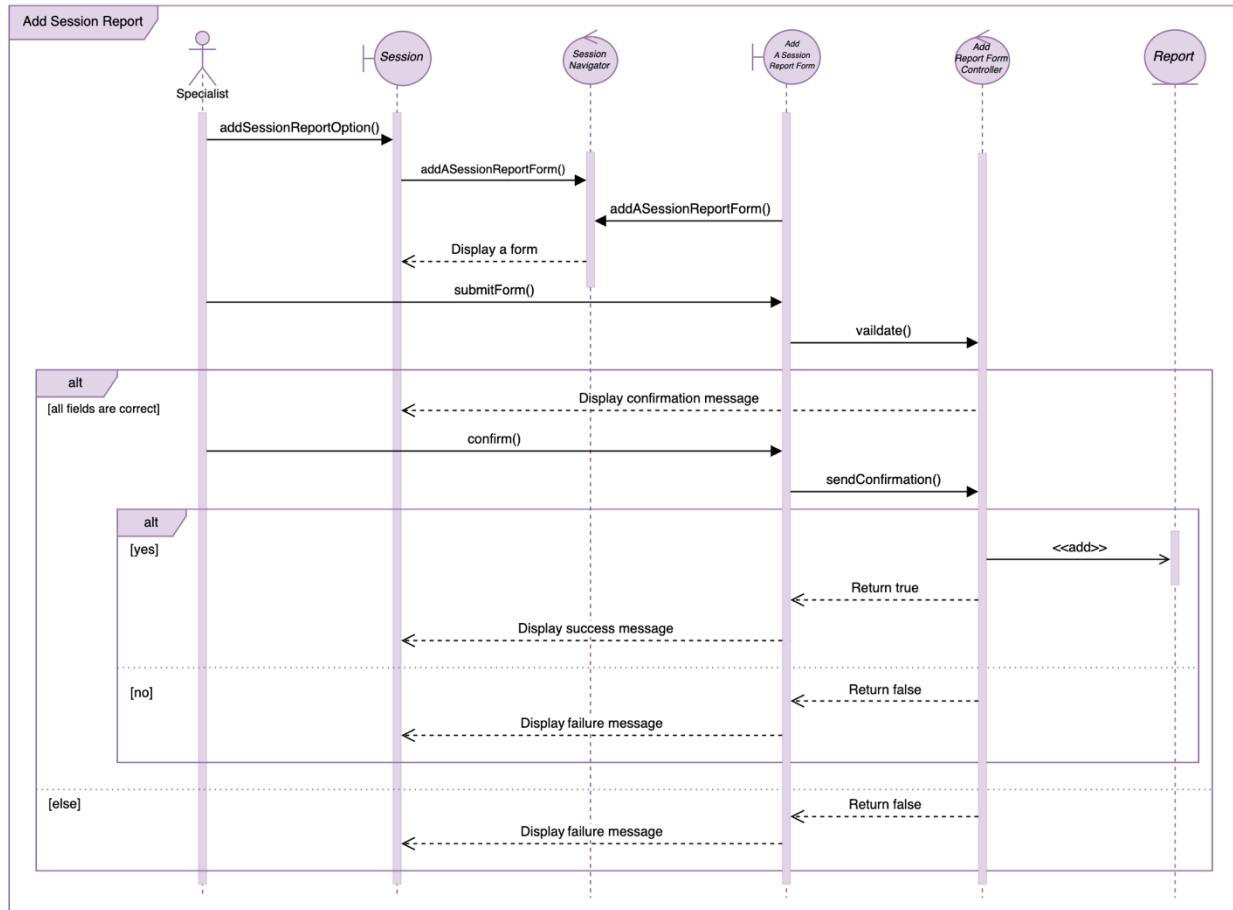


Figure 34 Add session report interaction diagram

10.9 edit upcoming appointment

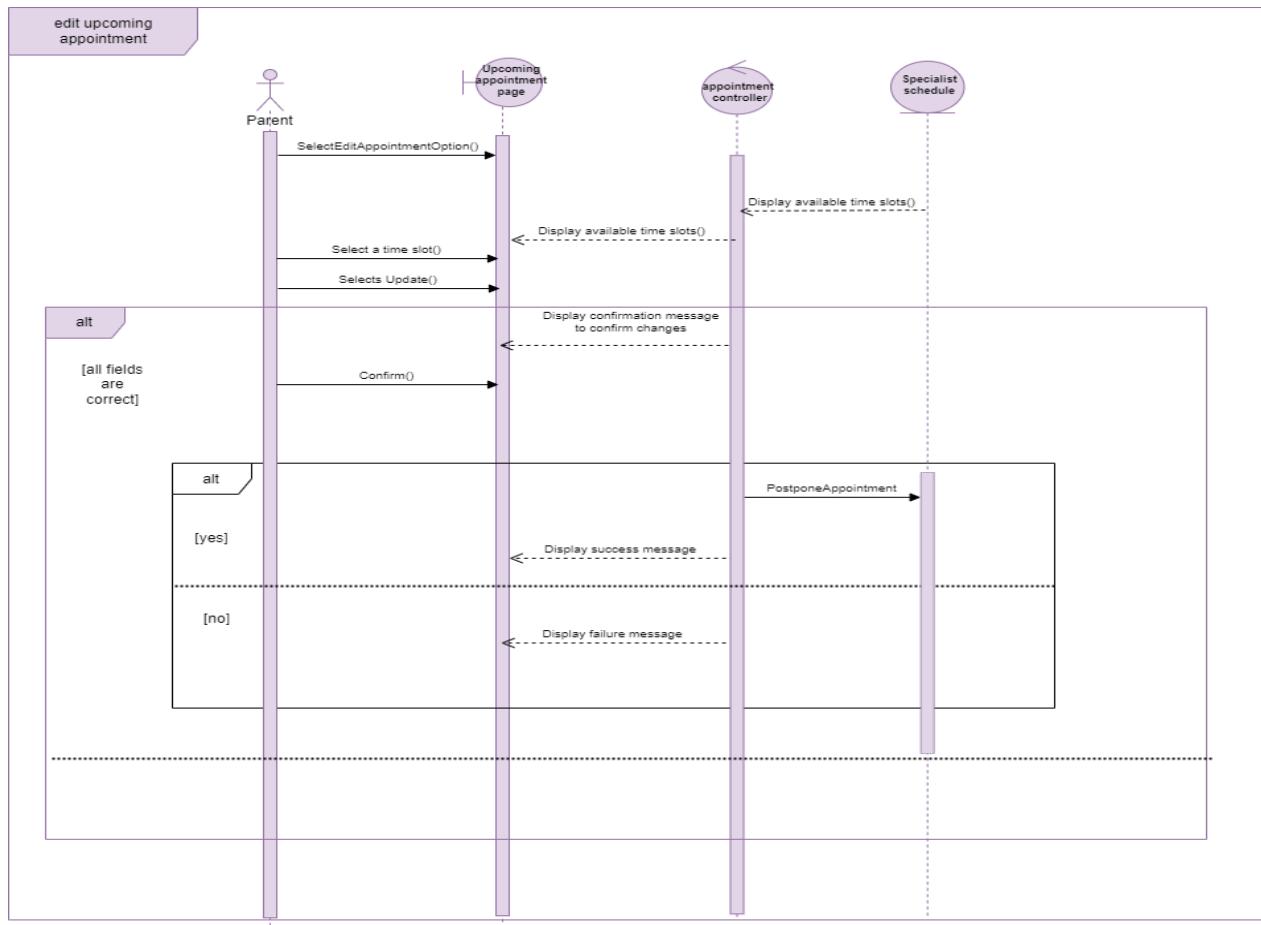


Figure 35 edit upcoming appointment interaction diagram

9.10 Join via chat to the current appointment

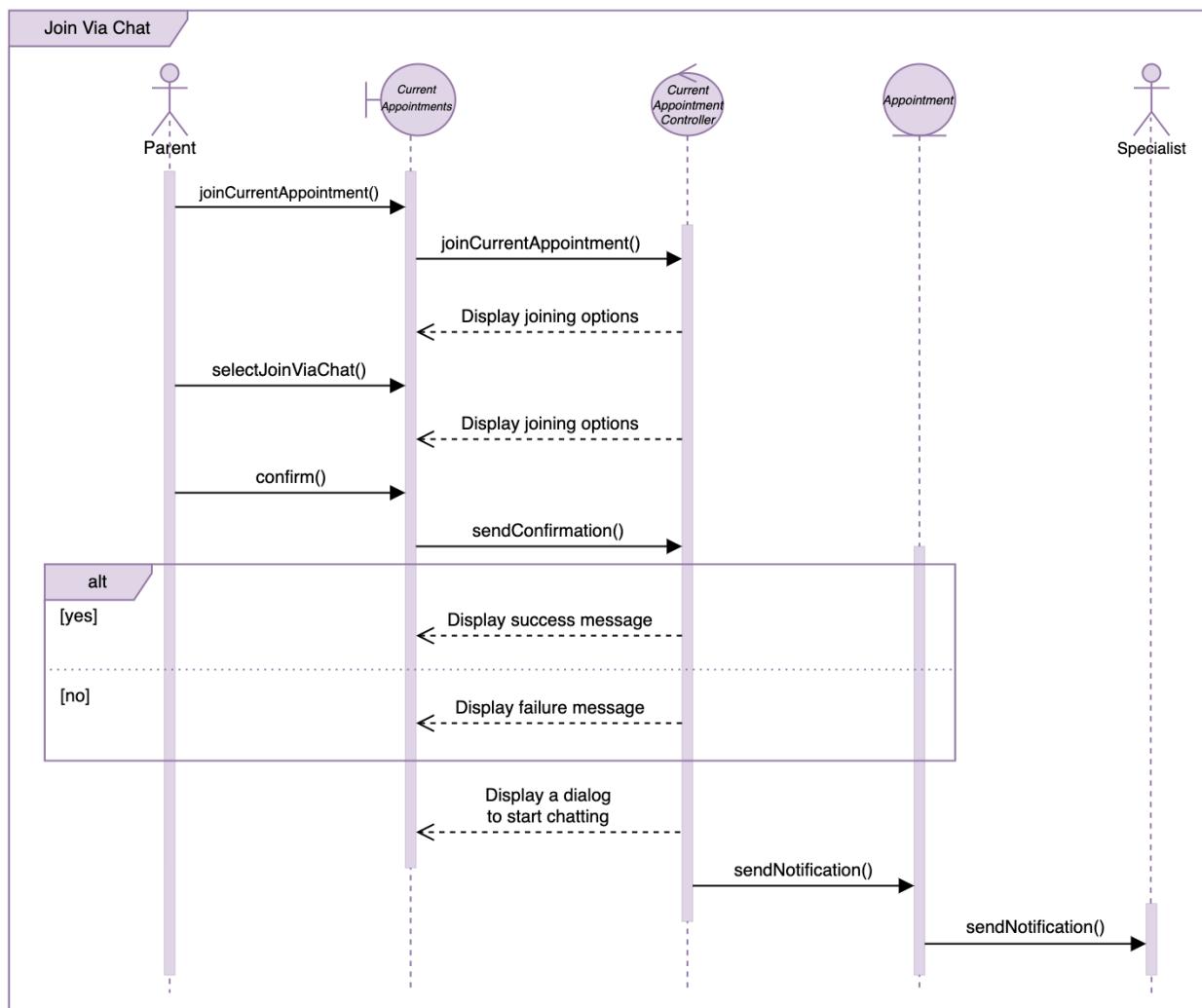


Figure 36 Join via chat to the current appointment interaction diagram

11. Design Class

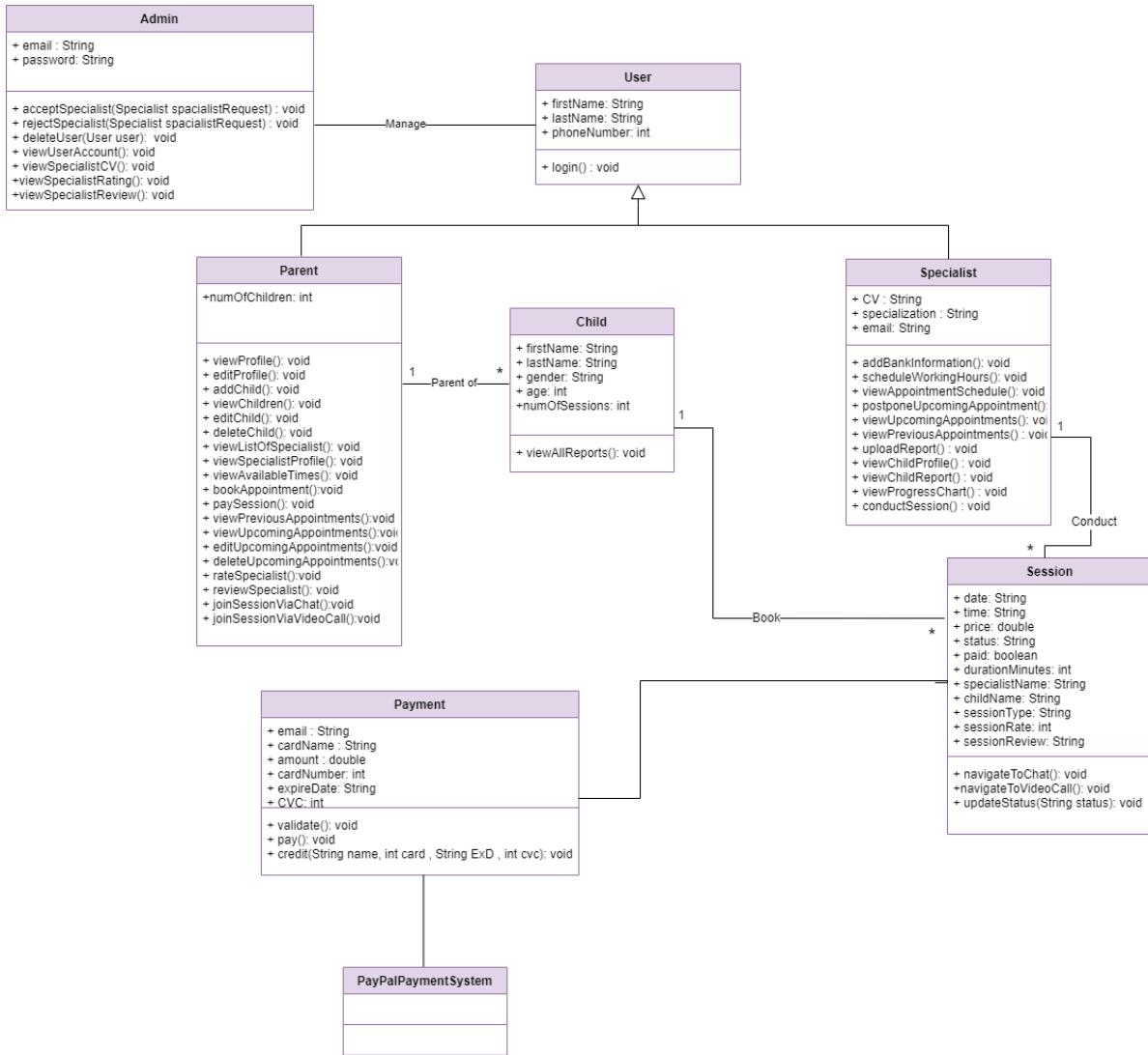


Figure 37 Ayadi System Design Class Diagram

12. System Architecture

The architecture of the system is defined as "the fundamental and unifying system structure defined in terms of system elements, interfaces, processes, constraints, and behaviors" (*Concept: System Architecture*, n.d.). This section describes *Ayadi* system architecture, including the architectural style and structural model.

12.1 Architectural Style

Ayadi architecture style is a combination of Model-View-Controller (MVC) architecture and Client-Server architecture.

12.1.1 Model-View-Controller (MVC) Architecture

MVC is a lightweight, testable framework that is commonly used in the creation of an interactive and graphical user interface (GUI). It separates the system into three interconnected logical components: Model, View, and Controller [22]. Each component is built to handle specific development aspects of a system and has several responsibilities:

- Model: this component manages data, logic and rules of the application. It's usually the underlying infrastructure of the whole system and it usually doesn't actively interact with the other two components.
- View: this component is responsible for displaying information to the user, such as if the user wants to register to the system, or wants to view an appointment, or schedule an appointment etc.
- Controller: this component acts as an interface between the model and view components to process all the business logic and incoming requests, manipulate data using the model component and interact with the views to provide the final output. For example, the user controller will handle all the inputs and interactions from the user View and update the database with the help of the user model. The same controller will be used to view the user data.

This architecture It is useful for our system for different reasons:

- The separation between the client model, view, and controllers from the database enable the system to be more flexible, reliable, scalable, and can easily be adapted.
- Ease of use where system components can be deployed and tested independently.
- Support system maintainability due to the separation of concern (Model, View, and Controller), and the limited duplication of code which enables effective code extension, debugging, and reuse.

- Supports asynchronous technology which enables team members to work simultaneously in different parts of the system which helps to overcome the project's limited schedule restrictions.
- Supports system modifiability of any part of the system or system without affecting the entire model due to independence.
- Supports form authentication infrastructure where we can make use of it in the system to secure access to user accounts and confirm the user's identity.

12.1.2 Client-Server Architecture

The client-server architecture is an architecture that helps design distributed systems that involve a client system, a server system, and a connecting network are used by each online system. It is also an appropriate architecture pattern in a situation where there are several distributed clients that wish to access the same set of resources and services. clients interact by sending shared service requests to one central server or multiple distributed servers. Requests from clients are independent of each other. This means that when a server builds response to a request sent from a single client, it only needs to consider the information contained in that request and most likely the information stored in the database or file system on the server side. it doesn't need to consider requests from other clients or other requests from the same client.

The client server architecture will be very useful for our system because it allows users to access the system by their devices remotely and the shared resources make it easier to manage and modify if required later. It also allows for easy view module changes, as functional and non-functional requirements can also change, in addition to the possibility of making module updates without client-server architecture or disabling the service.

Finally, in *Ayadi*, all of our users will be connected to a network. The client side will contain the GUI and view component, making it relatively easy for users to keep while the server side will contain the business logic and data storage. However, users will need a strong internet connection to send orders and receive responses. For example, a user can use system features such as adding a new child on the display side, but they are managed and kept on the server side, so if the user inadvertently loses internet connection or close the app during their activity, the changes will be kept on the server side, allowing the user to follow up where they stop. Both client server and MVC also support the use of APIs, where our system uses the online payment system to help our system provide payment service to our user so that it can be used independently without interfering with the core system as their own subsystem or components.

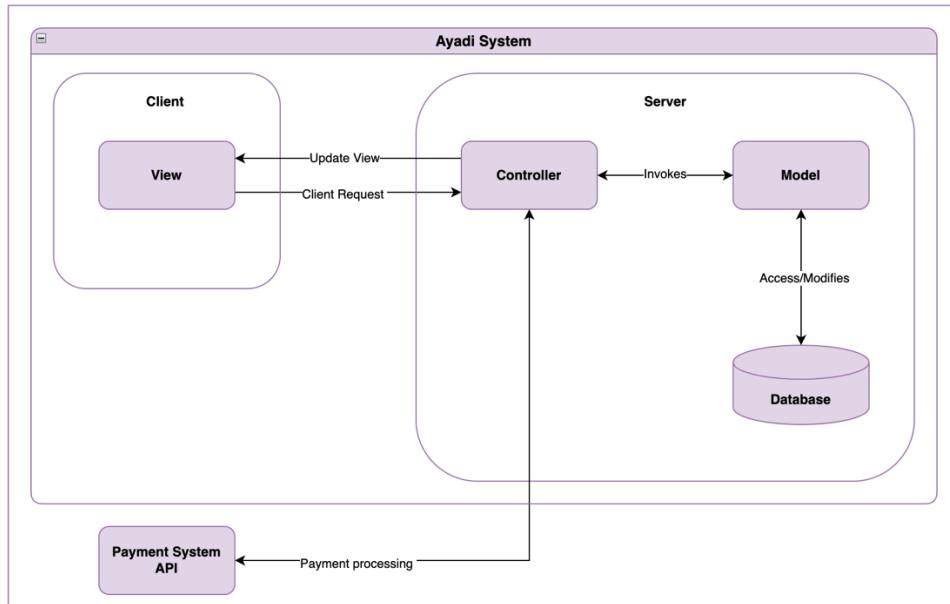


Figure 38 Ayadi System Architecture Diagram

12.2 Structural Model (Component Diagram)

This section illustrates the component diagram of *Ayadi* system.

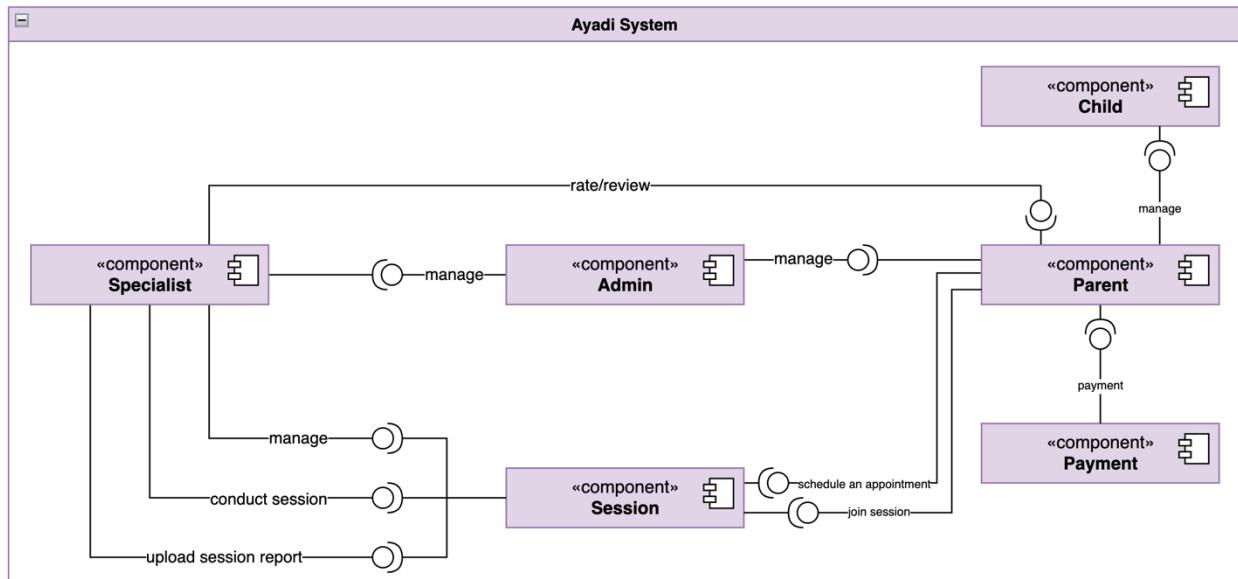


Figure 39 Ayadi System Component Diagram

13. Prototype Description

In this section, we describe implementation platform, algorithms, mapping between requirement and implemented function, implementation details, database schema, and user interface in *Ayadi* system.

13.1 Implementation Platform

Software		
Name	Use	Description
Dart	Programming Language	Client-optimized programming language for developing high-quality and beautiful interfaces
Flutter	Software Development Kit	Provided by Google for building native interfaces in both iOS and Android operating systems
Visual studio	Integrated Development Environment	It's an IDE made by Microsoft and it used for general software development.
Firebase	NoSQL Database	Backend-as-a-Service (BaaS) provided by Google cloud, for creating NoSQL database schema
GitHub	Configuration Management Tool	Web-based collaboration platform provided by Microsoft for managing software development projects
Figma	UI / UX Design	Web-based user interfaces designing tool provided by Adobe
Agora	cloud-based platform that provides real-time communication	It enables developers to integrate voice, video, and messaging functionalities into their applications and services[23].
Notion	Project Management Tool	It is a productivity and collaboration tool that allows users to organize and manage their tasks, notes, and projects in a flexible and customizable way.

Table 14 Hardware tools

Hardware		
Name	Description	No. of used tools
Laptop	MacBook pro running on Mac OS.	3
	Asus and Lenovo running on Window OS.	2
Mobile Devices	iPhone running on iOS, that has been used for testing purposes.	5

Table 15 Software tools

13.2 Algorithm

At *Ayadi*, our application features three algorithms. The first algorithm calculates the amount of time left until a scheduled session is due to start using a timer. The video call button is made available to both specialist and parent on the chat page once the session is ready to begin. To accomplish this, the algorithm follows a set of logical steps, as outlined in the provided pseudocode:

```

2
3 function buttonEnabledStream(sessionStartTime):
4     repeat every second:
5         now = timeNow
6         timeElapsed = now - sessionStartTime
7         if timeElapsed >= 0 minutes & timeElapsed <= 45 minutes:
8             return true
9         else:
10            teturn false
11

```

Figure 40 Ayadi video call button enabled based on a specific time

The second algorithm operates by taking the working hours of the specialist and then calculating the appointment times. These appointment times are then displayed to the parents, allowing them to schedule sessions with the specialist at a convenient time. The algorithm's functionality is defined by following a set of logical steps, as outlined in the provided pseudocode:

```

2
3. function CalculateAppointments (specialistSchedule)
4.     list appointmentTimes
5.     for each day, schedule in specialistSchedule:
6.         for (i = 0 , i <= schedule length , i++){
7.             startTime = schedule[i]["start"]
8.             endTime = schedule[i]["end"]
9.
10            // Calculate total number of minutes between startTime and endTime
11            startMinutes = (startTime.hour *60) + startTime.minute
12            endMinutes = (endTime.hour *60) + endTime.minute
13            totalMinutes = endMinutes - startMinutes
14
15            // Generate appointment times within the current time period
16            while (totalMinutes >= 45):
17                add startTime to the list in appointmentTimes corresponding to the day
18                startTime = startTime + 45 minutes duration
19                decrement totalMinutes by 45
20

```

Figure 41 calculating appointments for a specialist

The third algorithm calculates the remaining time of conducted session. This algorithm notifies the parent and the specialist about the remaining time of the session and how many minutes are left until the session is done. The algorithm is triggered every second, and if the remaining time is less than 10 minutes, then the remaining time's color will be red to notify the users about that. Below is a pseudo code program sample that represents the algorithm.

```

1
2. Function CountdownTimer (endTime)
3.     endTime = endTime in milliseconds
4.     repeat every second:
5.         timeNow = current time
6.         time = endTime - timeNow
7.         if the time < 10 minutes:
8.             Set changeTimerColor to red
9.         Else
10            set changeTimerColor to purple
11

```

Figure 41 Ayadi session time left algorithm

13.3 Mapping between Requirements and Implemented Functions

The following table shows a mapping between the projected functionalities of the system and the corresponding implemented modules in *Ayadi* system.

Functional requirement	Modules/Functions/Class that implemented this requirement
The parent shall be able to register to the system using first name, last name, phone number, and email.	registerPage.dart
The parent shall be able to log in using their phone number.	EnterPhone.dart OTPpage.dart
The parent shall be able to log out from their account.	account_and_Children.dart
The parent shall be able to delete their account.	editProfile.dart
The parent shall be able to view their profile.	account_and_Children.dart
The parent shall be able to edit their profile (first name, last name, phone number).	editProfile.dart editOTP.dart
The parent shall be able to add their child(ren) profile under his/her account.	addChild.dart
The parent shall be able to view their child(ren) profile under his/her account.	viewChildProfile.dart
The parent shall be able to view their child(ren) sessions reports.	
The parent shall be able to edit their child(ren) profile under his/her account.	editChild.dart
The parent shall be able to delete their child(ren) profile under his/her account.	account_and_Children.dart editChild.dart
The parent shall be able to view the list of specialists.	parentHomePage.dart
The parent shall be able to view specialist profile.	viewSpecialistProfile.dart
The parent shall be able to view the available times for an appointment.	BookAppointment.dart
The parent shall be able to book an appointment.	
The parent shall be able to pay via an online payment tool.	payment_gateway.dart paymentContainer.dart paymentInfo.dart
The parent shall be able to view previous appointments.	
The parent shall be able to view upcoming appointments.	Appointment_Lists.dart
The parent shall be able to delete upcoming appointments.	
The parent shall be able to edit upcoming appointments.	EditAppointment.dart
The parent shall be able to rate the specialist after the appointment.	
The parent shall be able to review the specialist after the appointment.	RatingAndRev.dart
The parent shall be able to join the session via video call.	callPage.dart

The parent shall be able to join the session via chat messages.	Chating.dart
The Specialist shall be able to register to the system using first name, last name, email, and phone number, specializations, session price, and cv.	registerPageSP.dart
The Specialist shall be able to log in using their phone number.	EnterPhone.dart OTPpage.dart
The Specialist shall be able to log out from their account.	
The Specialist shall be able to view his/her profile.	viewSpecialistProfile.dart
The Specialist shall be able to delete their account.	editProfile.dart
The Specialist shall be able to edit his/her profile (first name, last name, phone number, Bio, IBAN).	editProfile.dart
The Specialist shall be able to add his/her bank information.	registerPageSP.dart
The Specialist shall be able to schedule his/her working hours.	SetSchedule.dart
The Specialist shall be able to view the appointment schedule.	viewAppointmentsSlots.dart
The Specialist shall be able to view upcoming appointments.	
The Specialist shall be able to view previous appointments.	Appointment_Lists.dart
The Specialist shall be able to write a report after each appointment.	
The Specialist shall be able to view the child's profile.	
The Specialist shall be able to view the child's reports.	viewChildProfile.dart
The admin shall be able to log in using their email and password.	
The admin shall be able to log out from their account.	adminHP.dart
The admin shall be able to view a list of parent/specialist accounts.	
The admin shall be able to delete parent/ specialist accounts.	Parents.dart Specialists.dart
The admin shall be able to view the specialist cv.	CV.dart
The admin shall be able to view the list of specialists' registration requests.	
The admin shall be able to accept/reject a specialist request.	Applicants.dart
The admin shall be able to view the specialist's ratings.	
The admin shall be able to view the specialist's reviews.	reviews. dart

Table 16 mapping requirement and functions

13.4 Implementation Details

In this section, we describe the implementation details of the main function of our *Ayadi* system. We describe the function and show the GUI and code snippet with description of the code.

Function	Select a specialist from specialist list
GUI	 

Code snippet

```
        child: StreamBuilder<QuerySnapshot>(
            stream: FirebaseFirestore.instance
                .collection("specialist")
                .where("status", isEqualTo: true)
                .snapshots(),
            builder: (context, snapshot) {
                if (snapshot.hasData) {
                    final specialists = snapshot.data!;
                    int count = specialists.size;
                    List users = [];
                    List behavioralList = [];
                    List educationalList = [];
                    List speechList = [];

                    searchresult.clear();

                    for (int i = 0; i < specialists.size; i++) {
                        String data = specialists.docs[i]["Fname"] +
                            " " +
                            specialists.docs[i]["Lname"];
                        String specialization =
                            specialists.docs[i]["specialization"];
                        if (data
                            .toLowerCase()
                            .contains(_searchText.toLowerCase())) {
                            searchresult.add(data);
                            users.add(specialists.docs[i]);
                            if (specialists.docs[i]["specialization"] ==
                                "إخصائي سلوكى")
                                behavioralList.add(specialists.docs[i]);
                            else if (specialists.docs[i]["specialization"] ==
                                "إخصائي تربوى")
                                educationalList.add(specialists.docs[i]);
                            else if (specialists.docs[i]["specialization"] ==
                                'إخصائي نطق و تخطاب')
                                speechList.add(specialists.docs[i]);
                        }
                    }
                }
            }
        )
    }
}
```

This code retrieves the specialists based on the specialists' specialization which has been chosen by the parent.

Function	View specialist profile
GUI	
Code snippet	<p>This code retrieves all the selected specialist's data after choosing him/her from the specialists list</p> <pre> void _getdata() async { setState(() { showLoading = true; print(showLoading); }); FirebaseFirestore.instance .collection("specialist") .where("phoneNumber", isEqualTo: specialistPhone1) .limit(1) .get() .then((QuerySnapshot querySnapshot) { if (querySnapshot.docs.length > 0) { var documentSnapshot = querySnapshot.docs.first; if (documentSnapshot.exists) { //var date = documentSnapshot.data(); setState(() { specialistFname = documentSnapshot['Fname']; specialistLname = documentSnapshot['Lname']; specialization = documentSnapshot['specialization']; specialistBio = documentSnapshot['bio']; sessionPrice = documentSnapshot['sessionPrice']; avgRate = documentSnapshot['avgRate'] * 1.0; //specialistPhone = documentSnapshot['phoneNumber']; }); } } setState(() { showLoading = false; print(showLoading); }); }); } </pre> <p>This code retrieves all the reviews received by the specialists.</p>

```

423     //review
424     StreamBuilder<QuerySnapshot>(
425       stream: FirebaseFirestore.instance
426         .collection("sessions")
427         .orderBy("date", descending: false)
428         .snapshots(),
429       builder: (BuildContext context,
430         AsyncSnapshot<QuerySnapshot> snapshot) {
431       if (snapshot.hasData) {
432         final Allreviews = snapshot.data.docs;
433         List<QueryDocumentSnapshot<Object?>> reviews = [];
434         for (int i = 0; i < Allreviews.length; i++) {
435           if ((Allreviews[i]["specialistPhone"] ==
436             specialistPhone) &&
437               (Allreviews[i]["review"] != ""))
438             reviews.add(Allreviews[i]);
439         }
440       }
441     }

```

This method formats the review's date as needed

```

80
81   String formattedDate(timestamp) {
82     var dateFromTimestamp =
83       | | DateTime.fromMillisecondsSinceEpoch(timestamp.seconds * 1000);
84     return DateFormat('dd MMM, yyyy').format(dateFromTimestamp);
85   }
86

```

Function Select appointment details (date and child)

GUI



Code snippet

This code retrieves all the children that a parent has and adds it to a list.

```

151 void getChildrenName() {
152     childrenName = {};
153     String fullName = "";
154     childrenName["----"] = ('-----');
155     FirebaseFirestore.instance
156         .collection("children")
157         .where("parentPhone", isEqualTo: parentPhoneNo)
158         .get()
159         .then((QuerySnapshot querySnapshot) {
160             if (querySnapshot.size > 0) {
161                 querySnapshot.docs.forEach((element) {
162                     if (element.exists) {
163                         var data = element.data();
164                         String child_id = element["id"];
165                         String childFname = element['Fname'];
166                         String childLname = element['Lname'];
167                         fullName = childFname + " " + childLname;
168                         setState(() {
169                             childrenName[fullName] = child_id;
170                         });
171                     } else {
172                         print('No documents found in children');
173                     }
174                 });
175             } else {
176                 print('No documents found in children1');
177             }
178         });
179     }
180 }
```

This method retrieves the specialist's weekly schedule:

```

181 void _getAppointmentsTimes() {
182     FirebaseFirestore firestore = FirebaseFirestore.instance;
183     _scheduleByDay.clear();
184
185     firestore.collection('weeklySchedule').where('SPphone', isEqualTo: specialistID).get()
186         .then((QuerySnapshot querySnapshot) {
187             if (querySnapshot.size > 0) {
188                 querySnapshot.docs.forEach((DocumentSnapshot documentSnapshot) {
189                     List<List<DateTime>> sunday = [];
190                     List<Timestamp> sundayPeriods = List<Timestamp>.from(
191                         (documentSnapshot.data() as Map<String, dynamic>)['sun']);
192                     for (int i = 0; i < sundayPeriods.length; i += 2) {
193                         sunday.add([sundayPeriods[i].toDate(), sundayPeriods[i + 1].toDate()]);
194
195                     List<List<DateTime>> monday = [];
196                     List<Timestamp> mondayPeriods = List<Timestamp>.from(
197                         (documentSnapshot.data() as Map<String, dynamic>)['mon']);
198                     for (int i = 0; i < mondayPeriods.length; i += 2) {
199                         monday.add([mondayPeriods[i].toDate(), mondayPeriods[i + 1].toDate()]);
200
201                     List<List<DateTime>> tuesday = [];
202                     List<Timestamp> tuesdayPeriods = List<Timestamp>.from(
203                         (documentSnapshot.data() as Map<String, dynamic>)['tue']);
204                     for (int i = 0; i < tuesdayPeriods.length; i += 2) {
205                         tuesday.add([tuesdayPeriods[i].toDate(), tuesdayPeriods[i + 1].toDate()]);
206
207                     List<List<DateTime>> wednesday = [];
208                     List<Timestamp> wednesdayPeriods = List<Timestamp>.from(
209                         (documentSnapshot.data() as Map<String, dynamic>)['wed']);
210                     for (int i = 0; i < wednesdayPeriods.length; i += 2) {
211                         wednesday.add([wednesdayPeriods[i].toDate(), wednesdayPeriods[i + 1].toDate()]);
212
213                     List<List<DateTime>> thursday = [];
214                     List<Timestamp> thursdayPeriods = List<Timestamp>.from(
215                         (documentSnapshot.data() as Map<String, dynamic>)['thu']);
216                     for (int i = 0; i < thursdayPeriods.length; i += 2) {
217                         thursday.add([thursdayPeriods[i].toDate(), thursdayPeriods[i + 1].toDate()]);
218
219                 });
220             }
221         });
222     }
223 }
```

```

219     List<List<DateTime>> friday = [];
220     List<Timestamp> fridayPeriods = List<Timestamp>.from(
221       (documentSnapshot.data() as Map<String, dynamic>)['fri']);
222     for (int i = 0; i < fridayPeriods.length; i += 2) {
223       friday.add((fridayPeriods[i].toDate(), fridayPeriods[i + 1].toDate()));
224     }
225     List<List<DateTime>> saturday = [];
226     List<Timestamp> saturdayPeriods = List<Timestamp>.from(
227       (documentSnapshot.data() as Map<String, dynamic>)['sat']);
228     for (int i = 0; i < saturdayPeriods.length; i += 2) {
229       saturday.add((saturdayPeriods[i].toDate(), saturdayPeriods[i + 1].toDate()));
230     }
231     setState(() {
232       _scheduleByDay = {
233         'sun': sunday,
234         'mon': monday,
235         'tue': tuesday,
236         'wed': wednesday,
237         'thu': thursday,
238         'fri': friday,
239         'sat': saturday,
240       };
241       DateTime firstAvailableDay = DateTime.now();
242       while (!enabledDayPredicate(firstAvailableDay)) {
243         firstAvailableDay = firstAvailableDay.add(Duration(days: 1));
244       }
245       // Set the initial selected day to the first available day
246       _selectedDay = firstAvailableDay;
247       DateTime _sentDay = firstAvailableDay;
248       _focusedDay = firstAvailableDay;
249       print("Focused day is: $_focusedDay");
250       int dayNum = firstAvailableDay.weekday;
251       weekDay = (dayNum == 7)
252         ? "sun"
253         : (dayNum == 1)
254           ? "mon"
255           : (dayNum == 2)
256             ? "tue"
257               :
258                 : (dayNum == 3)
259                   ? "wed"
260                     :
261                       : (dayNum == 4)
262                         ? "thu"
263                           :
264                             : (dayNum == 5)
265                               ? "fri"
266                                 :
267                                   : "sat";
268       print(firstAvailableDay);
269       _getAppointments(_selectedDay, () {
270         appointmentsLoaded = true;
271       });
272     });
273   } else {
274     setState(() {
275       _scheduleByDay = {
276         'sun': [],
277         'mon': [],
278         'tue': [],
279         'wed': [],
280         'thu': [],
281         'fri': [],
282         'sat': []
283       };
284       noAppointments = true;
285     });
286     print('No documents found');
287   }
288   print('Schedule by day: $_scheduleByDay');
289 }
290 
```

this method finds the days that the specialist has an appointment in to make it selectable:

```
bool enabledDayPredicate(DateTime day) {
    if (_scheduleByDay["sun"]!.isEmpty && day.weekday == DateTime.sunday)
        return false;

    if (_scheduleByDay["mon"]!.isEmpty && day.weekday == DateTime.monday)
        return false;

    if (_scheduleByDay["tue"]!.isEmpty && day.weekday == DateTime.tuesday)
        return false;

    if (_scheduleByDay["wed"]!.isEmpty && day.weekday == DateTime.wednesday)
        return false;

    if (_scheduleByDay["thu"]!.isEmpty && day.weekday == DateTime.thursday)
        return false;

    if (_scheduleByDay["fri"]!.isEmpty && day.weekday == DateTime.friday)
        return false;

    if (_scheduleByDay["sat"]!.isEmpty && day.weekday == DateTime.saturday)
        return false;

    return true;
}
```

This method converts the specialist's weekly schedule to an appropriate appointments list by splitting his/her working hours to 45-minute appointments with taking the reserved sessions into consideration by not adding it to the list.

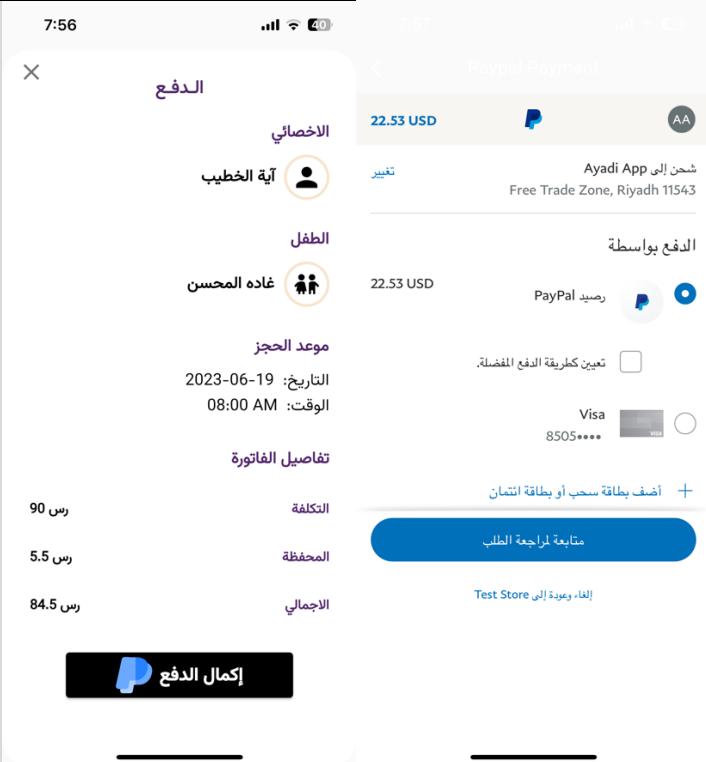
```
294 void _getAppointments(DateTime selectedDay, VoidCallback callback) {
295   Map<String, DateTime> reservedAppointmentTimes = {};  
296   // Store reserved appointment times for selected day  
297   FirebaseFirestore.instance.collection("sessions").where("specialistPhone", isEqualTo: specialistID).get()
298   .then((QuerySnapshot querySnapshot) {
299     if (querySnapshot.size > 0) {
300       querySnapshot.docs.forEach((DocumentSnapshot documentSnapshot) {
301         DateTime reservedDate = documentSnapshot["date"].toDate();
302         if (selectedDay.year == reservedDate.year &&
303             selectedDay.month == reservedDate.month &&
304             selectedDay.day == reservedDate.day) {
305           reservedAppointmentTimes[documentSnapshot.id] = reservedDate;
306         }
307       });
308     }
309   })
310   setState(() {
311     appointmentTimes = {
312       'sun': [],
313       'mon': [],
314       'tue': [],
315       'wed': [],
316       'thu': [],
317       'fri': [],
318       'sat': [],
319     };

```

```

319     _scheduleByDay.forEach((day, schedule) {
320         for (int i = 0; i < schedule.length; i++) {
321             DateTime startTime = schedule[i][0];
322             DateTime endTime = schedule[i][1];
323             int startMinutes = startTime.hour * 60 + startTime.minute;
324             int endMinutes = endTime.hour * 60 + endTime.minute;
325             int totalMinutes = endMinutes - startMinutes;
326
327             // Generate appointment times within the current time period if not reserved
328             while (totalMinutes >= 45) {
329                 bool isReserved = false;
330                 DateTime appointmentTime1 = DateTime(
331                     selectedDay.year, selectedDay.month, selectedDay.day,
332                     startTime.hour, startTime.minute);
333
334                 int appointmentTime = (appointmentTime1.hour * 60) + appointmentTime1.minute;
335
336                 reservedAppointmentTimes.forEach((documentId, reservedDateTime1) {
337                     int reservedDateTime = (reservedDateTime1.hour * 60) + appointmentTime1.minute;
338                     if (((appointmentTime - reservedDateTime).abs() < 45)) {
339                         isReserved = true;
340                     }
341                 });
342
343                 if (!isReserved)
344                     appointmentTimes[day]!.add(appointmentTime1);
345
346                 startTime = startTime.add(Duration(minutes: 45));
347                 totalMinutes -= 45;
348             }
349         });
350     });
351 });
352
353     callback();
354 });
355 });
356

```

Function	Pay for the appointment
GUI	 <p>The screenshot shows a mobile application interface for paying an appointment. At the top, it says "7:56". Below that is a header "الدفع" (Payment) with a close button "X". To the right of the header, there's a "PayPal Payment" section showing "22.53 USD" and a "P" logo. It also shows "شحن إلى Ayadi App Free Trade Zone, Riyadh 11543". Below this, there are two sections: "الاخصائي" (Specialist) and "الطفل" (Child), both showing "22.53 USD" and a "PayPal" logo. Under "الاخصائي", it says "آية الخطيب". Under "الطفل", it says "غادة المحسن". Further down, it shows "موعد الحجز" (Booking Date) as "2023-06-19", "التاريخ" (Date) as "08:00 AM", and a checkbox for "تعيين كمتريرة الدفع المفضلة" (Set as preferred payment method). There's also a Visa card icon with the number "8505*****". A blue button at the bottom right says "إكمال الدفع" (Complete payment).</p>

Code snippet

This code represents the payment gateway integration with our system:

```
b > payment > paymentInfo.dart > ...
1 import 'package:awesome_dialog/awesome_dialog.dart';
2 import 'package:ayadi/payment/paymentContainer.dart';
3 import 'package:cloud_firestore/cloud_firestore.dart';
4 import 'package:firebase_auth/firebase_auth.dart';
5 import 'package:flutter/material.dart';
6 import 'package:flutter/services.dart';
7 import 'package:flutter/src/widgets/framework.dart';
8 import 'package:flutter/src/widgets/placeholder.dart';
9 import 'package:flutter_paypal_checkout/flutter_paypal_checkout.dart';
10 import 'package:intl/intl.dart';
11
12 import '../NavigationPages/account_and_Children.dart';
13
```

```
paymentInfo.dart •
b > payment > paymentInfo.dart > _PaymentInfoState > build
51 onPressed: () async {
52   Navigator.of(context).push(MaterialPageRoute(
53     builder: (BuildContext context) => PaypalCheckout(
54       sandboxMode: true,
55       clientId:
56         "AcoJjlLaaX9Aff1Nl8rwQnwlaFFMpi0WhB9x454pGBjMgv4aLrLKewIwEss6d7btF59bdUfdBzzwbWBt",
57       secretKey:
58         "EAzkqgnIO_LEQCP_ZL1x9h0bnLir4_08nBQxuiTIZMff3Qj4ykgnNxroDCMCns1C5n1cLVfwWz-IViW8C",
59       returnUrl: "success.snippetcoder.com",
60       cancelURL: "cancel.snippetcoder.com",
61       transactions: [
62         {
63           "amount": {
64             "total": totalUSD.toString(),
65             "currency": "USD",
66             "details": {
67               "subtotal": totalUSD.toString(),
68               "shipping": '0',
69               "shipping_discount": 0
70             }
71           },
72           "description":
73             "The payment transaction description.",
74         }
75       ],
76       note:
77         "Contact us for any questions on your order.",
78       onSuccess: (Map params) async {
79         whenPaid();
80         print("onSuccess: $params");
81       },
82       onError: (error) {
83         print("onError: $error");
84         Navigator.pop(context);
85       },
86       onCancel: () {
87         print('cancelled:');
88       },
89     ), // PaypalCheckout
90   ), // MaterialPageRoute
91 },
92 style: ButtonStyle(
93   backgroundColor: MaterialStateProperty.all<Color>(
94     Colors.black,
95   ),
96   ),
97   // ButtonStyle
98   child: Row(
99     mainAxisAlignment: MainAxisAlignment.center,
```

The following code snippet demonstrates how we calculate the session price by detecting the wallet amount, and then update both the session price and wallet amount. Finally, we send the total price in USD to the payment gateway, as it only accepts USD.

```

    });

    setState(() {
      if (wallet < sessionPrice) {
        total = sessionPrice - wallet;
        updatedWallet = 0.0;
      } else if (wallet == sessionPrice) {
        total = 0.0;
        updatedWallet = 0.0;
      } else if (wallet > sessionPrice) {
        total = 0.0;
        updatedWallet = wallet - sessionPrice;
        updatedWallet = double.parse(updatedWallet.toStringAsFixed(2));
      }

      total = double.parse(total.toStringAsFixed(2));
      if (total != 0.0) {
        totalUSD = total / 3.75;
        totalUSD = double.parse(totalUSD.toStringAsFixed(2));
        print(totalUSD);
      }
    });
  }
}

```

Function	View upcoming appointments list
GUI	

Code snippet	This code represents the number of unread messages to show it for the user in the appointments list
---------------------	---

```

587
588         return StreamBuilder(
589           stream: firebaseFirestore
590             .instance
591               .collection('messages')
592                 .where('receiver',
593                   isEqualTo: parentID)
594                   .where("sessionId",
595                     isEqualTo: session.id)
596                     .where('unread',
597                       isEqualTo: true)
598                         .snapshots(),
599                           builder: (context, snapshot) {
600                             if (snapshot.connectionState ==
601                               ConnectionState.waiting){
602                                 loadingNumI++;
603                                 if (loadingNumI ==1)
604                                   return Center(child: CircularProgressIndicator(
605                                     color: Color.fromARGB(160, 145, 75, 185) ,)); // CircularProgressIndicator
606                               }
607                               if (snapshot.hasData) {
608                                 final mes =
609                                   snapshot.data!.docs;
610                                 int countNew = mes.length;

```

This code represents how the user will join the session chat by clicking on the chatting button

```

705   //Message call
706   TextButton(
707     onPressed:
708       () {
709         for (int i = 0; i < countNew; i++) {
710           mes[i].reference.update({
711             'unread': false
712           });
713         }
714       Navigator.of(context).push(PageRouteBuilder(
715         pageBuilder: (_, __) => chating(
716           session: session,
717           )));
718       } // chating // PageRouteBuilder

```

Function	Join Chat
GUI	

Code snippet	this code represents the retrieving the previous messages that has been sent in the chat
---------------------	--

```

StreamBuilder<QuerySnapshot>(
    stream: _firebase
        .collection('messages')
        .orderBy('time')
        .snapshots(),
    builder: (context, snapshot) {
        // List<MessageLine> messageWidgets = [];
        if (!snapshot.hasData) {}

        try {
            final messages = snapshot.data!.docs;
            messageWidgets.clear();
            for (var message in messages) {
                if ((message.get('sender') == specialistID &&
                    message.get('receiver') == parentID &&
                    message.get('sessionId') == session.id) ||
                    (message.get('sender') == parentID &&
                    message.get('receiver') == specialistID &&
                    message.get('sessionId') == session.id)) {
                    final messageText = message.get('text');
                    final messageSender = message.get('sender');
                    final messageTime =
                        formattedDate(message.get('time'), 'hh:mm a');
                    final currentUser = specialistID;

                    final messageWidget = Message(
                        sender: messageSender,
                        text: messageText,
                        time: messageTime,
                        messageTime: messageTime,
                        isMe: currentUser == messageSender,
                    ); // Message
                    messageWidgets.add(messageWidget);
                }
            }
        }
    }
)

```

This code represents converting the message status to old when the user reads it

```

if ((message.get('sender') == parentID &&
    message.get('receiver') == specialistID) &&
    (message.get('status') == "new")) {
    _firebase
        .collection("messages")
        .doc(message.id)
        .update({
            'status': "old",
        });
    _firebase
        .collection("messages")
        .doc(message.id)
        .update({
            'unread': false,
        });
}

messageWidgets.add(messageWidget);
}

```

This code represents creating a message object which has all the message attributes for each message in the chat

```

}
class Message {
    final String sender;
    final String text;
    final String time;
    final bool isMe;
    final String? messageTime;
    Message({
        required this.sender,
        required this.text,
        required this.time,
        required this.isMe,
        this.messageTime,
    });
}

```

Function	Join via video call
GUI	 <p>في انتظار انضمام المستخدم الآخر</p> <p>Microphone, Video, Call, Share icons</p>
Code snippet	This method represents initializing Agora cloud-based Package which will start the video-call session

```

Future<void> initializeAgora() async {
  setState(() {
    loading = true;
  });
  _engine = await RtcEngine.createWithContext(RtcEngineContext(appId));
  await _engine.enableVideo();
  await _engine.setChannelProfile(ChannelProfile.Communication); //
  _engine.setEventHandler(RtcEngineEventHandler(
    joinChannelSuccess: (channel, uid, elapsed) {
      print('channel joined');
    },
    userJoined: (uid, elapsed) {
      print('user joined: $uid');
      setState(() {
        _remotUid.add(uid);
      });
    },
    userOffline: (uid, reason) {
      print('user offline: $uid');
      setState(() {
        _remotUid.remove(uid);
      });
    },
  ));
  await _engine.joinChannel(null, widget.channelName, null, 0).then((value) {
    setState(() {
      loading = false;
    });
  });
}

```

This code represents the tools and features in the video-call which are enabling/disabling and switching the camera, muting/unmuting microphone, and leaving the video call.

```

void _onToggleMute() {
  setState(() {
    muted = !muted;
  });
  _engine.muteLocalAudioStream(muted);
}

void _onToggleCamera() {
  setState(() {
    isCameraOff = !isCameraOff;
  });
  _engine.enableLocalVideo(!isCameraOff);
  _engine.muteLocalVideoStream(isCameraOff);
}

void _onCallEnd() {
  _engine.leaveChannel().then((value) {
    Navigator.pop(context);
  });
}

void _onSwitchCamera() {
  _engine.switchCamera();
}

```

This method represents the count down timer which calculates the remaining time for the session, changes status when the remaining time is less than 10 minutes

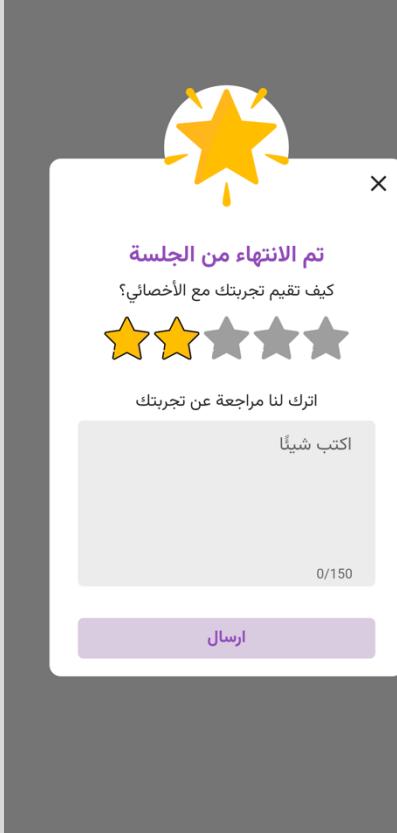
	<pre> child: CountdownTimer(), endTime: endTime.millisecondsSinceEpoch, widgetBuilder: (_, time) { if ((time!.min!) < 10) { timerColor = false; } if (time == null) { _onCallEnd(); return Container(); } } </pre>
Function	Rating and review the session
GUI	
Code snippet	<p>This code represents the rating bar:</p> <pre> child: RatingBar.builder(initialRating: rating, minRating: 1, direction: Axis.horizontal, allowHalfRating: true, itemCount: 5, itemPadding: EdgeInsets.symmetric(horizontal: 2.0), itemBuilder: (context, _) => Image.asset('assets/star-9.png'), onRatingUpdate: (value) { rating = value;},),),), // RatingBar.builder // Center / </pre> <p>This code represents adding the rate and the review to be added to firebase:</p> <pre> final _firestore = FirebaseFirestore.instance; Future addRating(double rating, String rev, String id) async { await _firestore .collection('session') .doc(id) .update({'rate': rating, 'review': rev});} </pre>

Table 17 implementation details table

13.5 Database Schema

We chose to use the NoSQL Firebase Firestore as our database. We researched different options and determined that Firebase was the best choice for our mobile application in terms of accessibility, security, speed and scalability, maintainability, and usability [24] since NoSQL databases have become an essential tool for modern applications that require high performance and scalability in the era of big data (*What Are NoSQL Databases?* / IBM, n.d.).

Firestore is a cloud-hosted NoSQL database built on Google's infrastructure. It allows users to store, synchronize, and query data globally. It's a fully managed backend service that provides several useful features for Ayadi, including an API that simplifies communication with the database, built-in authentication services for application security, and pattern matching on data or user identification.[25]

We also took into account that we are using Flutter in our application, and after researching and discussing, we concluded that Firebase and Flutter are an excellent match for developing mobile applications, which helps in the development of secure and high-performing applications. [26]

Firebase Firestore and other NoSQL databases are designed to move away from the strict rows and columns of relational database modeling. They are flexible in terms of organizing data, which is why they are sometimes called "schema-less" (MongoDB, n.d.).

As a result, these databases do not have a schema in the same strict way that relational databases do. Therefore, our data model is not represented in the same strict way as a relational database schema.

Firebase Firestore follows the document database model, which is similar to JSON objects [27]. Each collection has a document that stores multiple fields and their values, as illustrated in the database model below.

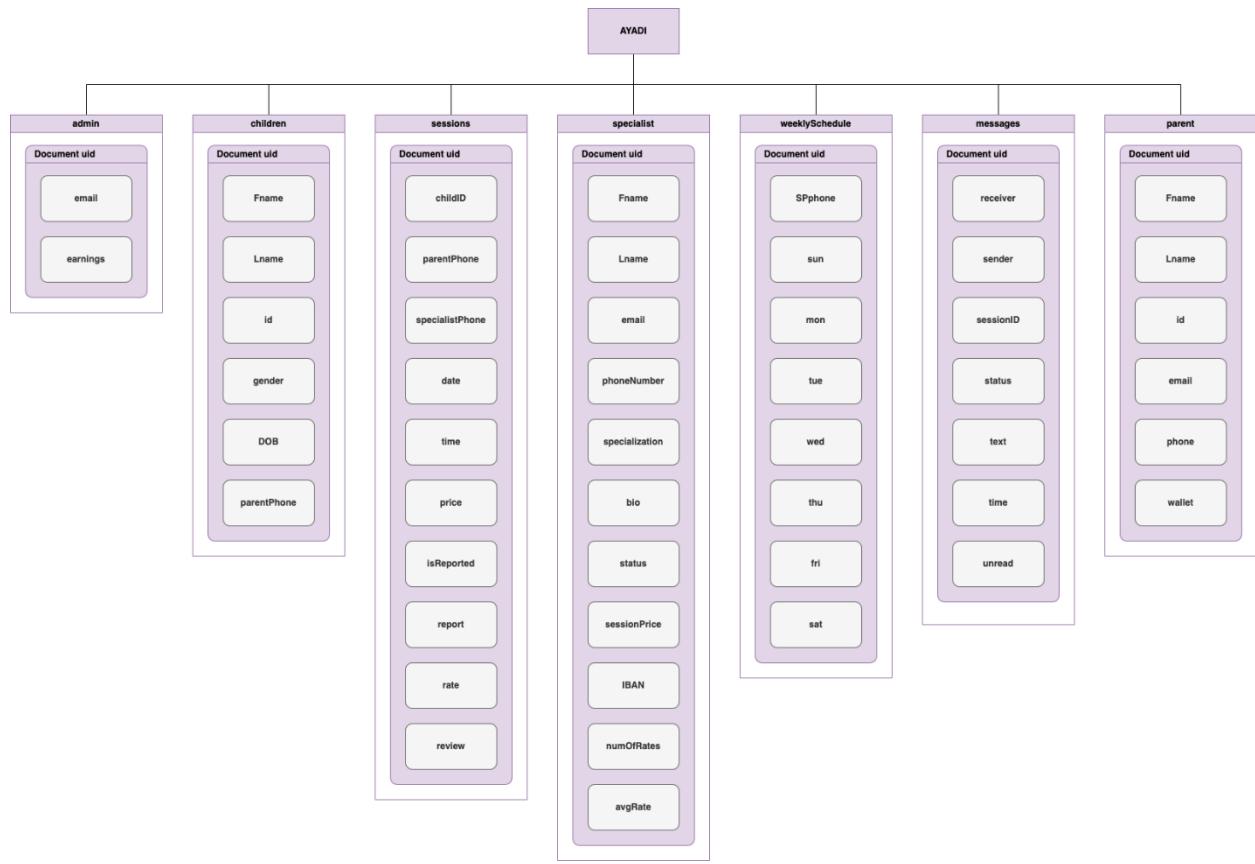


Figure 42 Ayadi Database Schema Diagram

13.6 User Interface

- Ayadi Parent App

[Launching]

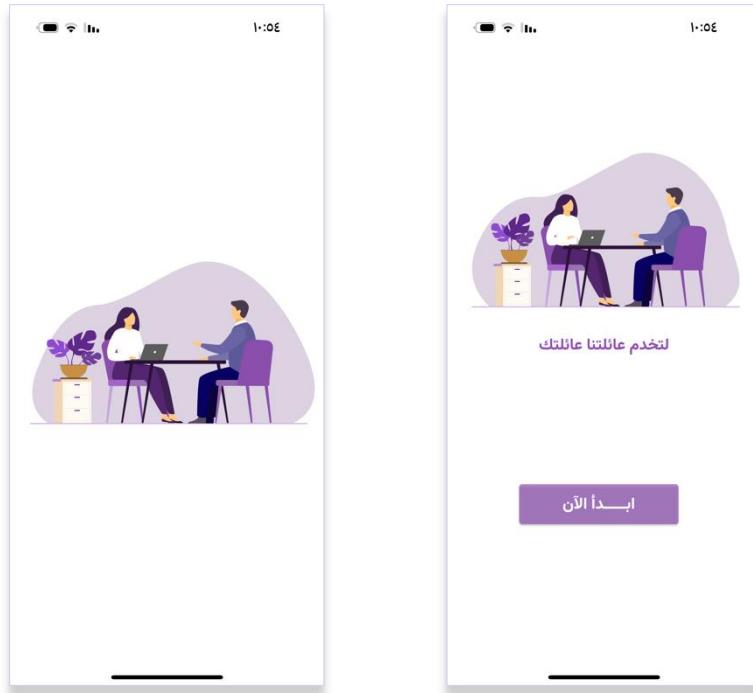


Figure 43 parent welcome page

[Registration]



Figure 44 Parent registration page

[Log In]

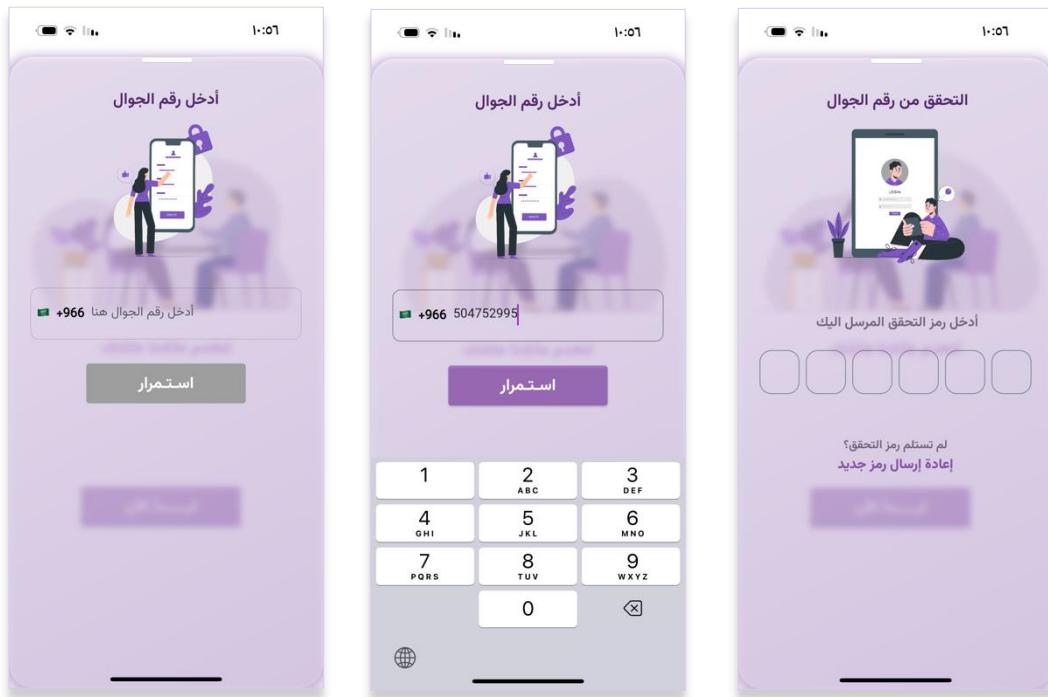


Figure 45 Parent log in process

[Parent Home Page]



Figure 46 Parent home page

[View and Edit Parent Profile]



Figure 47 Parent profile page

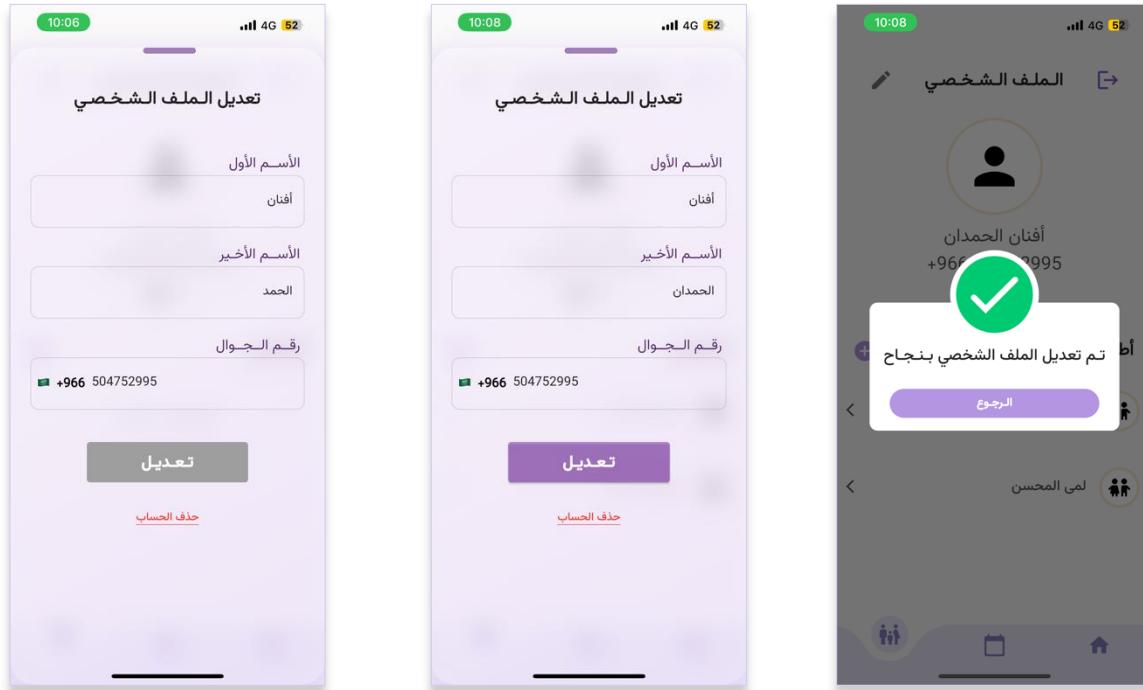


Figure 48 Edit parent profile process

[Log Out]

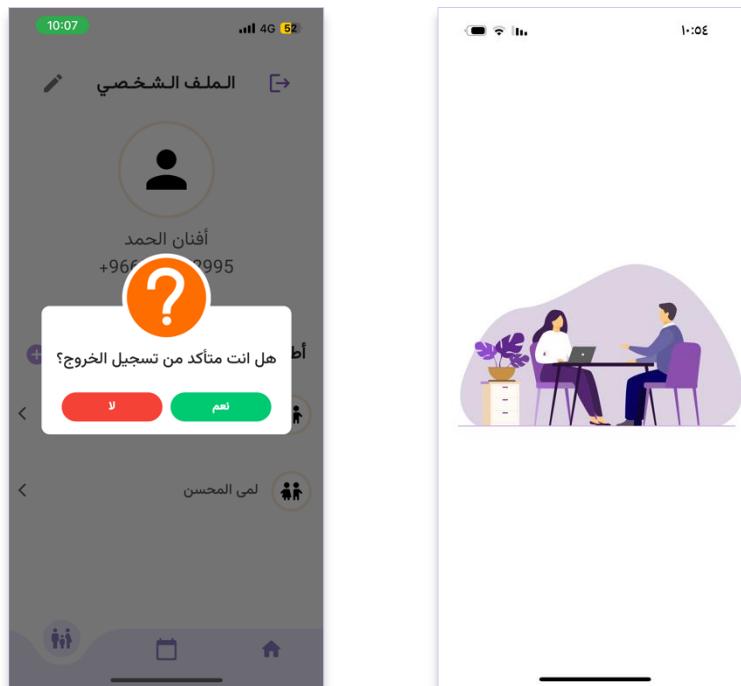


Figure 49 Parent log out process

[Add Child]

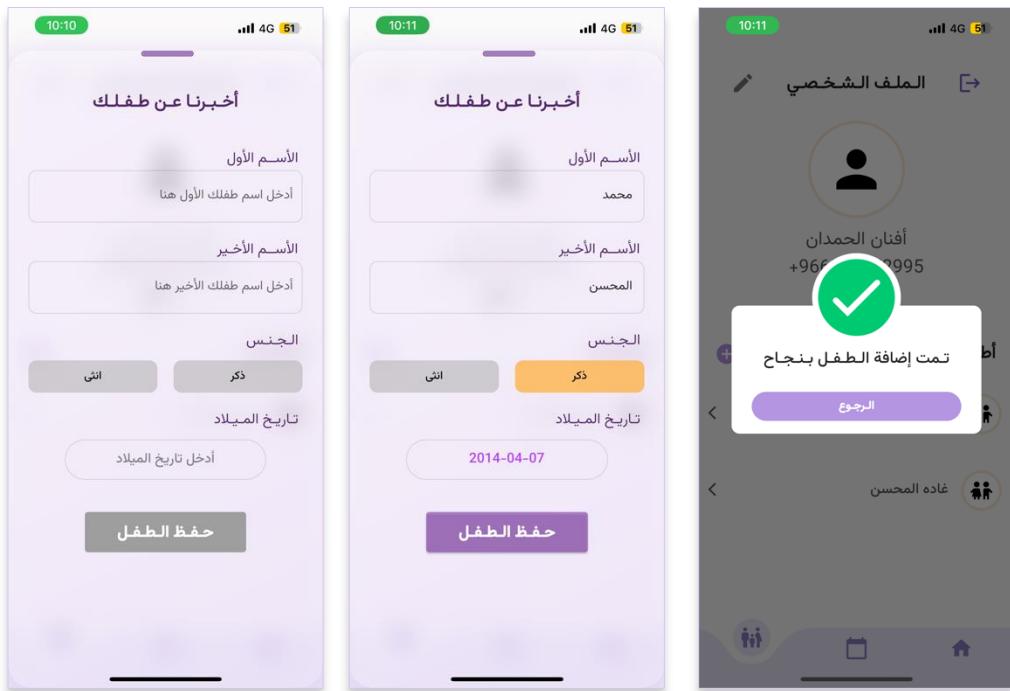


Figure 50 Add child process

[View and Edit Child Profile]



Figure 51 Child profile page

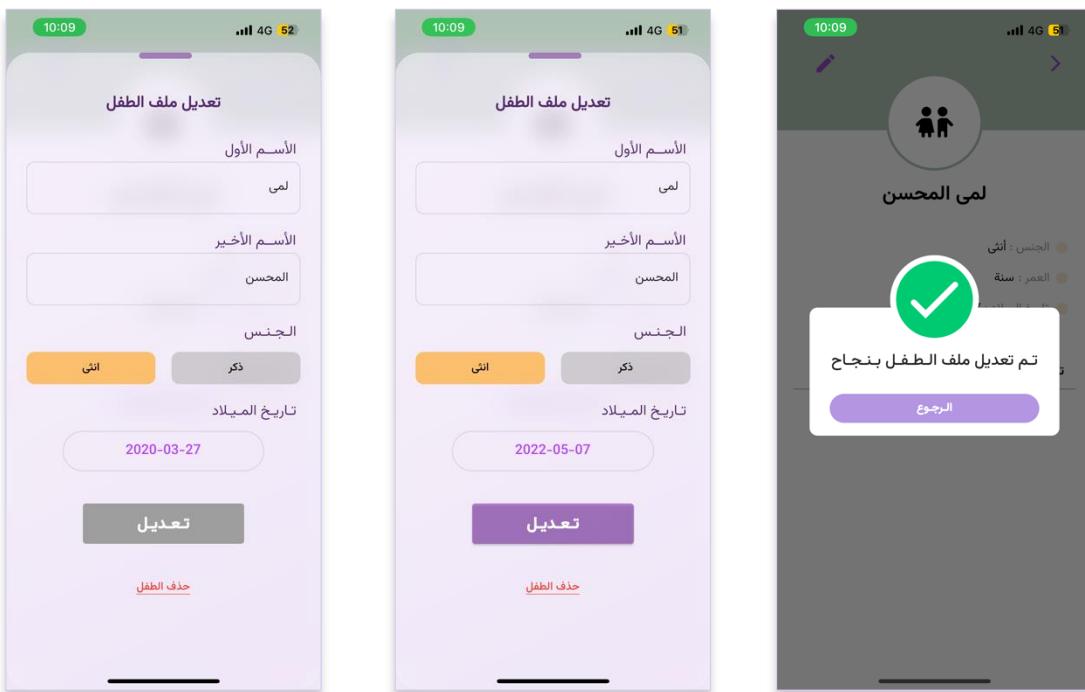


Figure 52 Edit child profile process

[Delete Child Profile]

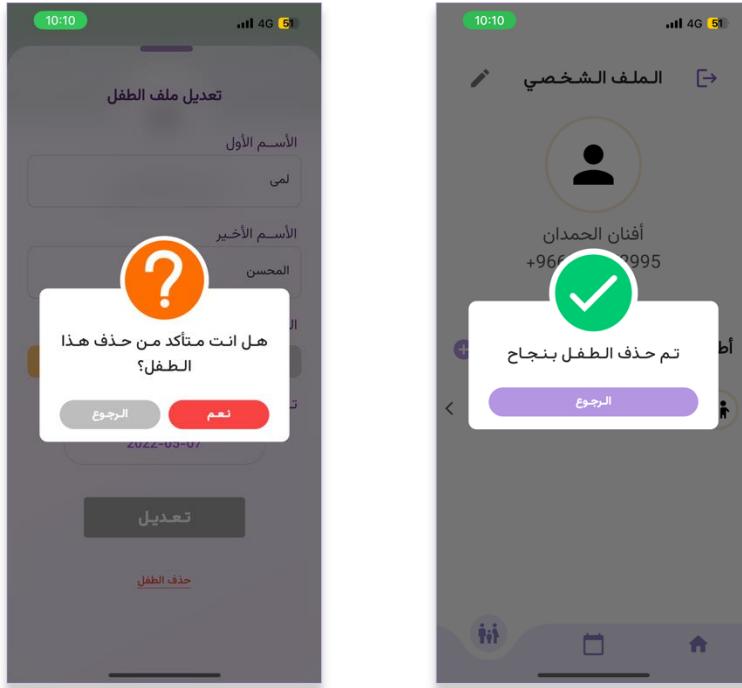


Figure 53 Delete child profile process

[Search for Specialist]

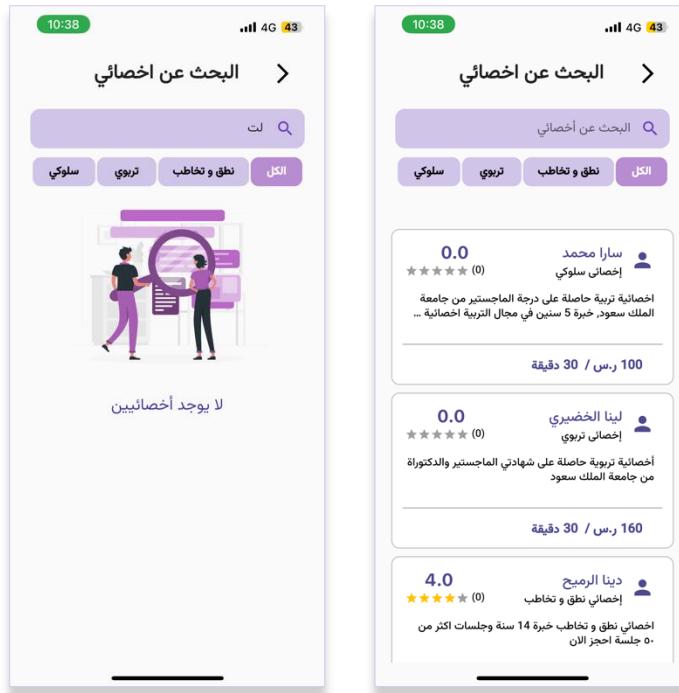


Figure 54 Search for specialist page

[View Specialist Profile]



Figure 55 Specialist profile page

[Book Appointment]



Figure 56 Book appointment process

[Payment Process]

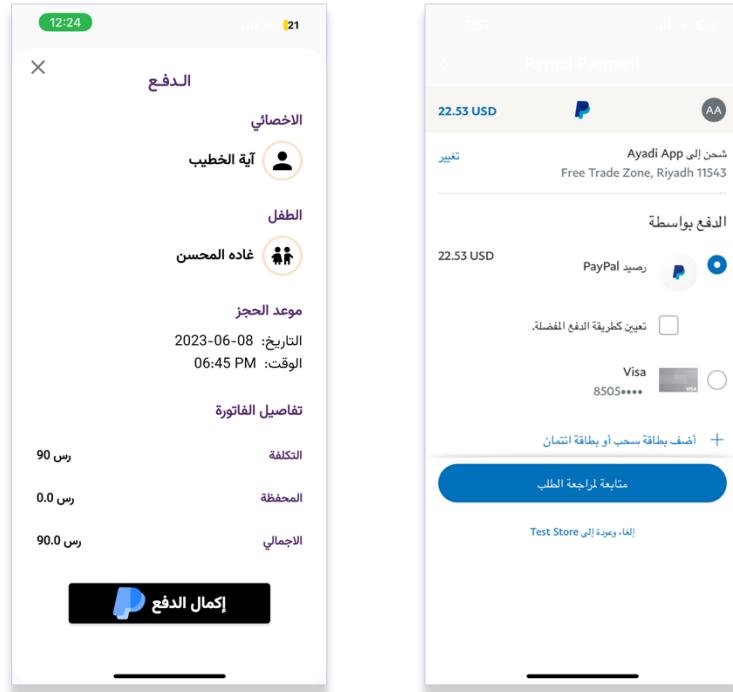


Figure 57 Payment process

[Upcoming Appointment List]

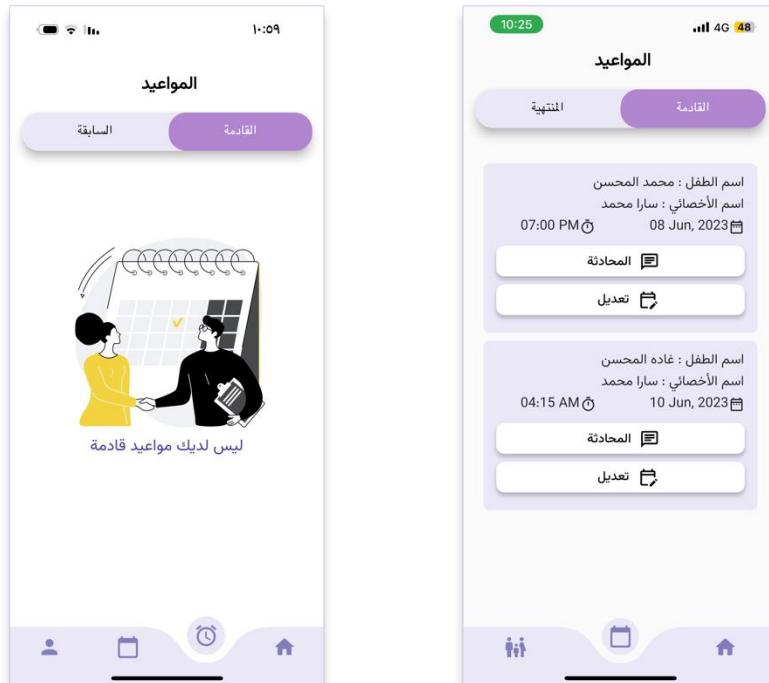


Figure 58 Upcoming appointment

[Edit Upcoming Appointment]

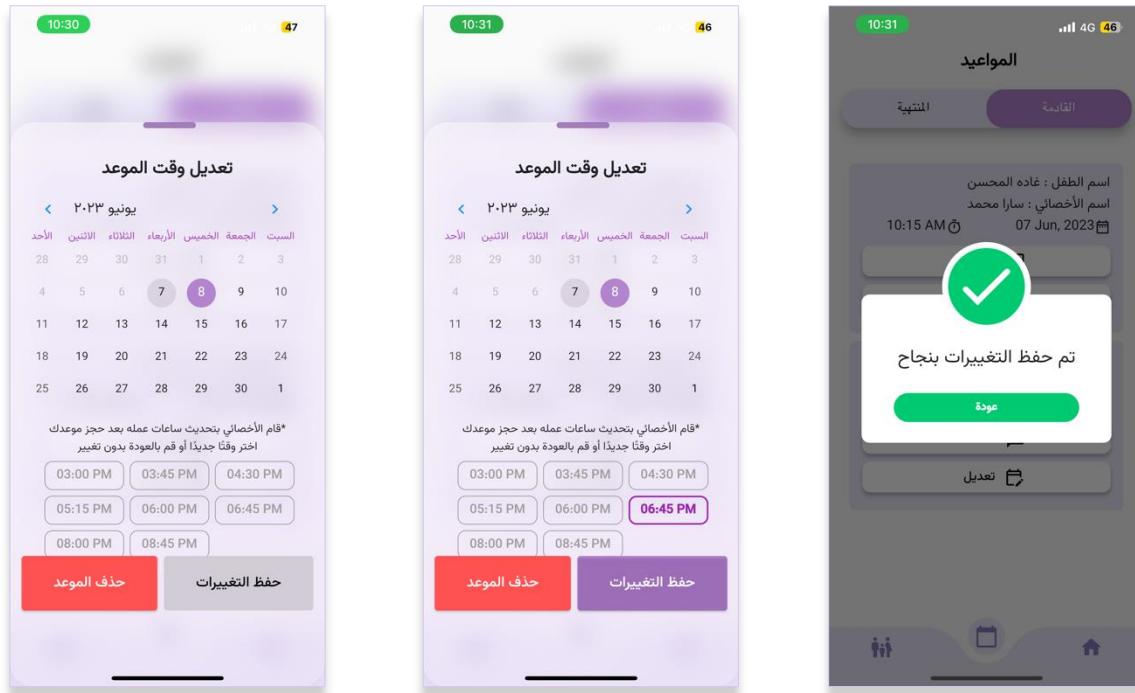


Figure 59 Edit upcoming appointment process

[Delete Upcoming Appointment]

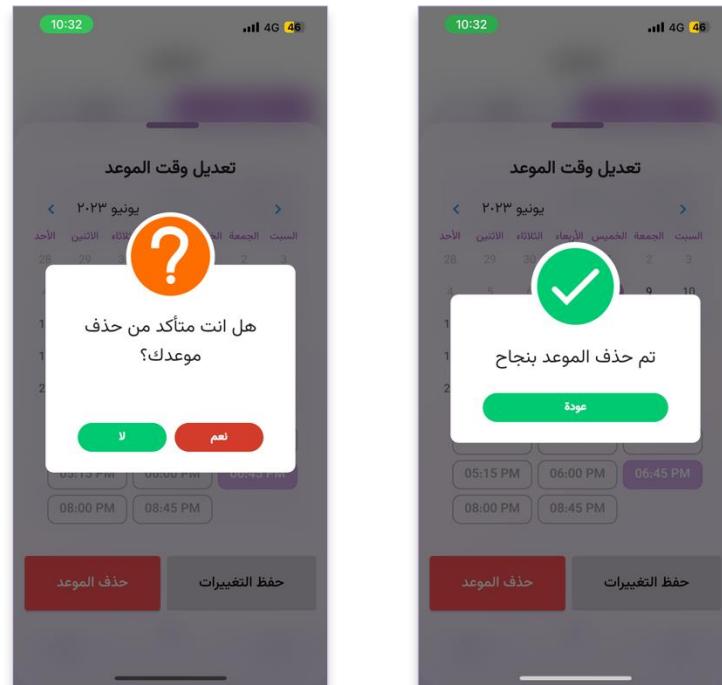


Figure 60 Delete upcoming appointment process

[Chatting]

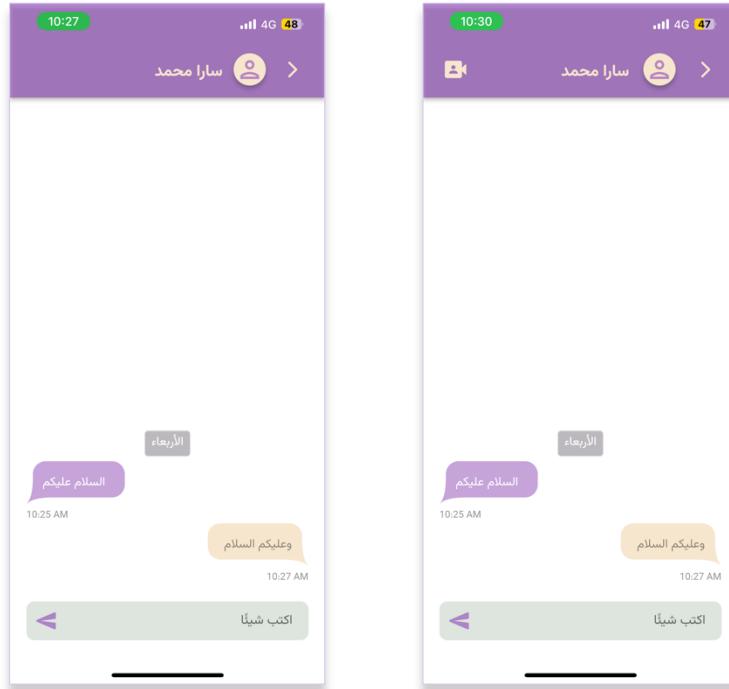


Figure 61 Chatting page before and after the video call icon appears

[Video Call]



Figure 62 Video call page

[Rate and Review Specialist]

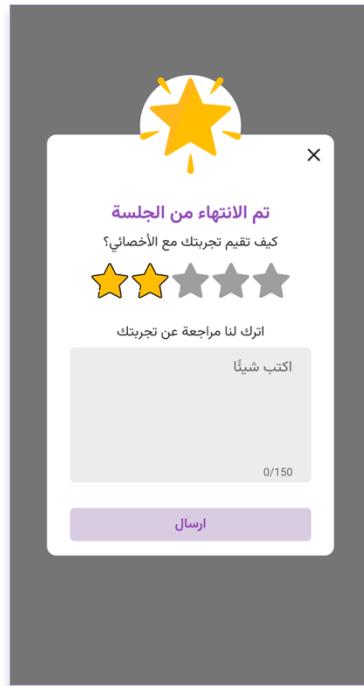


Figure 63 Rate and review specialist

[Previous Appointment]



Figure 64 Previous appointment

[Delete Parent Account]

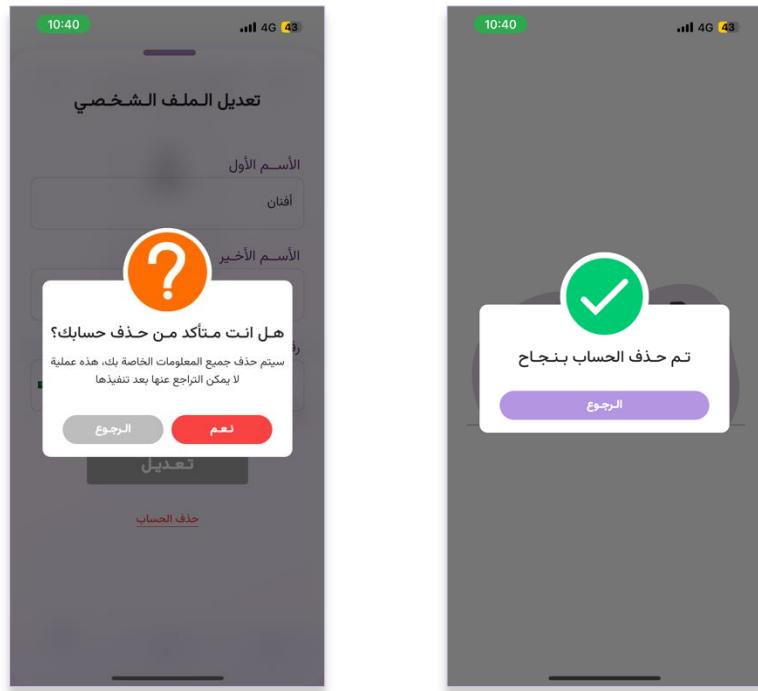


Figure 65 Delete parent account process

- Ayadi Specialist App

[Launching]

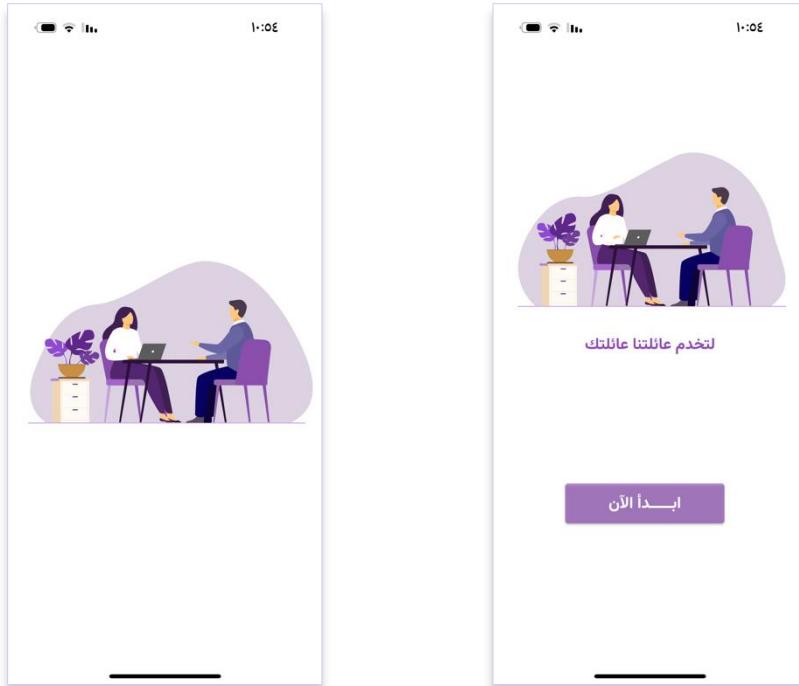


Figure 66 specialist welcome page

[Registration]

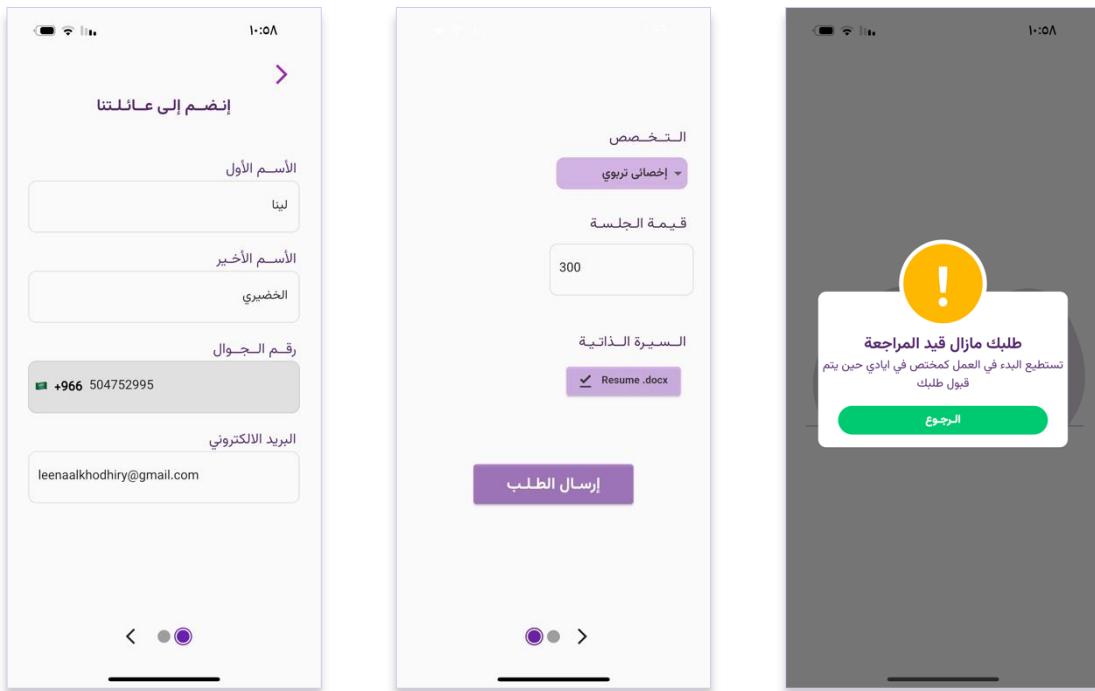


Figure 67 Specialist registration process

[Log In]

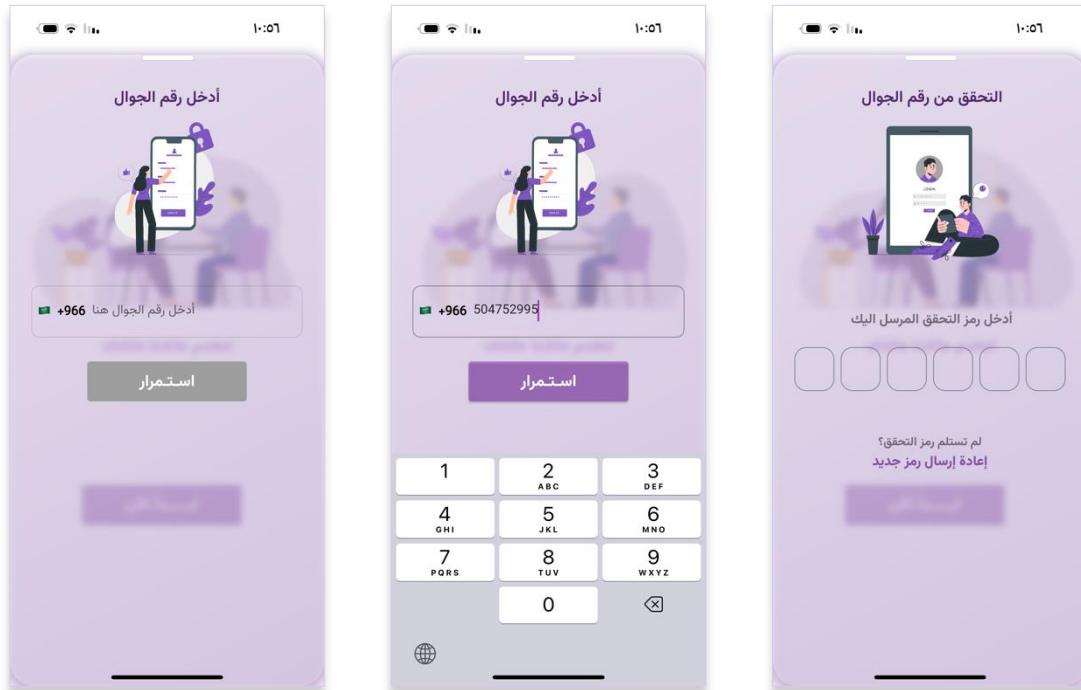


Figure 68 Specialist log in process

[Specialist Home Page]



Figure 69 Specialist home page

[View and Edit Specialist Profile]



Figure 70 Specialist profile page

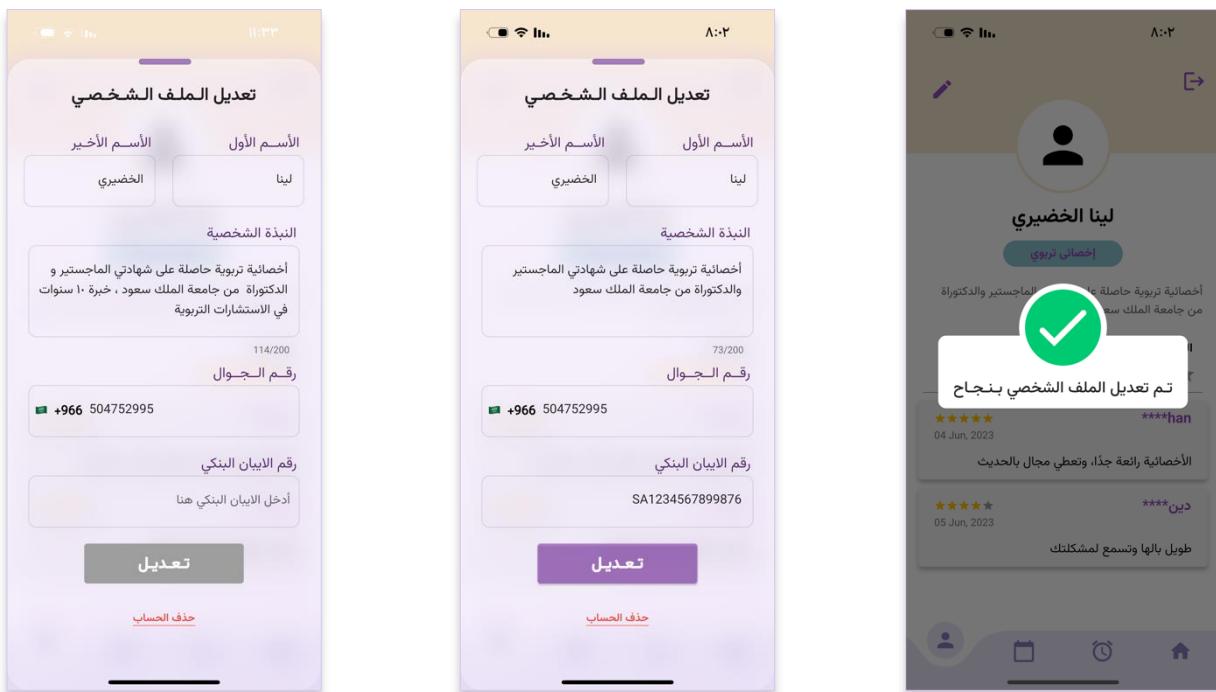


Figure 71 Edit specialist profile process

[Log Out]

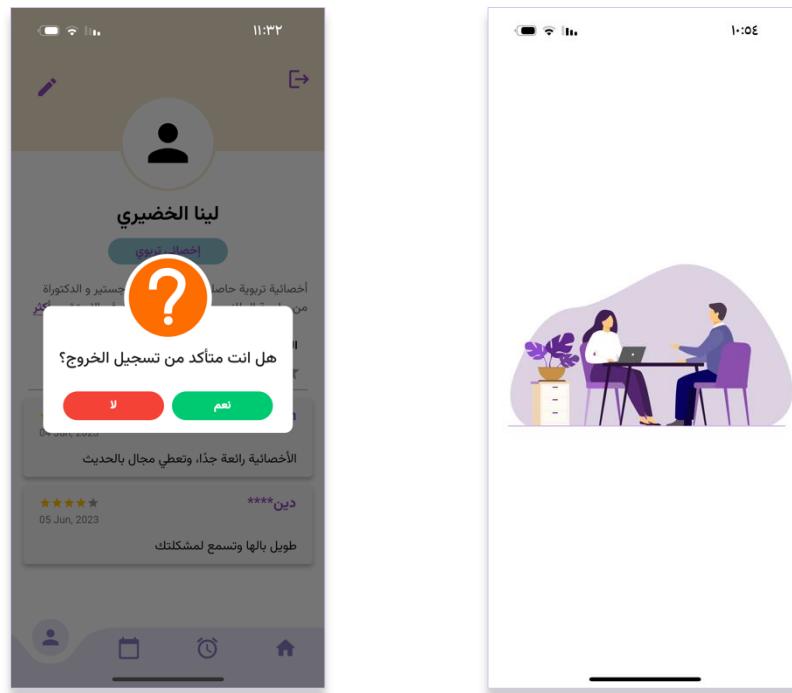


Figure 72 Specialist log out process

[View Schedule]

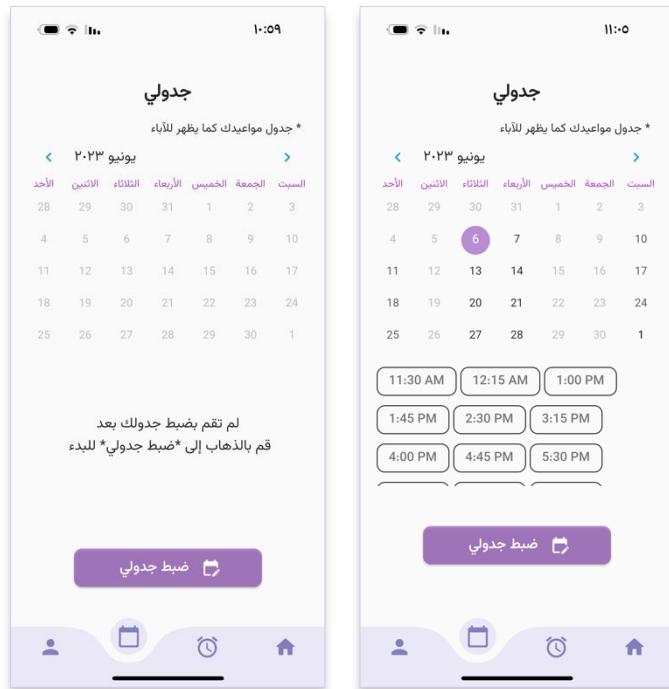


Figure 73 Specialist schedule page

[Set Schedule]

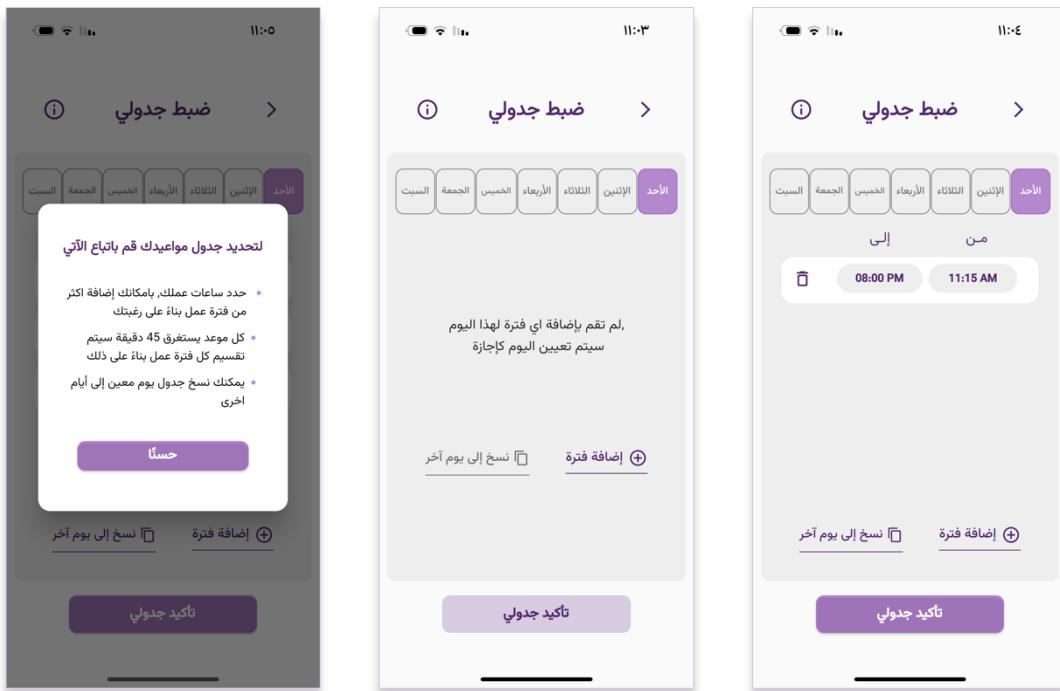


Figure 74 Specialist set schedule process part I

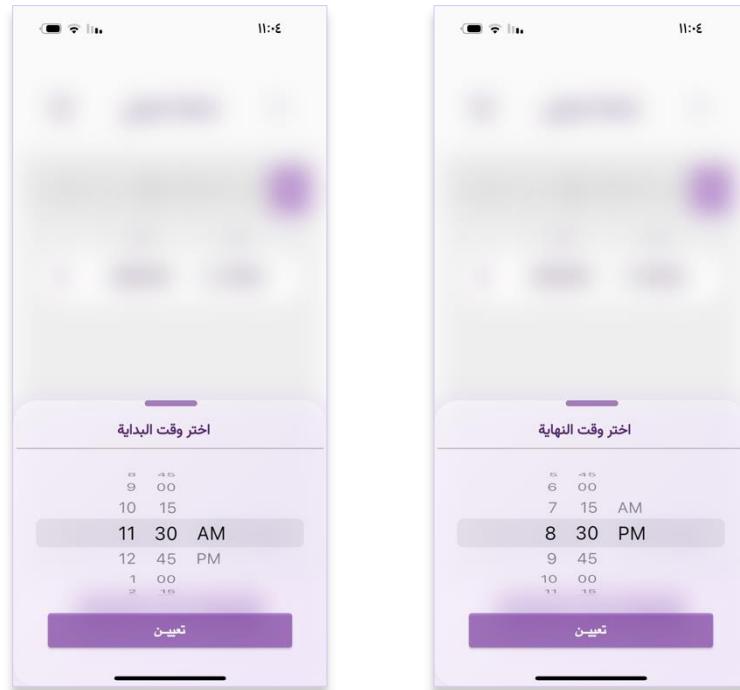


Figure 75 set schedule process part II

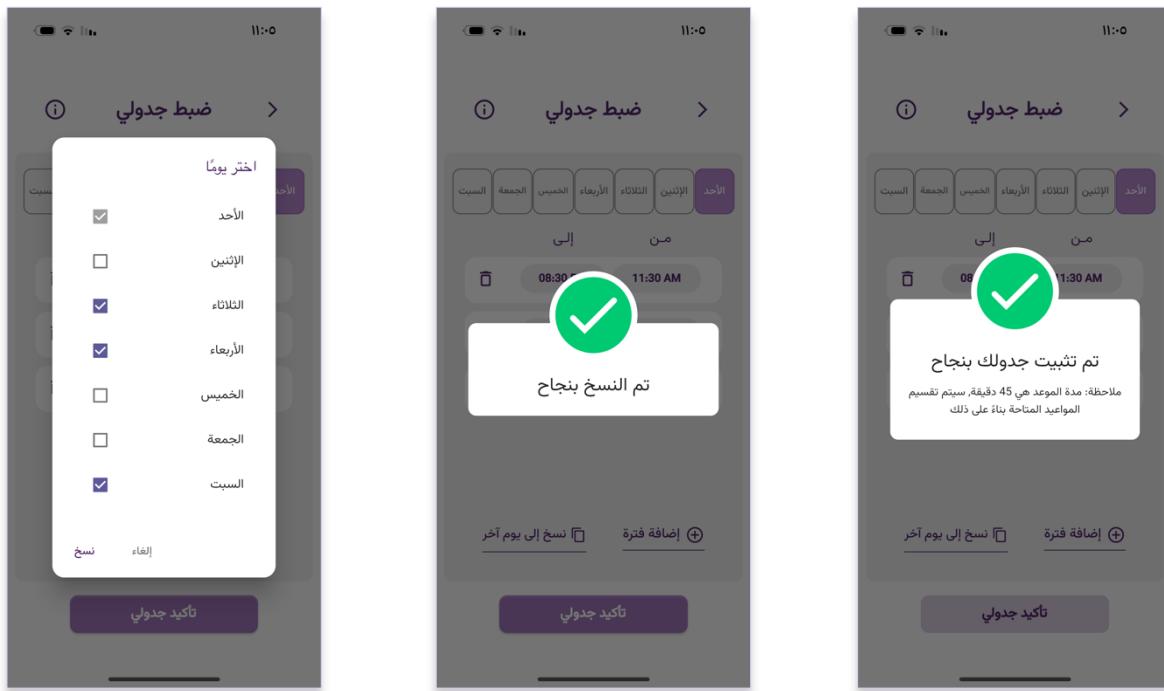


Figure 76 Specialist set schedule process part III

[Upcoming Appointment List]

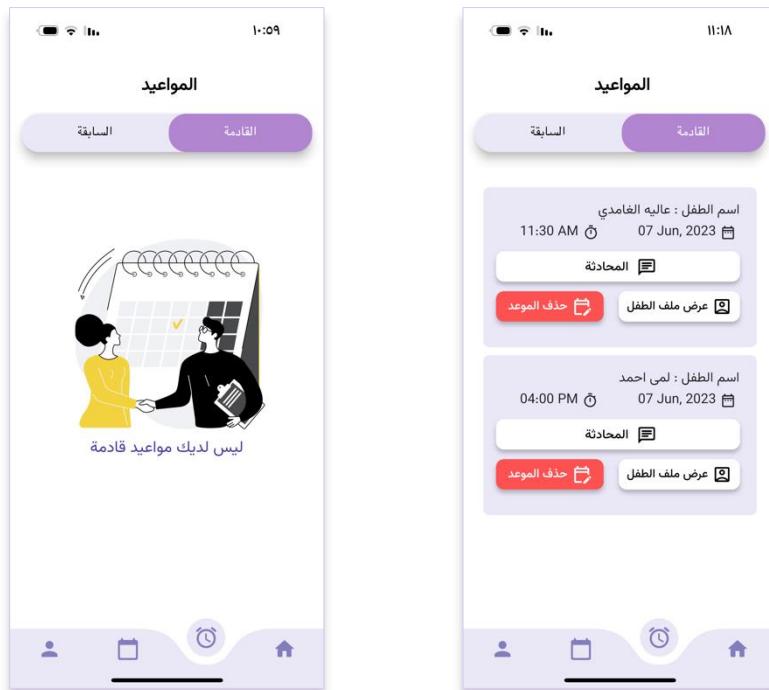


Figure 77 Upcoming appointment

[Delete Upcoming Appointment]

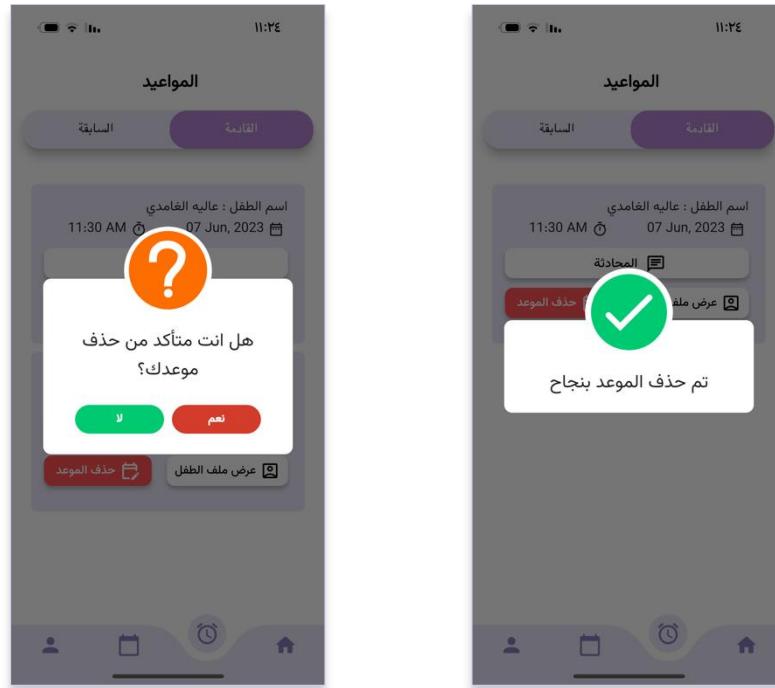


Figure 78 Delete upcoming appointment process

[View Child Profile]



Figure 79 Child profile

[Chatting]

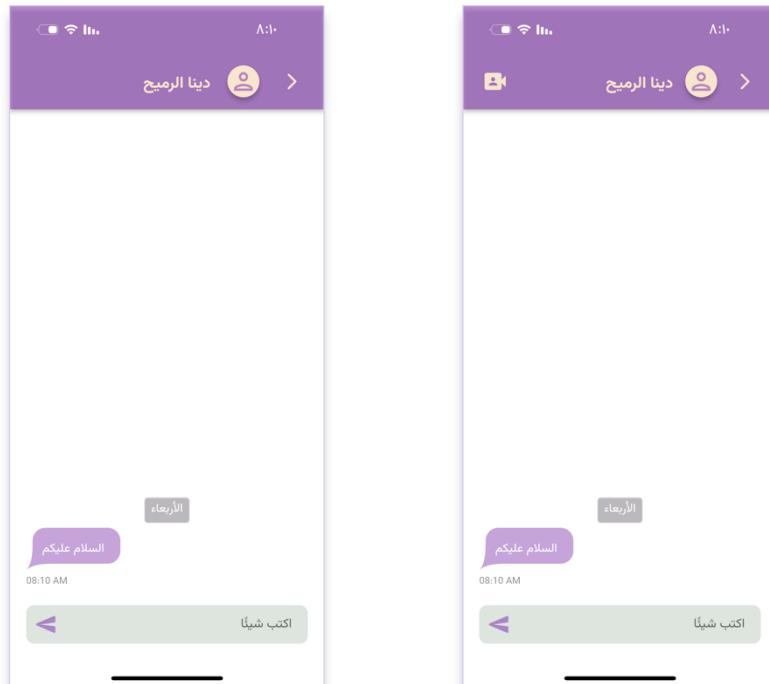


Figure 80 Chatting page before and after the video call icon appears

[Video Call]



Figure 81 Video call page

[Previous Appointment]

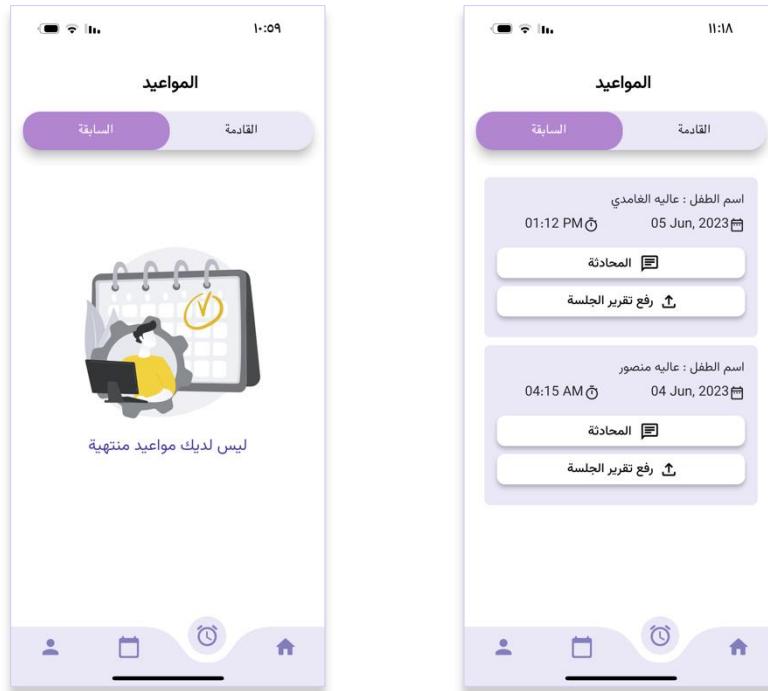


Figure 82 Previous appointment

[Upload Session Report]



Figure 83 Upload session report process

[View Session Report]

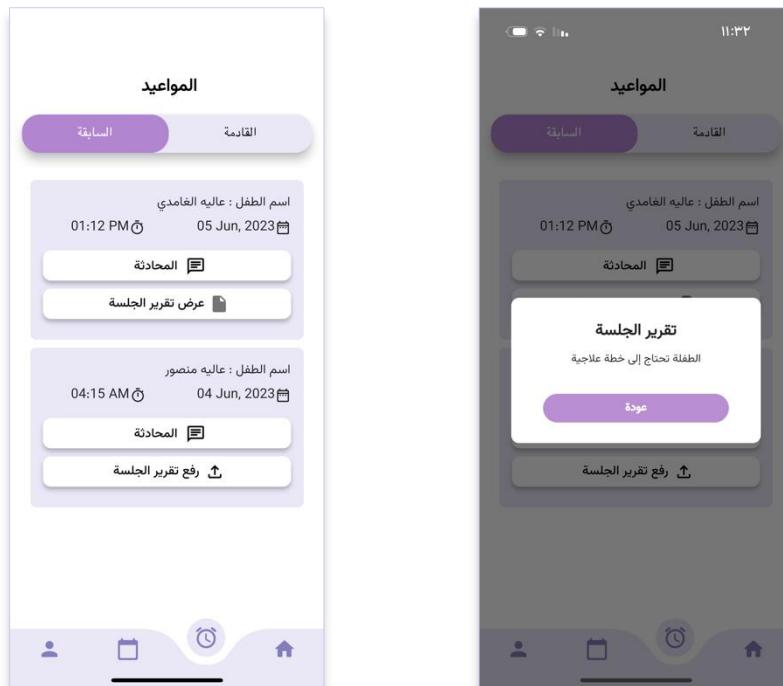


Figure 84 View session report process

[Delete Account]

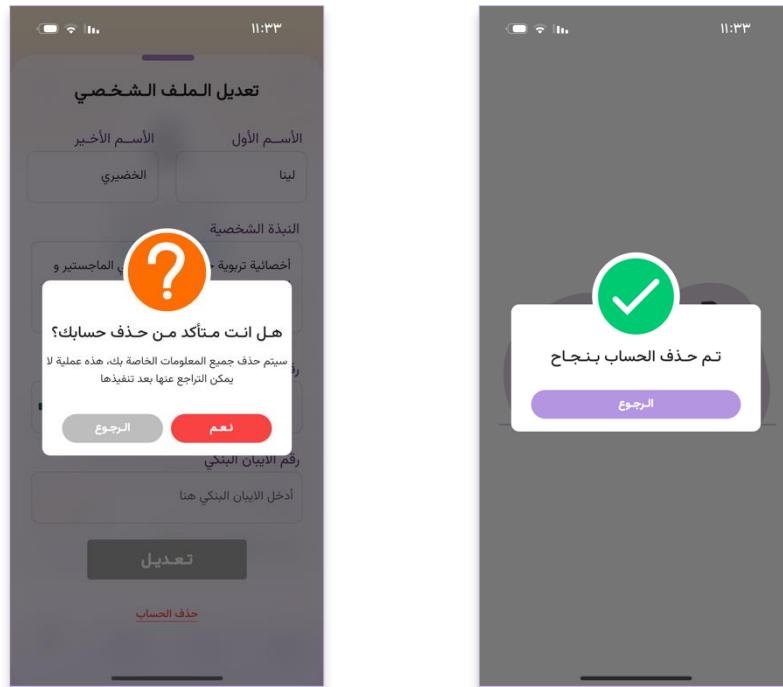


Figure 85Delete account process

- Ayadi Admin Website

[Welcome Page]

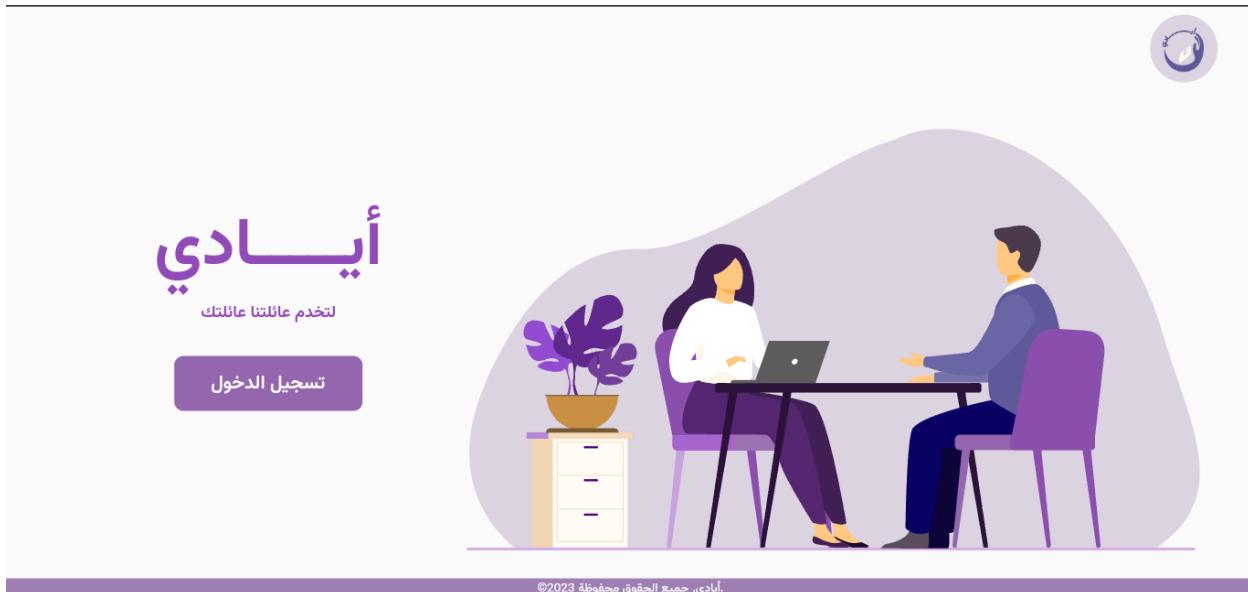


Figure 86: Website Welcome Page

[Login Page]

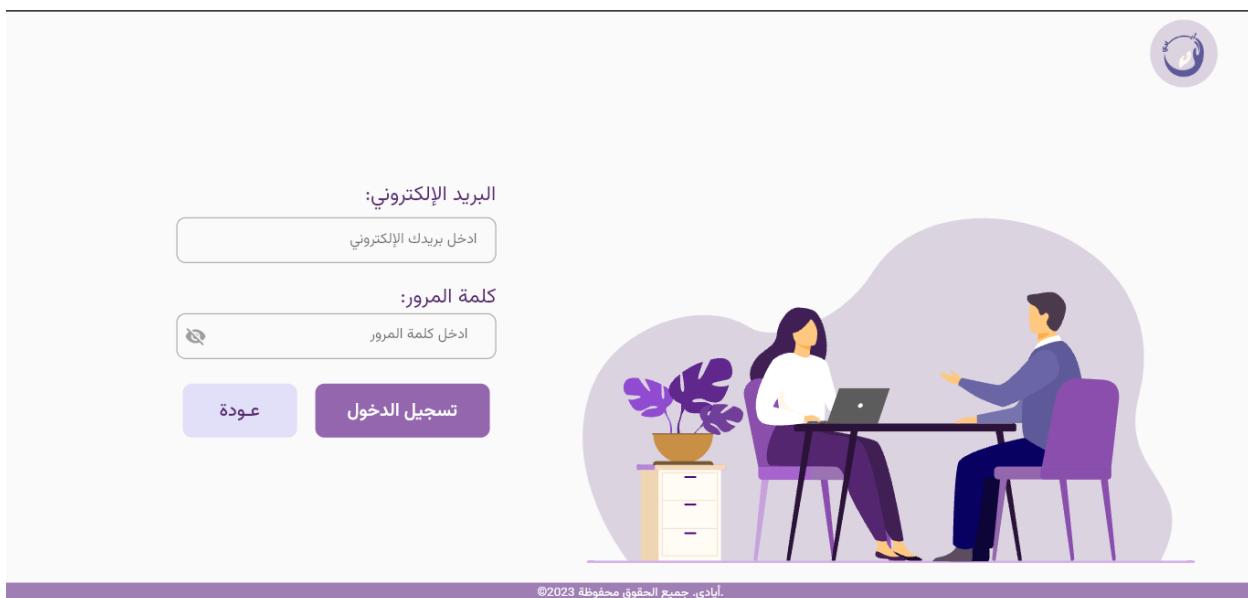


Figure 87: Log in page

[Home Page]



Figure 88: Home page

[Specialist Requests Page]



Figure 89: Requests Page

[View Specialist CV]

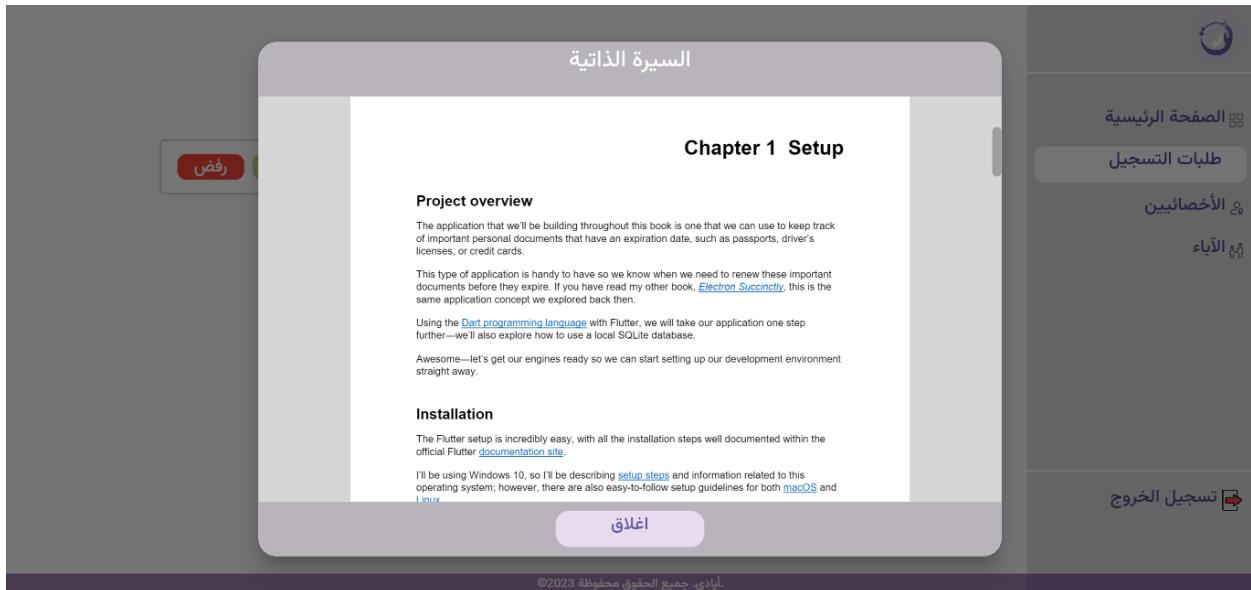


Figure 90: view specialist CV

[Accept Specialist Request]

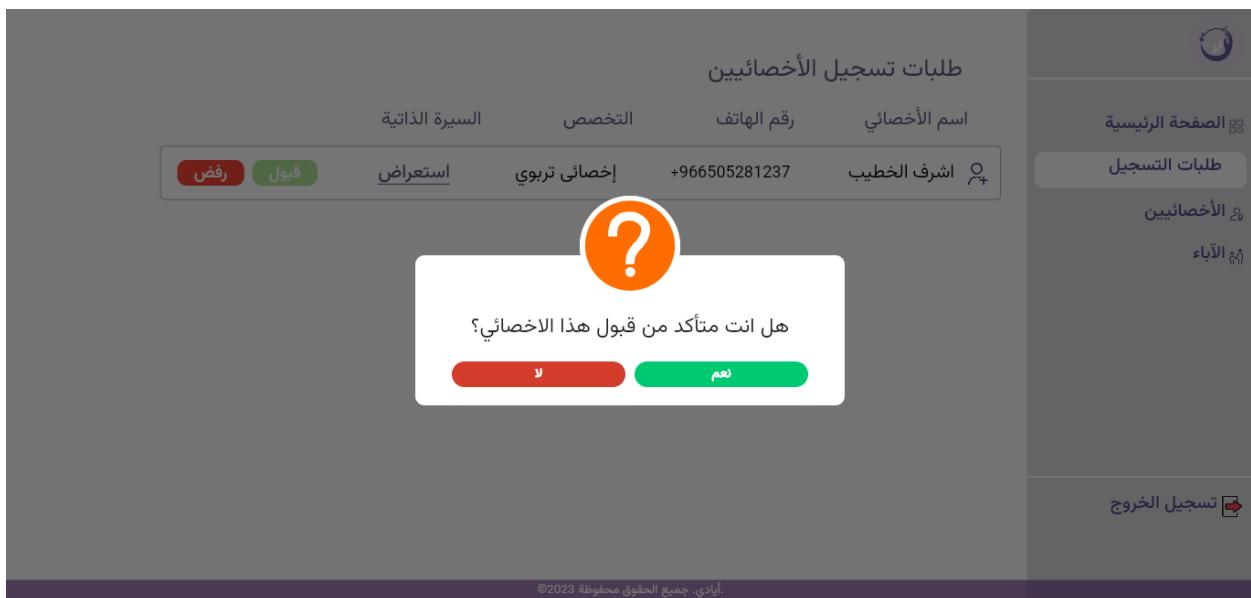


Figure 91: accept specialist request

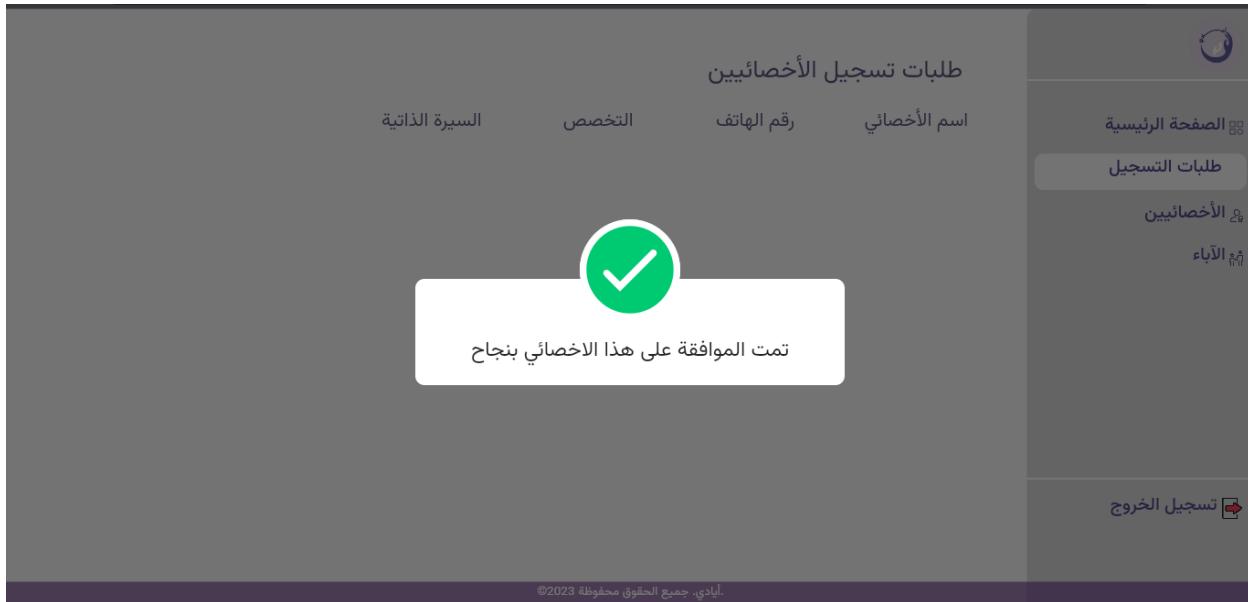


Figure 92: specialist request accepted

[View Specialists List]

الإسم	التقييم	بيانات الاتصال
سارة محمد	★★★★★ 0.0	إخصائى سلوكي رقم التواصل: 9661234567890+ رقم البيانات: SA0720000002094376989940
لينا الخضريري	★★★★★ 0.0	إخصائى تربوى رقم التواصل: 966504752995+ رقم البيانات: SA12345678989876
دينا المربي	★★★★★ 4.0	إخصائى نطق و لغاط رقم التواصل: 966563925640+ رقم البيانات: SA0720000002094376989940
شرف الخطيب	★★★★★ 0.0	بيانات الاتصال

Figure 93: specialist list

[View specialist's reviews]

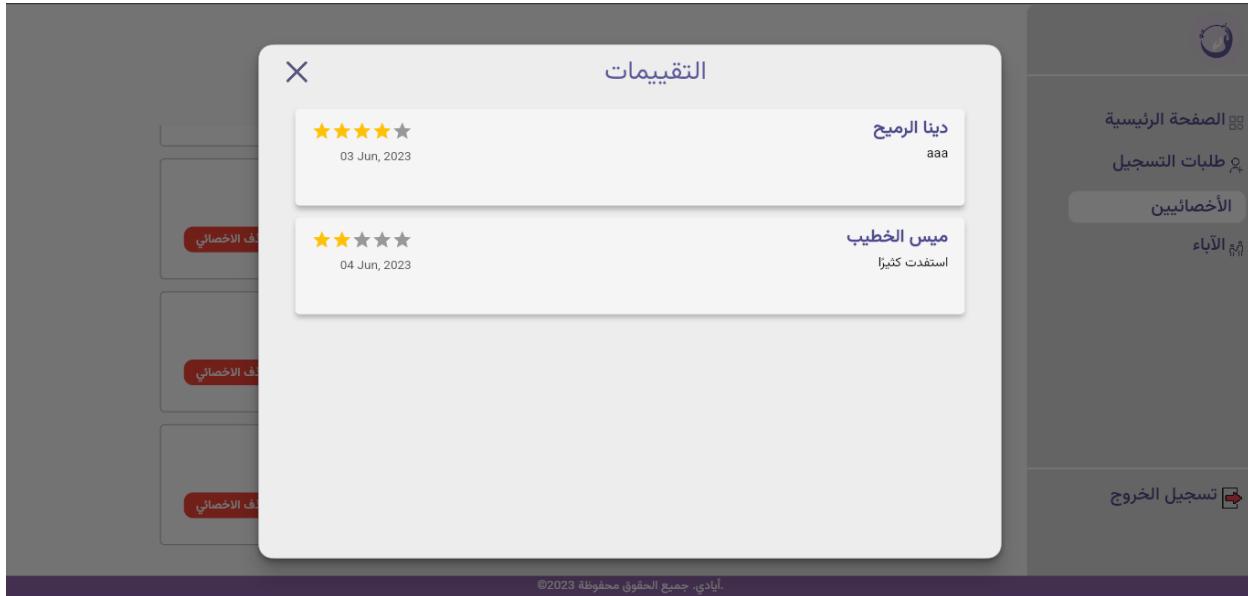


Figure 94: specialist reviews

[View parents list]

الأباء			
الأطفال	رقم الهاتف	الاسم	
حذف	استعراض	+966987654321	أمل احمد
حذف	استعراض	+966563925640	دينا الرميح
حذف	استعراض	+966545545460	hanan muhammad
حذف	استعراض	+966554424158	نائل النايل
حذف	استعراض	+966557607587	غادة محسن
حذف	استعراض	+966123456789	أمل احمد
حذف	استعراض	+966122150000	test account

Figure 95 parents list

[View parent's children]



Figure 96 view parent's children

[Delete specialist account]

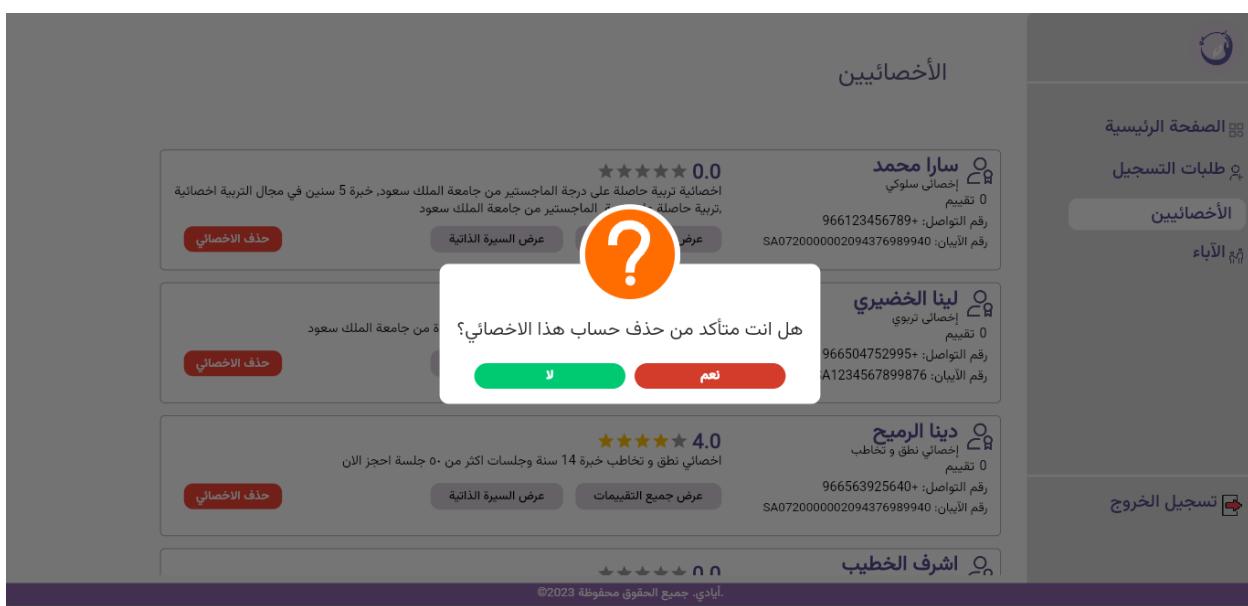


Figure 97 delete specialist account

[Log out from Ayadi website]



Figure 98 logout from Ayadi

14. Testing

Software testing is a crucial stage in SDLS to assess and validate whether a developed system aligns with its predefined requirements. Through this stage, various types of testing are conducted to ensure that the final product is error-free, meeting the expectations of users. By conducting comprehensive testing, we strive to deliver a high-quality, satisfying product that fulfills its intended purpose. Those types include:

- Unit Testing
- Functional Testing
- Non-functional Testing
- Usability Testing

14.1 Test Scenarios

Creating test scenarios that effectively demonstrate and evaluate Ayadi's key features is essential to develop a high-quality system. Our testing scenarios will be centered around the following functions:

List of Functions	
Function #	Function Name
1	Sign Up
2	Login
3	Specialist set schedule
4	Parent book an appointment
5	Parent and Specialist view upcoming appointment
6	Parent and Specialist view profile
7	Specialist upload report
8	Logout

Table 18 test case scenarios

14.2 Unit Testing

Unit testing is a process that assesses the accuracy of a piece of code (i.e., a function, method, or class). In our case, we utilized the test package offered by Flutter ([test package](#)) to carry out unit testing. We tested multiple independent units in isolation, and the tables below illustrates the units/methods that we assessed. Further information about each unit test is presented in subsequent tables.

14.2.1 Unit to be tested: CalculateAge (String Age)

Method Name	Method Description	Test Data	Expected Value	Actual Value	Verdict
CalculateAge(String Age)	This method return the age of the child	2020-01-27	3	3	Pass



The screenshot shows the VS Code interface with the following details:

- File path: ayadi>test>unit_test.dart>main>test("Testing the age of the child method")
- Test status: 1/1 tests passed (100%)
- Test description: Testing the age of the child method
- Test duration: 35ms
- Code snippet:

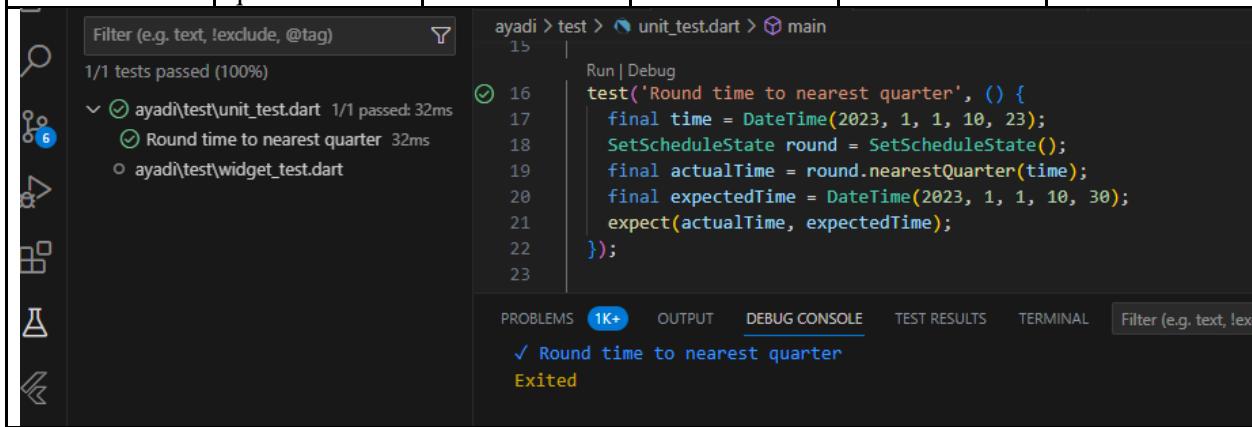
```
ayadi>test>unit_test.dart 1/1 passed: 35ms
  ✓ Testing the age of the child method 35ms
>  o ayadi\test\widget_test.dart

  31 |   test('Testing the age of the child method', (){
  32 |     String dateOfBirth = '2020-01-27';
  33 |     viewChildProfileState viewChild = viewChildProfileState("H00z9Ilp0RAJwhZHiiYt");
  34 |     int age = viewChild.calculateAge(dateOfBirth);
  35 |     expect(age, 3);
  36 |   );
  37 | 
```
- Bottom status bar: PROBLEMS (21), OUTPUT, DEBUG CONSOLE, TEST RESULTS, TERMINAL
- Console output: ✓ Testing the age of the child method
- Message: Exited

Table 19 UNIT TESTING FOR CalculateAge METHOD

14.2.2 Unit to be tested: nearestQuarter(DateTime Object)

Method Name	Method Description	Test Data	Expected Value	Actual Value	Verdict
nearestQuarter (DateTime Object)	This method round the time to the nearest quarter	2023,1,1,10,23	2023,1,1,10,30	2023,1,1,10,30	Pass



The screenshot shows a code editor interface with a sidebar on the left containing icons for search, file, and other tools. The main area displays a terminal window with the following output:

```

ayadi > test > unit_test.dart > main
15
16     Run | Debug
17     test('Round time to nearest quarter', () {
18         final time = DateTime(2023, 1, 1, 10, 23);
19         SetScheduleState round = SetScheduleState();
20         final actualTime = round.nearestQuarter(time);
21         final expectedTime = DateTime(2023, 1, 1, 10, 30);
22         expect(actualTime, expectedTime);
23     });

```

Below the terminal, there is a navigation bar with tabs: PROBLEMS (1K+), OUTPUT, DEBUG CONSOLE (selected), TEST RESULTS, TERMINAL, and a Filter input field.

Table 20 UNIT TESTING FOR nearestQuarter METHOD

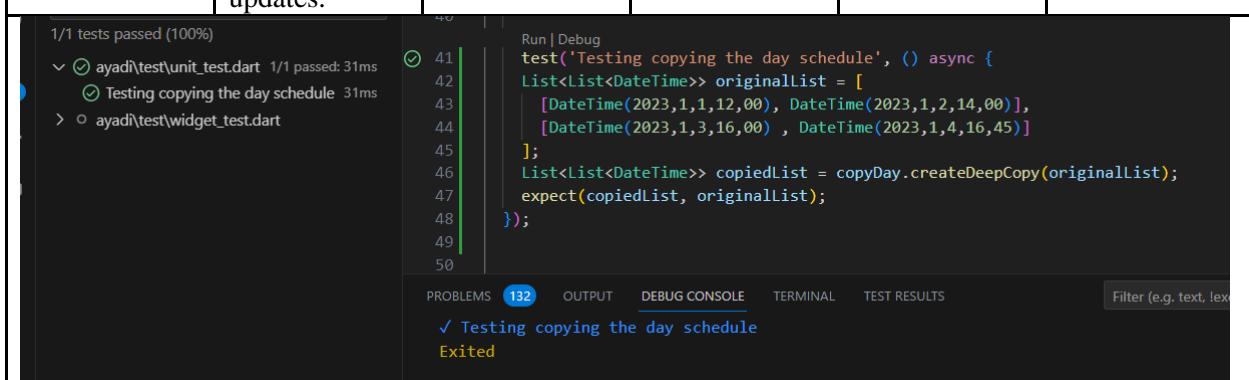
14.2.3 Unit to be tested: formattedDate (String Age)

Method Name	Method Description	Test Data	Expected Value	Actual Value	Verdict
FormattedDate (String Age)	This method returns today's date	Today's date	01 Jun 2023	01 Jun 2023	Pass
		<pre> 1/1 tests passed (100%) ✓ ayadi\test\unit_test.dart 1/1 passed: 52ms ✓ Testing the formattedDate method 52ms > o ayadi\test\widget_test.dart </pre>	<pre> 14 15 Run Debug 16 test('Testing the formattedDate method', () async { 17 Timestamp date = Timestamp.now(); 18 AppointmentListState appointmentListState = AppointmentListState(); 19 String strDate = await appointmentListState.formattedDate(date); 20 expect(strDate, "01 Jun, 2023"); 21 }); </pre>	<p>PROBLEMS 210 OUTPUT DEBUG CONSOLE TEST RESULTS TERMINAL Filter (e.g. text, exclude)</p> <p>✓ Testing the formattedDate method Exited</p>	

Table 21UNIT TESTING FOR formattedDate METHOD

14.2.4 Unit to be tested: CreateDeepCopy List<List<DateTime>>

Method Name	Method Description	Test Data	Expected Value	Actual Value	Verdict
CreateDeepCopy List<List<DateTime>>	This method is implemented to ensures that after the specialist copies his working hours from day to another successfully, both days are independent and not affected by each other in the future updates.	[[DateTime(2023,1,1,12,0), DateTime(2023,1,2,14,00), [DateTime(2023,1,3,16,0), DateTime(2023,1,4,16,45)]]	[[DateTime(2023,1,1,12,0), DateTime(2023,1,2,14,00), [DateTime(2023,1,3,16,0), DateTime(2023,1,4,16,45)]]	[[DateTime(2023,1,1,12,0), DateTime(2023,1,2,14,00), [DateTime(2023,1,3,16,0), DateTime(2023,1,4,16,45)]]	Pass



```

1/1 tests passed (100%)
✓ ayad\test\unit_test.dart 1/1 passed: 31ms
  ✓ Testing copying the day schedule 31ms
> o ayad\test\widget_test.dart

41 |   test('Testing copying the day schedule', () async {
42 |     List<List<DateTime>> originalList = [
43 |       [DateTime(2023,1,1,12,00), DateTime(2023,1,2,14,00)],
44 |       [DateTime(2023,1,3,16,00) , DateTime(2023,1,4,16,45)]
45 |     ];
46 |     List<List<DateTime>> copiedList = copyDay.createDeepCopy(originalList);
47 |     expect(copiedList, originalList);
48 |   });
49 |
50 |

Run | Debug
PROBLEMS 132 OUTPUT DEBUG CONSOLE TERMINAL TEST RESULTS Filter (e.g. text, lex)
✓ Testing copying the day schedule
Exited

```

Table 22 UNIT TESTING FOR CreateDeepCopy METHOD

14.3 Functional Testing (Black Box Testing)

14.3.1 Scenario Testing

Our software testing activity employs scenario testing by using hypothetical stories to identify positive and negative aspects of the project. To test the primary feature of Ayadi, we offer several test cases

TC#	Function Name	Description	input
1	Sign Up	This use case tests how the system behaves when specialist sign up with valid data	First name: خولة Last name: النابل Email: Kalna@gmail.com Specialization: أخصائي تربوي Session price: 150 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> • Open Ayadi Application • Click on “ابدا الان” button • Enter phone number • Enter First name • Enter Last name • Enter Email • Choose specialization • Enter session price • Upload CV • Click on “ارسال الطلب” 	
	Expected output		”طلبك مازال قيد المراجعة“ An message appears
	Actual output		
	Pass/Fail		Pass

Table 23 SIGN UP WITH VALID DATA

TC#	Function Name	Description	input
2	Sign Up	This use case tests how the system behaves when user sign up with invalid First Name	First name: @خ Last name: النابل Email: Kalna@gmail.com Specialization: أخصائي تربوي Session price: 150 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> Open Ayadi Application Click on “ابدأ الآن” button Enter phone number Enter First name Enter Last name Enter Email 	
	Expected output	The system will not allow the user to write any special character	
Actual output		 <p>A screenshot of the Ayadi application's sign-up screen. The screen has a light gray background with a navigation bar at the top. Below the bar, there are four input fields with labels in Arabic: "الاسم الأول" (First name) with placeholder "خ", "الاسم الأخير" (Last name) with placeholder "النابل", "رقم الهاتف" (Phone number) with placeholder "+966 555848879", and "البريد الإلكتروني" (Email) with placeholder "Kalna@gmail.com". At the bottom of the screen, there is a footer with a back arrow, a circular progress indicator, and a forward arrow.</p>	
Pass/Fail		Pass	

Table 24 SIGN UP WITH INVALID FIRSTNAME

TC#	Function Name	Description	input
3	Sign Up	This use case tests how the system behaves when user sign up invalid Last Name	First name: خولة Last name: -ال Email: Kalna@gmail.com Specialization: أخصائي تربوي Session price: 150 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> • Open Ayadi Application • Click on “ابدا الآن” button • Enter phone number • Enter First name • Enter Last name • Enter Email 	
	Expected output	The system will not allow the user to write any special character	
	Actual output		 <p>A screenshot of the Ayadi application's sign-up interface. The screen shows fields for 'الاسم الأول' (First name) containing 'خولة', 'الاسم الأخير' (Last name) containing '-ال', 'رقم التسجيل' (Registration number) containing '+966 555848879', and 'البريد الإلكتروني' (Email) containing 'Kalna@gmail.com'. The 'الاسم الأخير' field is highlighted in red, indicating an error. Navigation arrows are visible at the bottom.</p>
	Pass/Fail		Pass

Table 25 SIGN UP WITH INVALID LASTSTNAME

TC#	Function Name	Description	input
4	Sign Up	This use case tests how the system behaves when user sign up with invalid Email	First name: خولة Last name: النابل Email: Kalna.com Specialization: أخصائي تربوي Session price: 150 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> Open Ayadi Application Click on "ابداً الآن" button Enter phone number Enter First name Enter Last name Enter Email 	
	Expected output	An Error message appears "الرجاء ادخال بريد الكتروني صحيح" with highlights the field with red color warning.	
	Actual output		
	Pass/Fail		Pass

Table 26 SIGN UP WITH INVALID EMAIL

TC#	Function Name	Description	input
5	Sign Up	This use case tests how the system behaves when user sign up with invalid session price	First name: خولة Last name: النايل Email: Kalna@gmail.com Specialization: أخصائي سلوكى Session price: 0 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> • Open Ayadi Application • Click on “ابداً الآن” button • Enter phone number • Enter First name • Enter Last name • Enter Email • Choose specialization • Enter session price 	
	Expected output	An Error message appears “الرجاء إدخال قيمة صحيحة” with highlights the field with red color warning.	
	Actual output	 A screenshot of the Ayadi application's sign-up form. The form fields include 'النомер' (Phone Number), 'النامن الأول' (First Name), 'النامن الثاني' (Last Name), 'البريد الإلكتروني' (Email), 'الخطة' (Session Price) which is set to 0 and highlighted in red, and 'ال專業' (Specialization) which is set to 'أخصائي سلوكى'. At the bottom is a 'رسالة طلب' (Request Message) button.	
	Pass/Fail	Pass	

Table 27 SIGN UP WITH INVALID SESSION PRICE

TC#	Function Name	Description	input
6	Sign Up	This use case tests how the system behaves when user sign up with invalid Specialization	First name: خولة Last name: النايل Email: Kalna@gmail.com Specialization: None Session price: 150 CV: resume.pdf
	Steps	<ul style="list-style-type: none"> • Open Ayadi Application • Click on “ابدا الآن” button • Enter phone number • Enter First name • Enter Last name • Enter Email • Choose specialization • Enter session price • Upload CV • Click on “إرسال الطلب” 	
	Expected output	“إرسال الطلب” button will be not clickable	
	Actual output	 A screenshot of the Ayadi application's sign-up form. The form fields include 'النبايل' (Last name) set to 'النايل', 'قيمة الجلسة' (Session price) set to '150', 'الملف الذاتي' (Resume) uploaded as 'Resume.docx', and a large 'إرسال الطلب' (Send Request) button at the bottom.	
	Pass/Fail		Pass

Table 28 SIGN UP WITH INVALID SPECIALIZATION

TC#	Function Name	Description	input
7	Sign Up	This use case tests how the system behaves when user sign up with invalid CV	First name: خولة Last name: النايل Email: Kalna@gmail.com Specialization: أخصائي سلوكي Session price: 150 CV: None
	Steps	<ul style="list-style-type: none"> • Open Ayadi Application • Click on “ابداً الآن” button • Enter phone number • Enter First name • Enter Last name • Enter Email • Choose specialization • Enter session price • Upload CV • Click on “إرسال الطلب” 	
	Expected output	“إرسال الطلب” button will be not clickable	
	Actual output	 A screenshot of the Ayadi application's sign-up screen. The screen shows fields for first name, last name, email, specialization, session price, and CV upload. A red error message box at the bottom left states: "الرجاء إدخال سلوكى" (Please enter a specialization). The "إرسال الطلب" (Send Request) button is visible at the bottom.	
	Pass/Fail	Pass	

Table 29 SIGN UP WITH INVALID CV

TC#	Function Name	Description	input
	Login	This use case tests how the system behaves when user login with valid mobile number	Phone number: 555706340
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Click on “ابدأ الآن” button • Enter phone number • Click “استمرار” 	
	Expected output	The system redirects the user to one time password page	
8	Actual output		
	Pass/Fail		Pass

Table 30 LOGIN WITH VALID MOBILE NUMBER TEST CASE

TC#	Function Name	Description	input
	Login	This use case tests how the system behaves when user login with valid mobile number	Phone number: 555706340
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Click on “ابداً الان” button • Enter phone number • Click “استمرار” • Enter the OTP that has been send 	
	Expected output	A message appears	”طلبك مازال قيد المراجعة“
9	Actual output		
	Pass/Fail		Pass

Table 31 LOGIN WITH VALID MOBILE SPECIALIST IS STILL NOT ACCEPTED TEST CASE

TC#	Function Name	Description	input
10	Login	This use case tests how the system behaves when user login with unregistered phone number	Phone number: 555848854 OTP: SMS message content
	Steps	<ul style="list-style-type: none"> Open Ayadi application Click on “ابداً الآن” button Enter phone number Click “استمرار” Enter the OTP that has been send 	
	Expected output	The system redirects the user to sign up page	
	Actual output		
	Pass/Fail	Pass	

Table 32 LOGIN WITH UNREGISTERED MOBILE NUMBER TEST CASE

TC#	Function Name	Description	input
11	Login	This use case tests how the system behaves when the user login with valid mobile number and valid OTP	Phone number: 555848854 OTP: SMS message content
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Click on “ابدا الان” button • Enter phone number • Click “استمرار” • Enter the OTP that has been send 	
	Expected output	The system redirects the user to home page	
	Actual output		 <p>The screenshot shows the Ayadi app's main dashboard. At the top, it displays "مرحبا سارة" and "إليك آخر إحصائياتك". Below this are two large boxes: one purple box with "98.0" and "نسبة إنجاز الأدوار" (Achievement rate), and one pink box with "0.0" and "نسبة الالتحاقات" (Attendance rate). In the center, there is a yellow box with the number "6" and "عدد المدربين" (Number of trainers). At the bottom, it says "موجدى الفادرم" and shows "اسم المعلم: ماجدة الفادرم" and "الوقت المعلم المدرب: 0:2:12:12". The bottom navigation bar includes icons for profile, calendar, clock, and home.</p>
	Pass/Fail	Pass	

Table 33 LOGIN WITH VALID MOBILE NUMBER AND VALID OTP

TC#	Function Name	Description	input
12	Login	This use case tests how the system behaves when the user login with valid mobile number and invalid OTP	Phone number: 555848854 OTP: 222222
	Steps	<ul style="list-style-type: none"> Open Ayadi application Click on “ابدا الان” button Enter phone number Click “استمرار” Enter random OTP 	
	Expected output	An Error message appears “رمز تحقق خاطئ” with highlights the field with red color warning.	
	Actual output		
	Pass/Fail	Pass	

Table 34 LOGIN WITH VALID MOBILE NUMBER AND INVALID OTP TEST CASE

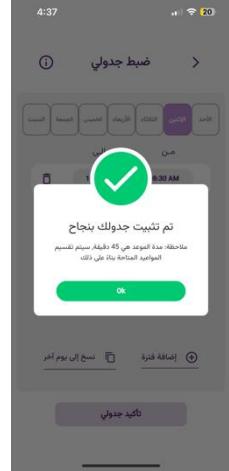
TC#	Function Name	Description	input
	Specialist set schedule	This use case tests how the system behaves when the specialist set schedule with valid data	Start time: 8:30 AM End time: 10:30 PM
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Click on et appointment icon • Click on “ضبط جدول” button • Choose a day • Click on “إضافة فترة” button • Add start time • Click on “تعيين” button • Add end time • Click on “تعيين” button • Click on “تأكيد جدول” button 	
13	Expected output		An message appears “تم تثبيت جدولك”
	Actual output		
	Pass/Fail		Pass

Table 35 SPECIALIST SET SCHEDULE WITH VALID DATA

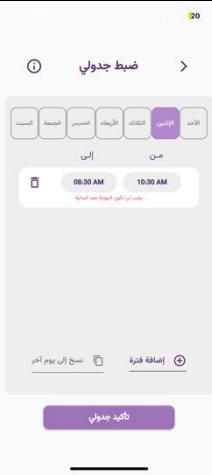
TC#	Function Name	Description	input
14	Specialist set schedule	This use case tests how the system behaves when the specialist set schedule with invalid end time	Start time: 10:30 AM End time: 8:30 AM
	Steps	<ul style="list-style-type: none"> Open Ayadi application Log in Click on et appointment icon Click on “ضبط جدول” button Choose a day Click on “إضافة فترة” button Add start time Click on “تعيين” button Add end time Click on “تعيين” button Click on “تأكيد جدول” button 	
	Expected output	“يجب أن تكون النهاية بعد البداية”	An Error message appears
	Actual output		
	Pass/Fail		Pass

Table 36 SPECIALIST SET SCEDULE WITH INVALID END TIME

TC#	Function Name	Description	input
15	Book an Appointment	This use case tests how the system behaves when the parent book an appointment with valid data	Child Name: سارة النايل Day: 14 June Time: 1:00 PM Email: Sb-hxvpk26116192@personal.example.com
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on specialist • Press on “جزء جديد” button • Select child • Select day • Select Time • Press “تأكيد” button • Press “إكمال الدفع” button • Enter Email • Select “التالي” button • Select Payment Way • Press “متابعة لمراجعة الطلب” button 	
	Expected output	A message appears “تم حجز الجلسة بنجاح”	
	Actual output		
	Pass/Fail		Pass

Table 37 BOOK AN APPOINTMENT WITH VALID DATA

TC#	Function Name	Description	input
16	Book an Appointment	This use case tests how the system behaves when the parent book an appointment with invalid child name	Child Name: None Day: 14 June Time: 1:00 PM Email: Sb-hxvpk26116192@personal.example.com
	Steps	<ul style="list-style-type: none"> Open Ayadi application Log in Press on specialist Press on “جزء موعد جديد” button No child selected Select day Select Time 	
	Expected output	“تأكيد” button will be not clickable	
	Actual output		
	Pass/Fail		Pass

Table 38 BOOK AN APPOINTMENT WITH INVALID CHILD NAME

TC#	Function Name	Description	input
17	Book an Appointment	This use case tests how the system behaves when the parent book an appointment with invalid time	Child Name: سارة النابل Day: 14 June Time: None Email: Sb-hxvpk26116192@personal.example.com
	Steps	<ul style="list-style-type: none"> Open Ayadi application Log in Press on specialist Press on “جز موعد جديد” button Select child Select Day No time selected 	
	Expected output	“تأكيد” button will be not clickable	
	Actual output		
	Pass/Fail		Pass

Table 39 BOOK AN APPOINTMENT WITH INVALID TIME

TC#	Function Name	Description	input
18	Book an Appointment	This use case tests how the system behaves when the parent book an appointment with invalid email	سارة النايل Child Name: سارة النايل Day:15 June Time: 5:00 PM Email: kalna.com
	Steps	<ul style="list-style-type: none"> Open Ayadi application Log in Press on specialist Press on “جز موعد جديد” button Select child Select day Select Time Press “تأكيد” button Press “إكمال الدفع” button Enter Email 	
	Expected output	صيغة البريد الإلكتروني أو رقم الهاتف “المحمول غير صحيحة”	
	Actual output	 	
	Pass/Fail	Pass	

Table 40 BOOK AN APPOINTMENT WITH INVALID EMAIL

TC#	Function Name	Description	input
19	View upcoming appointments	This use case tests how the system behaves when the specialist/parent views upcoming appointments	None
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on appointment icon • Press “المواييد القادمة” button 	
	Expected output	The system displays all upcoming appointment	
	Actual output		
	Pass/Fail	Pass	

Table 41 VIEWS UPCOMING APPOINTMENT

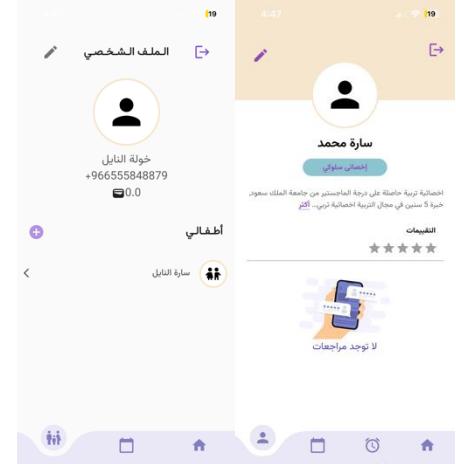
TC#	Function Name	Description	input	
20	View profile	This use case tests how the system behaves when the specialist/parent view profile	None	
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on profile icon 		
	Expected output	The system displays profile page		
	Actual output			
	Pass/Fail	Pass		

Table 42 VIEWS PROFILE

TC#	Function Name	Description	input
21	Upload session report	This use case tests how the system behaves when the specialist upload session report	None
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on appointment icon • Press on “المواعيد السابقة” button • Press on “رفع تقرير الجلسة” button 	
	Expected output	The system shows pop up window for writing report	
	Actual output		
	Pass/Fail	Pass	

Table 43 UPLOAD SESSION REPORT WITH UNUPLOADED REPORT APPOINTMENTS

TC#	Function Name	Description	input
22	Upload session report	This use case tests how the system behaves when the specialist upload session report	Specialist report: ---
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on appointment icon • Press on “المواعيد المنتهية” button • Press on “رفع تقرير الجلسة” button • Press on “ارسال” button 	
	Expected output	The system will not allow the user to write any special character	
	Actual output		
	Pass/Fail	Pass	

Table 44 UPLOAD APPOINTMENT REPORT WITH INVALID DATA

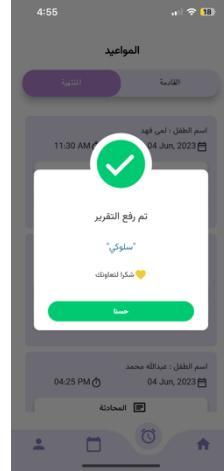
TC#	Function Name	Description	input
23	Upload session report	This use case tests how the system behaves when the specialist upload session report	Specialist report: سلوكي
	Steps	<ul style="list-style-type: none"> Open Ayadi application Log in Press on appointment icon Press on “المواعد المنتهية” button Press on “رفع تقرير الجلسة” button Press on “ارسال” button 	
	Expected output	The system shows pop up window	تم رفع التقرير
	Actual output		
	Pass/Fail	Pass	

Table 45 UPLOAD APPOINTMENT REPORT WITH VALID DATA

TC#	Function Name	Description	input
24	Log out	This use case tests how the system behaves when the user logs out	None
	Steps	<ul style="list-style-type: none"> • Open Ayadi application • Log in • Press on view profile • Press on log out icon • The system will show the confirmation dialog • Press on “نعم” 	
	Expected output	The system redirects the user welcome page	
	Actual output		
	Pass/Fail		Pass

Table 46 LOGOUT TEST CASE

14.3.2 Equivalence partitioning

Equivalence partitioning is the process of methodically reducing the huge set of possible test cases into much smaller, but still equally effective.

14.3.2.1 Equivalence class testing (Sign Up, Session Report)

Input Condition	Valid ECs	Invalid ECs
First Name	<ul style="list-style-type: none"> • Not Empty (1) • Arabic Characters (2) • English Characters [A-Z] (3) • English Characters [a-z] (4) • Length [2-20] (5) 	<ul style="list-style-type: none"> • Empty (6) • Contain special (7) • Length > 20 (8) • Length < 2 (9) • Contain Numbers (10)
Last Name	<ul style="list-style-type: none"> • Not Empty (11) • Arabic Characters (12) • English Characters [A-Z] (13) • English Characters [a-z] (14) • Length [2-20] (15) 	<ul style="list-style-type: none"> • Empty (16) • Contain special (17) • Length > 20 (18) • Length < 2 (19) • Contain Numbers (20)
Email	<ul style="list-style-type: none"> • Not Empty (21) • English Characters [A-Z] (22) • English Characters [a-z] (23) <ul style="list-style-type: none"> • Digit [0-9] (24) • Contain special (25) • Email with format: <u>name@domain.com</u> (26) 	<ul style="list-style-type: none"> • Empty (27) • Arabic Characters (28) • Not Contain (.) (29) • Not Contain (@) (30) • Not follow email format: <u>name@domain.com</u> (31)
Session Price	<ul style="list-style-type: none"> • Not Empty (32) • Only Digit [10-999] (33) • Length [2-3] (34) 	<ul style="list-style-type: none"> • Empty (35) • Contains Characters (36) <ul style="list-style-type: none"> • Length > 3 (37) • Length < 2 (38) • Contain special (39)
Report	<ul style="list-style-type: none"> • Not Empty (40) • Length [2-2000] (41) • English Characters [A-Z] (42) • English Characters [a-z] (43) • Arabic Characters (44) • Digit [0-9] (45) 	<ul style="list-style-type: none"> • Empty (46) • Contain special (47) • Length > 2000 (48) • Length < 2 (49)

Table 47 (Sign Up, Session Report) Equivalent test classes

14.3.2.2 Equivalence class test data.

No. Of Test Data	Test Case Data	Covers Equivalence Class Valid /Invalid
Sign Up		
1	First Name: Khawlah Last Name: Alnayel Email: Ko0_ko014@hotmail.com Session Price :250	1,3,4,5,11,13,14,15,21,22,23,24,25,26,32,33,34
2	First Name: خولة Last Name: النايل Email: None Session Price: None	2,12,27,35
3	First Name: None Last Name: None Email: _خ Session Price :4\j	6,16,27,28,29,30,31,36,39
4	First Name: 5aaaawww_wllllaaaahhhh Last Name: Alll2nnn_aaayyyeeellll Email: Ko0_ko014@hotmail.com Session Price :4000	7,8,10,17,18,20,37
5	First Name: K Last Name: A Email: Ko0_ko014@hotmail.com Session Price :2	9,19,38
Report		
6	لدى الطفل بعض من ردود الفعل السلبية الناتجة عن بعض المشاكل التربوية وسيكون له موعد متابعة التطور في تاريخ 24 June	40,41,42,43,44,45
7	None	46
8	يعاني المريض من مشكل تربوية مختلفة وهو بحاجة الى علاج ومراقبة ومواعيد بشكل دائم/ كما انه من المهم ان تكون بشكل دوري ... (أكثر من ٢٠٠٠ حرف)	47,48
9	ن	49

Table 48 (Sign Up , Session report) valid test case

14.4 Branch coverage testing

Branch testing is a type of software testing that involves testing individual branches or decision points in the code. In software development, a branch refers to a conditional statement that determines which code path to execute based on a certain condition.

Register account on Ayadi use case scenario.	
Use case name	Register account on Ayadi.
Actor	specialist.
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - The user has a working mobile phone that can receive SMS texts.
Goal	The specialist wants to register a new account in Ayadi system.
Basic flow of events	<ol style="list-style-type: none"> 1 – specialist selects “ابدا الان” button. 2- specialist enter his/her phone number. 3- specialist enters the OTP that has been received. 4 – specialist enter his/her first name. 5 – specialist enter his/her last name. 6 – specialist enter his/her email. 7 – specialist select “الشخصن” from the menu. 8 – specialist enter “قيمة الجلسة”. 9 – specialist uploads his/her CV. 10 –specialist selects “ارسال الطلب” button.
Alternative flows	<ol style="list-style-type: none"> 2a. 9 <phone number < 9 <ol style="list-style-type: none"> 2a1. Ayadi highlights the field with red color warning. 2a2. Redirects to step 2. 3a. Invalid verification code was entered.

	<p>3a1. Ayadi displays error message.</p> <p>3a2. Redirects to step 3.</p> <p>4a. $20 < \text{Number of characters in the first name} < 2$</p> <p>4a1. Ayadi highlights the field with red color warning.</p> <p>4a2. Redirects to step 4.</p> <p>4b. first name have symbol and numbers.</p> <p>4b1. Ayadi highlights the field with red color warning.</p> <p>4b2. Redirects to step 4.</p> <p>5a. $20 < \text{Number of characters in the last name} < 2$</p> <p>5a1. Ayadi highlights the field with red color warning.</p> <p>5a2. Redirects to step 5.</p> <p>5b. Last name have symbol and numbers.</p> <p>5b1. Ayadi highlights the field with red color warning.</p> <p>5b2. Redirects to step 5.</p> <p>6b. invalid email format.</p> <p>6b1. Ayadi highlights the field with red color warning.</p> <p>6b2. Redirects to step 6.</p> <p>8b. $9 > \text{session price} < 1000$.</p> <p>8b1. Ayadi highlights the field with red color warning.</p> <p>8b2. Redirects to step 8.</p>
Post Condition	specialist is successfully registered in Ayadi.

Table 49 Register account on Ayadi use case scenario.

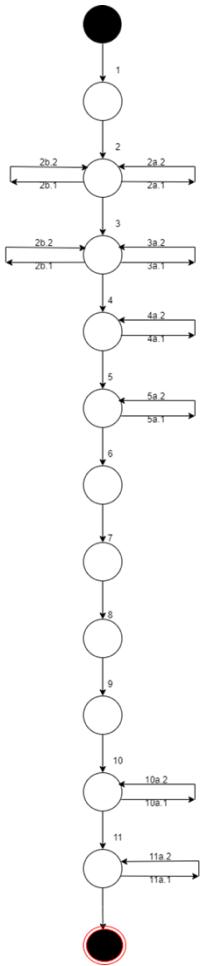


Figure 99 Register account scenario graph.

ID	Events	Description
#1	1-2-3-4-5-6-7-8-9-10-11-12	specialist selects “ابداً الان” button specialist enters a valid phone number specialist enters a valid OTP specialist enters a valid first name specialist enters a valid last name

		<p>specialist enters a valid email</p> <p>specialist select a specialization</p> <p>specialist enters a valid session price</p> <p>specialist uploads his/her CV.</p> <p>specialist selects “ارسال الطلب” button.</p> <p>Normal scenario (specialist registers account on Ayadi)</p>
#2	1-2-2a.1-2a.2-2-3-3a.1-3a.2-3-4-4a.1-4a.2-4-5-5a.1-5a.2-5-6-6a.1-6a2-6-8-8a.1-8a.2-8-9-10-11-12	<p>specialist selects “ابداً الان” button</p> <p>specialist enters an invalid phone number on the first try.</p> <p>specialist enters a valid phone number in the second try.</p> <p>specialist enters an Invalid verification code on the first try.</p> <p>specialist enters a valid verification code in the second try.</p> <p>specialist enters an invalid first name on the first try.</p> <p>specialist enters a valid first name in the second try.</p> <p>specialist enters an invalid last name on the first try.</p> <p>specialist enters a valid last name in the second try.</p>

	<p>specialist enters an invalid email format on the first try.</p> <p>specialist enters a valid email format in the second try.</p> <p>specialist enters an invalid session price on the first try.</p> <p>specialist enters a valid session price in the second try.</p> <p>specialist uploads his/her CV.</p> <p>specialist selects “ارسال الطلب” button</p> <p>specialist has registered successfully.</p>
--	---

Table 50 Register an account branch coverage scenario

Test normal scenario

Test case: TC#1

Goal: Test normal scenario of Register an account on Ayadi.

Setup:

- 1 – specialist selects “ابدا الان” button.
- 2 – specialist enter his/her phone number (0566707123).
- 3- specialist enters the OTP that has been received.
- 4 – specialist enter his/her first name (سارة).
- 5 – specialist enter his/her last name(محمد).
- 6 – specialist enter his/her [email\(sara@gmail.com\)](mailto:email(sara@gmail.com)).
- 7– specialist select “الشخص” from the menu(. اخصائي تربوي).

8 – specialist enter “قيمة الجلسة”.(50)

9 – specialist uploads his/her CV (MyCV.Pdf).

9 – specialist selects “ارسال الطلب”button.

#	External event	reaction	comment
1	specialist selects “ابدا الان”button.	System prompts the specialist to enter his/her mobile phone number.	--
2	specialist enter his/her phone number (0566707123).	System send the OTP SMS to the specialist	-
3	specialist enter the OTP number (123456).	System prompts the specialist to enter his/her first name.	-
4	specialist enter his/her first name(سارة).	System prompts the specialist to enter his/her last name.	-
5	specialist enter his/her last name(محمد).	System prompts the specialist to enter his/her email.	-
6	specialist enter his/her email(sara@gmail.com).	System prompts the specialist to select his/her specialization.	-
7	specialist select “ التخصص ” from the menu . (اخصائي تربوي).	System prompts the specialist to enter the session price.	-
8	specialist enter “50) قيمة الجلسة”.	System prompts the specialist to upload his/her CV.	-
9	specialist uploads his/her CV (MyCV.Pdf).	System enable the user to click on the “ارسال الطلب” button.	-
10	specialist selects “ارسال الطلب”button.	System validates the request and send it to the admin.	-

Table 51 Register an account test case

Pass criteria: User registers account on Ayadi.

Log in to Ayadi use case scenario.	
Use case name	Login to Ayadi.
Actor	specialist/parent
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - specialist/parent has a working mobile phone that can receive SMS texts. - specialist/parent already has been registered in the system.
Goal	specialist/parent wants to login in Ayadi system.
Basic flow of events	<ol style="list-style-type: none"> 1 – specialist/parent selects “ابدا الان” “button. 2 – specialist/parent enter his/her phone number. 3 – specialist/parent selects “استمرار” “button. 4- specialist/parent enters the OTP that has been received from SMS 5- System displays the home page.
Alternative flows	<p>2a. 9 <phone number < 9. 2a1. Ayadi highlights the field with red color warning. 2a2. Redirects to step 2.</p> <p>3a. phone number has not registered. 3a1. Ayadi displays sign up page. 3a2. Operation cancelled.</p> <p>4a. specialist/parent select ”اعادة ارسال رمز التحقق“ button. 4a1. System sends another OTP SMS to specialist/parent. 4a2. Redirects to step 4.</p> <p>4b. Invalid verification code was entered. 4b1. Ayadi highlights the field with red color warning. 4b2. Redirects to step 4.</p>
Post Condition	specialist/parent is successfully logged in in Ayadi.

Table 52 Log in to Ayadi use case scenario.

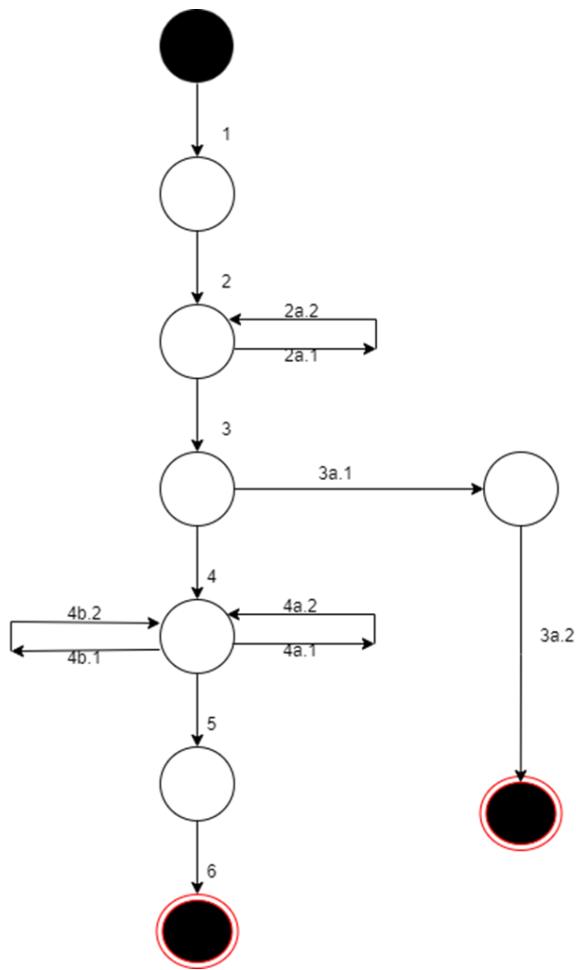


Figure 100 . Log in to account scenario graph.

ID	Events	Description
#1	1-2-3-4-5-6	<p>ابداً الان “button.”</p> <p>specialist/parent enter his/her phone number.</p>

		<p>استمرار“ specialist/parent selects “ button.</p> <p>specialist/parent selects has registered before with Ayadi</p> <p>specialist/parent selects enter a valid OTP.</p> <p>Normal scenario (specialist/parent log in on Ayadi)</p>
#2	<p>1 – 2 – 2a1 – 2a2 – 2 – 3 - 3a1 – 3a2 – 3 – 4 – 4a1 – 4a2 – 4 – 4b1 – 4b2 – 4 – 5 – 6</p>	<p>ابدا الان“ specialist/parent selects “button</p> <p>specialist/parent enters an invalid phone number in the first try.</p> <p>specialist/parent enters a valid phone number in the second try.</p> <p>استمرار“ specialist/parent selects “ button</p> <p>specialist/parent has registered before with Ayadi</p> <p>اعادة“ specialist/parent select“ ” ارسال رمز التحقق ” button</p> <p>specialist/parent enters an invalid OTP in the first try</p> <p>specialist/parent enter valid OTP in the second try</p>

		specialist/parent has logged in successfully.
#3	1 – 2 – 2a1 – 2a2 - 2– 3 - 3a1 – 3a2	<p>specialist/parent selects “ابداً“ button</p> <p>specialist/parent enter an invalid phone number in the first try.</p> <p>specialist/parent enter a valid phone number in the second try.</p> <p>specialist/parent selects “استمرار“ button</p> <p>specialist/parent has not registered with Ayadi (The operation Is cancelled)</p>

Table 53 Log in to an account branch coverage scenario

Test normal scenario

Test case: TC#2

Goal: Test normal scenario of Log in to an account on Ayadi.

Setup:

- 1 – specialist/parent selects “ابداً“ button.
- 2 – specialist/parent enter his/her phone number (555706340).
- 3 – specialist/parent selects “استمرار“ button.
- 4- specialist/parent enters the OTP that has been received from SMS.
- 5- System displays the home page.

#	External event	reaction	comment
1	specialist/parent selects “ابداً الان” “button.	System displays log in page	-
2	specialist/parent enter his/her phone number (555706340) and select “استمرار” button.	System sends SMS with a verification code to the specialist/parent phone number.	-
3	specialist/parent receives the SMS with a verification code.	System prompts the specialist/parent to enter the received verification code.	-
4	specialist/parent enters the verification code	System validates the verification number to complete the log in and display the home page.	-

Table 54Log in to an account test case

Pass criteria: specialist/parent is successfully logged in to Ayadi.

set schedule use case scenario.	
Use case name	specialist set his schedule.
Actor	Specialist.
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - The specialist has already been logged in to the system.
Goal	The specialist sets his schedule.
Basic flow of events	<ol style="list-style-type: none"> 1 - specialist selects “جدولي“ button. 2- System displays the calendar and available hours for each day. 3- specialist selects “ضبط جدولي“ button. 4- The specialist determines the appropriate periods starting session to end session. 5- specialists select “إضافة فترة“. 6- specialists select “نسخ الى يوم اخر“ 7- specialists select “تأكيد جدولي“
Alternative flows	<ol style="list-style-type: none"> 4a. specialists select his starting session after ending session <ol style="list-style-type: none"> 4a1. System prints an error message “يجب ان تكون النهاية بعد البداية“ 4a2. setting periods fails 5a. specialists select his starting second period before the end of the first period. <ol style="list-style-type: none"> 5a1. System prints an error message “يجب ان تكون بداية الفترة بعد نهاية الفترة السابقة“ 5a2. setting periods fails
Post Condition	specialist set his schedule successfully.

Table 55 set schedule use case scenario.

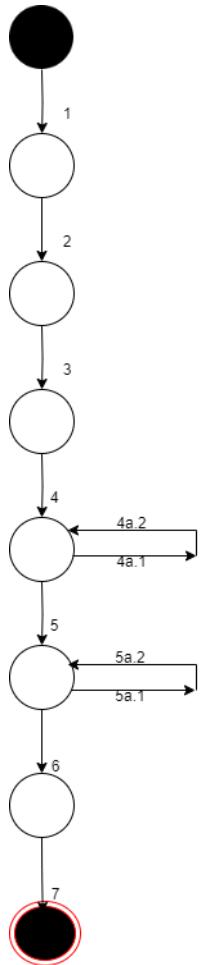


Figure 101 specialist sets his schedule scenario graph.

ID	Events	Description
#1	1-2-3-4-5-6-7	<p>specialist selects “جدولي” button.</p> <p>System displays the calendar and available hours for each day</p> <p>specialist selects “ضبط جدولي” button.</p> <p>The specialist determines his appropriate periods starting session to end session.</p> <p>specialists select “إضافة فترة”.</p> <p>specialists select “نسخ الى يوم اخر”</p> <p>specialists select “تأكيد جدولي”</p> <p>Normal scenario (specialist set his schedule)</p>
#2	1-2-3-4-4a.1-4a.2-4-5-5a.1-5a.2-5-6-7	<p>specialist selects “جدولي” button.</p> <p>System displays the calendar and available hours for each day</p> <p>specialist selects “ضبط جدولي” button.</p> <p>The specialist determines invalid periods starting session to end session in the first try.</p> <p>The specialist determines valid periods starting session to end session in the second try.</p> <p>specialists select his starting second period before the end of the first period in the first try.</p> <p>specialists select his starting second period after the end of the first period in the second try.</p> <p>specialists select “نسخ الى يوم اخر”</p> <p>specialists select “تأكيد جدولي”</p>

Table 56 Specialist set his schedule branch coverage scenario

Test normal scenario

Test case: TC#3

Goal: Test normal scenario of specialist set his schedule on Ayadi.

Setup:

- 1 - specialist selects “جدولي” button.
- 2- System displays the calendar and available hours for each day(1:30 PM). الأربعاء 9 يونيو PM).
- 3- specialist selects “ضبط جدولي” button.
- 4- The specialist determines his appropriate periods starting session to end session.(من 1:30 الى 2:15)
- 5- specialists select “3:55” (من 2:15 الى). إضافة فترة
- 6- specialists select “الاحد” (الاحد الى يوم اخر)
- 7- specialists select “تأكيد جدولي”

#	External event	reaction	comment
1	specialist selects “جدولي” button.	System displays “جدولي” page	-
2	System displays the calendar and available hours for each day.	Specialist select 9 يونيو 1:30 PM	-
3	specialist selects “ضبط جدولي” button.	System display “ضبط جدولي” page	-
4	The specialist determines his appropriate periods starting session to end session. (من 1:30 الى 2:15)	System validates the input if it is valid or display an error message	-
5	specialists select “3:55” (من 2:15 الى). إضافة فترة	System validates the input if it is valid or display an error message	-
6	specialists select “الاحد” (الاحد الى يوم اخر)	System displays a dialog with all 7 week days	-
7	specialists select “تأكيد جدولي”	System displays message تم تثبيت جدولك بنجاح	-

Table 57 specialist set his schedule test case

Pass criteria: specialist set his schedule successfully.

Book an appointment use case scenario.	
Use case name	parent book an appointment.
Actor	parent.
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - The parent has already been logged in to the system.
Goal	The parents book an appointment.
Basic flow of events	<ol style="list-style-type: none"> 1 – parent select a specialist 2- parent select “حجز موعد جديد” button 3- parent Select child 4- parent select session day and time 5- parent select “تأكيد” 6- parent select “اكمال الدفع” 7- parent enter his email address 8-parent enter "الاسم الاول" 9-parent enter "اسم العائلة" 10-parent enter "رقم البطاقة" 11-parent enter "تاريخ انتهاء الصلاحية" 12-parent enter "CVV" 13-parent enter "حفظ"
Alternative flows	<p>7a.invalid email format</p> <p>7a1. system highlights the field with red color warning. 7a2. Redirects to step 7.</p> <p>8a. first name have symbol and numbers. 8a1. System highlights the field with red color warning. 8a2. Redirects to step 8.</p>

	<p>9a. first name have symbol and numbers. 9a1. System highlights the field with red color warning. 9a2. Redirects to step 9.</p> <p>10a. invalid card number 10a1. System highlights the field with red color warning. 10a2. Redirects to step 10.</p> <p>11a. invalid card expire day. 11a1. System highlights the field with red color warning. 11a2. Redirects to step 11.</p> <p>12a. invalid CVV number. 12a1. System highlights the field with red color warning. 12a2. Redirects to step 12.</p>
Post Condition	parent booked an appointment successfully.

Table 58 Book an appointment use case scenario.

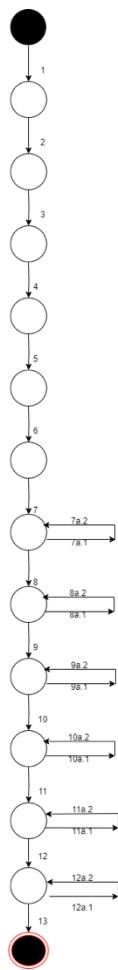


Figure 102 Parent book an appointment scenario graph

ID	Events	Description
#1	1-2-3-4-5-6-7-8-9-10-11-12	parent select a specialist parent select “جز موعد جديد” button parent Select child parent select session day and time parent select “تأكيد” parent select “اكمال الدفع”

		<p>parent enter valid email address</p> <p>parent enter valid first name</p> <p>parent enter valid last name</p> <p>parent enter valid card number</p> <p>parent enter a correct card expire date</p> <p>parent enter a correct “CVV”</p> <p>parent enter “<u>حفظ</u>”</p> <p>Normal scenario (parent book an appointment)</p>
#2	1-2-3-4-5-6-7-7a.1-7a.2-7-8-8a.1-8a.2-8-9-9a.1-9a.2-9-10-10a.1-10a.2-10-11-11a.1-11a.2-11-12-12a.1-12a.2-12-13	<p>parent select a specialist</p> <p>parent select “<u>حجز موعد جديد</u>” button</p> <p>parent Select child</p> <p>parent select session day and time</p> <p>parent select “<u>تأكيد</u>”</p> <p>parent select “<u>اكمال الدفع</u>”</p> <p>parent enter invalid email address in the first try</p> <p>parent enter valid email address in the second try</p> <p>parent enter invalid first name in the first try</p> <p>parent enter valid first name in the second try</p> <p>parent enter invalid last name in the first try</p> <p>parent enter valid last name in the second try</p> <p>parent enter invalid card number in the first try</p> <p>parent enter valid card number in the second try</p> <p>parent enter an incorrect card expire date in the first try</p> <p>parent enter a correct card expire date in the second try</p>

		parent enter an incorrect “CVV” in the first try parent enter a correct “CVV” in the second try parent enter “حفظ”
--	--	--

Table 59 . Parent book an appointment branch coverage scenario

Test normal scenario

Test case: TC#4

Goal: Test normal scenario of booked an appointment on Ayadi.

Setup:

1 – parent select a specialist

2- parent select “جز موعد جديد” button

3- parent Select child "عاليه الغامدي"

4- parent select session day and time (الاحد 6 يونيو PM).

5- parent select “تأكيد”

6- parent select “اكمال الدفع”

7- parent enter his email address (hxvpk26116192@personal.example.com)

8-parent enter "الاسم الاول"(Ayadi)

9-parent enter "اسم العائلة"(App)

10-parent enter “رقم البطاقة” (4777 7777 6663 6373)

11-parent enter “تاريخ انتهاء الصلاحية” (24/12)

12-parent enter “CVV” (747)

13-parent enter “حفظ”

#	External event	reaction	comment
1	parent select a specialist	System displays "جدولي" page	-
2	parent select "جز موعد جديد" button	System displays "جز موعد جديد" page	-
3	parent Select child "عاليه الغامدي"	System validates the input	-
4	parent select session day and time (الـحد 6 يومينيو 1:30PM).	System validates the input if it is valid or display an error message	-
5	parent select "تأكيد"	System display the Invoice details	-
6	parent select "اكمال الدفع"	System displays the email page	-
7	parent enter his email address (hxvpk2616192@personal.example.com)	System validates the input if it is valid or display an error message	-
8	parent enter "الاسم الاول" (Ayadi)	System validates the input if it is valid or display an error message	-
9	parent enter "اسم العائلة" (App)	System validates the input if it is valid or display an error message	-
10	parent enter " 7777 6663 6373 (4777)" رقم البطاقة	System validates the input if it is valid or display an error message	-
11	parent enter "24/12) (تاريخ انتهاء الصلاحية"	System validates the input if it is valid or display an error message	-
12	parent enter "CVV" (747)	System validates the input if it is valid or display an error message	-
13	parent enter "حفظ"	System displays message "تم حجز الجلسة بنجاح"	-

Table 60 Parent book an appointment test case

Pass criteria: parent booked an appointment successfully.

View upcoming appointments use case scenario.	
Use case name	specialist/parent View upcoming appointments.
Actor	specialist/parent
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - The specialist/parent has already been logged in to the system.
Goal	The specialist/parent View upcoming appointments.
Basic flow of events	<p>1 - specialist/parent selects “المواعيد القادمة” button 2- System displays the upcoming appointments.</p>
Alternative flows	None.
Post Condition	specialist/parent is successfully View upcoming appointments.

Table 61 View upcoming appointments use case scenario.

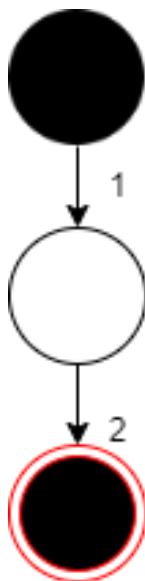


Figure 103 specialist/parent View upcoming appointments scenario graph.

Scenarios:

ID	Events	Description
#1	1-2	specialist/parent selects “المواييد القادمة” button. System displays the upcoming appointments. Normal scenario (specialist/parent view upcoming appointments.)

Table 62 specialist/parent View upcoming appointments branch coverage scenario

Test normal scenario

Test case: TC#5

Goal: Test normal scenario of View upcoming appointments on Ayadi.

Setup:

1 - specialist/parent selects “المواعيد القادمة” button.

2- System displays the upcoming appointments.

#	External event	reaction	comment
1	specialist/parent selects “المواعيد القادمة” button.	System displays the upcoming appointments.	-

Table 63 specialist/parent View upcoming appointments test case

Pass criteria: System successfully displays upcoming appointments.

View profile use case scenario.	
Use case name	View profile.
Actor	specialist/parent
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - The specialist/parent already has been logged in to the system.
Goal	The specialist/parent View his/her profile.
Basic flow of events	<p>1 - specialist/parent selects “الملف الشخصي” button.</p> <p>2- System displays the specialist/parent profile.</p>
Alternative flows	None.
Post Condition	specialist/parent is successfully View profile.

Table 64 View profile use case scenario.

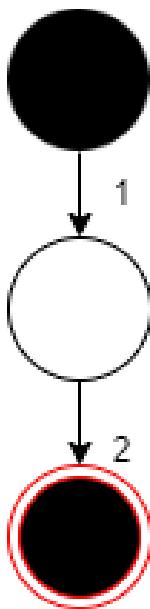


Figure 104 specialist/parent View profile scenario graph.

Scenarios:

ID	Events	Description
#1	1-2	specialist/parent selects “الملف الشخصي” button. System displays the specialist/parent profile. Normal scenario (specialist/parent view profile.)

Table 65 specialist/parent View their profile branch coverage scenario

Test normal scenario

Test case: TC#6

Goal: Test normal scenario of View profile on Ayadi.

Setup:

1 - specialist/parent selects “الشخصي الملف” button.

2- System displays the specialist/parent profile.

#	External event	reaction	comment
1	specialist/parent selects “الشخصي الملف” button.	System displays the specialist profile.	-

Table 66 specialist/parent View their profile test case

Pass criteria: System is successfully displaying specialist/parent profile.

upload child report use case scenario.	
Use case name	specialist upload child report.
Actor	Specialist.
Preconditions	<ul style="list-style-type: none"> - The specialist has already been logged in to the system. - The specialist should have unuploaded the report for previous appointment.
Goal	The specialist upload child report.
Basic flow of events	<ol style="list-style-type: none"> 1 - specialist selects “ارفع تقرير” button 2- System displays the report. 3- specialist enters the report details 4- specialist selects “ارسل” “ارسل” button.
Alternative flows	<ol style="list-style-type: none"> 3a. specialist selects “الغاء” “الغاء” button. <ol style="list-style-type: none"> 3a1. Upload report fails. 3a2. Operation cancelled.
Post Condition	specialist successfully uploaded child report.

Table 67 upload child report use case scenario.

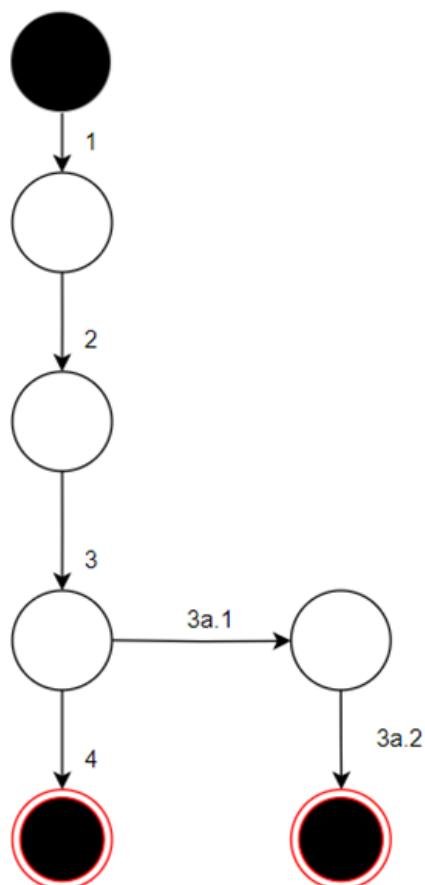


Figure 105 Specialist upload child report scenario graph.

ID	Events	Description
#1	1-2-3-4	specialist selects “ارفع تقرير” button System displays the report. specialist enters the report details. Normal scenario (specialist upload a report)
#2	1-2-3-3a.1-3a.2	specialist selects “الناء” button. (The operation Is cancelled)

Table 68 Specialist upload child report branch coverage scenario

Test normal scenario

Test case: TC#7

Goal: Test normal scenario of specialist upload child report.

Setup:

- 1 - specialist selects “ارفع تقرير” button
- 2- System displays the report.
- 3- specialist enters the report details (الطفل لديه مشاكل في النطق والاتصال)
- 4— specialist selects “ ارسال“ button.

#	External event	reaction	comment
1	specialist selects “ارفع تقرير” button	System displays a dialog	-
2	specialist enters the report details (الطفل لديه مشاكل في النطق والاتصال)	System processes the uploaded report and change the button to (عرض تقرير الجلسة)	-

Table 69 specialist upload child report test case

Pass criteria: System successfully uploaded the child report.

Log out use case scenario.	
Use case name	Log out from Ayadi
Actor	specialist/parent
Preconditions	<ul style="list-style-type: none"> - Ayadi is in idle state. - specialist/parent already has been logged in to the system.
Goal	The specialist/parent logs out from his/her account.
Basic flow of events	<ol style="list-style-type: none"> 1 - specialist/parent selects “الخروج تسجيل“ button. 2 - specialist/parent confirm on the log-out process. 3- System displays the welcome page.
Alternative flows	<ol style="list-style-type: none"> 2a. specialist/parent did not confirm on the log-out process. <ol style="list-style-type: none"> 2a1. Log out fails. 2a2. Operation cancelled.
Post Condition	specialist/parent is successfully logged out from his/her account.

Table 70 Log out use case scenario.

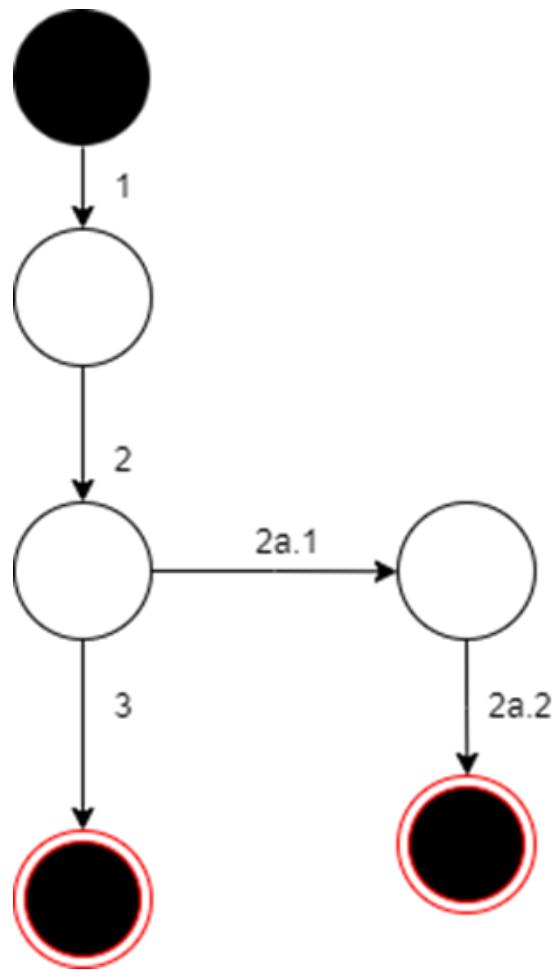


Figure 106 specialist/parent Log out from account scenario graph.

ID	Events	Description
#1	1-2-3	specialist/parent selects “تسجيل الخروج”button. System redirects to welcome page Normal scenario (specialist/parent log out from Ayadi)
#2	1-2-2a.1-2a.2	specialist/parent selects “تسجيل الخروج”button. specialist/parent did not confirm on the log-out (The operation Is cancelled)

Table 71 specialist/parent Log out from account branch coverage scenario

Test normal scenario

Test case: TC#8

Goal: Test normal scenario of Log out from Ayadi.

Setup:

1 - specialist/parent selects “تسجيل الخروج” button.

2- specialist/parent confirm the message.

#	External event	reaction	comment
1	specialist/parent selects “تسجيل الخروج” button.	System displays confirmation if the specialist/parent is sure about logging out from the account	-
2	specialist/parent confirm the message.	System processes the logout operation and displays the welcome page	-

Table 72 specialist/parent logs out from their account test cases

Pass criteria: System is successfully logged out the specialist/parent from his/her account.

14.5 Non-functional

Ayadi Application undergoes nonfunctional testing in this section, which verifies its reliability, performance, and usability in meeting expectations. It's important to mention that due to time constraints, Ayadi didn't test the interoperability and localization non-functional requirements.

- Performance Testing

Flutter provides exceptional performance profiling tools, such as [Dart DevTools](#), that we employed to monitor the performance timeline during the execution of the Ayadi application. The predefined non-functional requirements consist of the following:

- 1- The system's average response time (ART) shall be less than 1 second.

By analyzing the performance using the Dart DevTools provided by flutter, we have seen that most of the frames in our app are executed within less than 5 ms in specialist application and 3 ms in parent application which is considered fast as seen with the blue color in the graph. Some of the frames with the orange color have been considered as slow frames but they all have been executed in less than 20 ms in specialist application and less than 24 ms in parent application which we can say is acceptable based on our requirements.

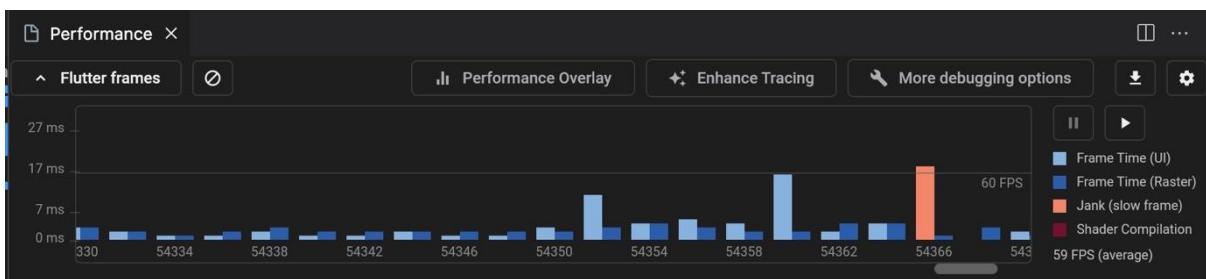


Figure 107 specialist application performance

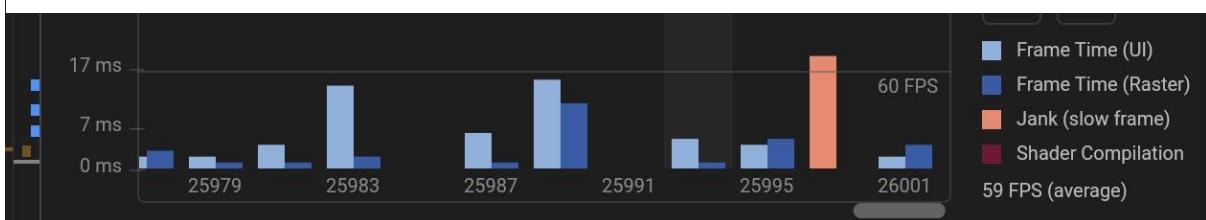


Figure 108 parent application performance

- Usability Testing

In order to ensure the usability of Ayadi, the team has performed usability testing by conducting sessions with different users (see appendix 9) to verify the achievement of the non-functional requirements we had previously established, which include:

- 1- The user shall be able to successfully complete a task in under one minute.
- 2- Average Time of Booking an appointment shall be no longer than 10 minutes.
- 3- The system's minimum Customer Satisfaction (CSAT) score of the system shall be 77%.

The results of the usability testing sessions are mentioned in the [Usability Testing section](#)

14.6 Usability Testing

Usability testing is the process of evaluating a product or software how ease of use and user friendly the software is, by testing it with real users [29].

14.6.1 Usability test steps

The following steps were planned during the usability test sessions to evaluate the usability of the Ayadi application:

- 1- Provide users with an overview of the Ayadi application and its objectives. (See Appendix 6, 7, 8)
- 2- Explain the purpose of the usability testing and the expected actions of users.
- 3- Ask users to perform the tasks listed below.

Lists of tasks for parent		
Task #	Task Name	Objective of the task
1	registration	this task was designed to gauge how long it took the parent to register to Ayadi Application
2	Search for a specialist	this task was designed to gauge how long it took the parent to Search for specialist
3	Book an appointment	this task was designed to gauge how long it took the parent to book an appointment
4	Edit appointment	this task was designed to gauge how long it took the parent to edit an appointment
5	View profile	this task was designed to gauge how long it took the parent to view profile
6	Add a new child	this task was designed to gauge how long it took the parent to add new child

7	Log out	this task was designed to gauge how long it took the parent log out
Lists of tasks for specialist		
Task #	Task Name	Objective of the task
1	registration	this task was designed to gauge how long it took the specialist to register to Ayadi Application
2	Set schedule	this task was designed to gauge how long it took the specialist to set schedule
3	View upcoming appointments	this task was designed to gauge how long it took the specialist view upcoming appointment
4	View child profile	this task was designed to gauge how long it took the specialist to view child profile
5	Upload child report	this task was designed to gauge how long it took the specialist to upload child report
6	Edit profile	this task was designed to gauge how long it took the specialist to edit profile
7	Log out	this task was designed to gauge how long it took the specialist to log out

Lists of tasks for admin		
Task #	Task Name	Objective of the task
1	Log in	this task was designed to gauge how long it took the admin to log in to Ayadi website
2	Accept specialist request	this task was designed to gauge how long it took the admin to accept a new specialist request
3	View child information from specific parent	this task was designed to gauge how long it took the admin to view child information from specific parent
4	View specialists rating	this task was designed to gauge how long it took the admin to view specialists rating
5	Log out	this task was designed to gauge how long it took the admin to log out

Table 73 Tasks for usability testing

- 4- Ask users to fill out the A application usability evaluation questionnaire and express appreciation for their participation. (See Appendix 9,10)

14.6.2 Participants Profiles

Participant name	Age	Gender	Average knowledge of similar systems (1-5)	Use of handheld device or computers (1-5)
Parent				
Nayel	48	Male	3	4
Hanan	46	Female	3	5
specialist				
Ashraf	50	Male	4	5
Lama	28	Female	2	5
Admin				
Mansour	55	Male	4	5
Reem	31	Female	4	4

Table 74 Participants Profiles

14.6.3 Timeline

Participant name	Day	Date	Start session time	End session time	Duration of session
Parents					
Nayel	Monday	5 th , June	3:08 PM	3:15 PM	6:10 min
Hanan	Tuesday	6 th , June	10:29 PM	10:45 PM	15:31 min
Specialists					
Ashraf	Sunday	4 th , June	9:45 PM	9:56 PM	10:55 min
Lama	Tuesday	6 th , June	3:10 PM	3:16 PM	6:06 min
Admin					
Mansour	Sunday	4 th , June	7:29 PM	7:37 PM	7:32 min
Reem	Tuesday	6 th , June	9:30 AM	9:34 AM	4:09 min

Table 75 Timeline

14.6.3 Context of testing

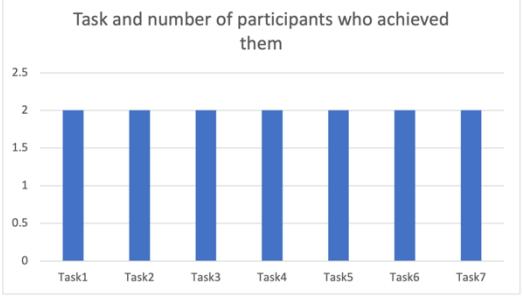
Participant	Location
Parents	
Nayel	Riyadh, Participant's home, Living room
Hanan	Riyadh, Participant's home, Living room
Specialists	
Ashraf	Riyadh, Participant's home, Living room
Lama	Riyadh, Participant's home, Office
Admin	
Mansour	Riyadh, Participant's home, Living room
Reem	Riyadh, Participant's house, Office room

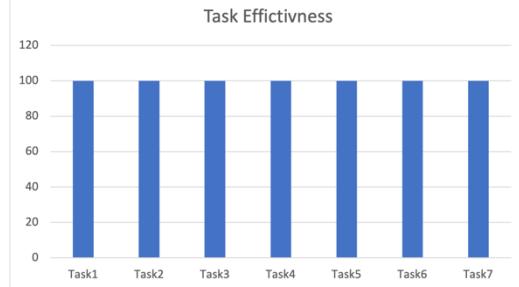
Table 76 Context of testing

The objectives of the usability test are to assess the following aspects of usability and user goals based on Nielsen Norman [30]:

- 1- Ease of Use and Learnability: By tracking the number of errors made by users.
- 2- Efficiency: By determining the time taken by users to complete each task.
- 3- User Satisfaction: By having users fill out the Ayadi application usability evaluation questionnaire to gauge their level of satisfaction.

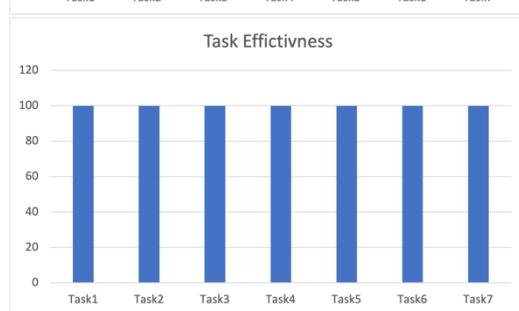
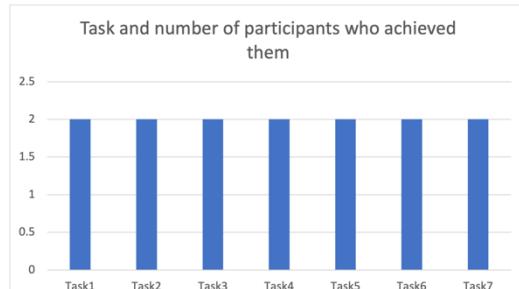
14.6.3 performance measures and feedback

Metric	How was it measured?	How was the data created / captured?																
Effectiveness (Ease of Use and Learnability)	Task success, Number of Errors	<p>After finishing the recording sessions, we noticed that the majority of participants in the Parent Application forgot to select their child's name, resulting in incomplete appointment bookings. Additionally, in the Specialist Application, when a specialist uploads a session report, adding spaces is not allowed, which makes the statement of uploading the session report difficult to understand.</p> $Effectiveness = \frac{\text{Number of tasks completed successfully}}{\text{Toltal number of tasks undertaken}} \times 100$ <p>Parent:</p> <p>Task one effectiveness = $7 / 7 * 100 = 100\%$ Task two effectiveness = $7 / 7 * 100 = 100\%$ Task three effectiveness = $7 / 7 * 100 = 100\%$ Task four effectiveness = $7 / 7 * 100 = 100\%$ Task five effectiveness = $7 / 7 * 100 = 100\%$ Task six effectiveness = $7 / 7 * 100 = 100\%$ Task seven effectiveness = $7 / 7 * 100 = 100\%$</p>  <table border="1"> <caption>Task and number of participants who achieved them</caption> <thead> <tr> <th>Task</th> <th>Participants</th> </tr> </thead> <tbody> <tr><td>Task1</td><td>2</td></tr> <tr><td>Task2</td><td>2</td></tr> <tr><td>Task3</td><td>2</td></tr> <tr><td>Task4</td><td>2</td></tr> <tr><td>Task5</td><td>2</td></tr> <tr><td>Task6</td><td>2</td></tr> <tr><td>Task7</td><td>2</td></tr> </tbody> </table>	Task	Participants	Task1	2	Task2	2	Task3	2	Task4	2	Task5	2	Task6	2	Task7	2
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Specialist:

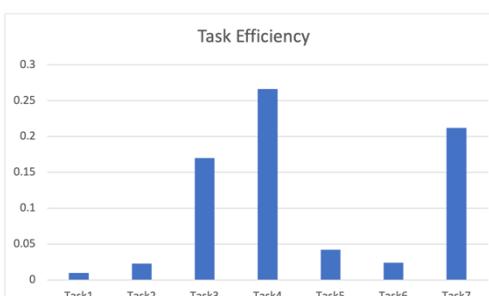
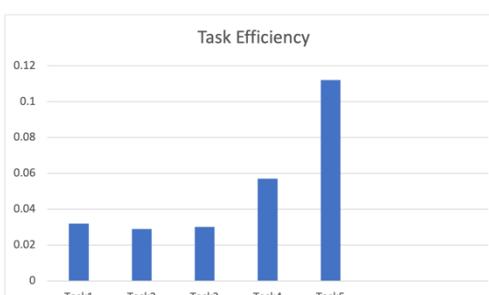
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Admin:

Task one effectiveness = $5 / 5 * 100 = 100 \%$
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 Task three effectiveness = $5 / 5 * 100 = 100 \%$
 Task four effectiveness = $5 / 5 * 100 = 100 \%$
 Task five effectiveness = $5 / 5 * 100 = 100 \%$

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Task4	100																										
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Efficiency	Time on Task	<p>Efficiency is measured in time-based-efficiency (TBE) calculation format:</p> <p>N: number of tasks. R: number of users.</p> <p>nij: If the task i done by the user j is successful nij is going to be equal to 1, other than nij is equal to 0.</p> <p>tij: The time taken by the user to carry out the task i</p> $Time\ Based\ Efficiency = \frac{\sum_{j=1}^R \sum_{i=1}^N \frac{n_{ij}}{t_{ij}}}{NR}$ <p>Parent:</p> <ul style="list-style-type: none"> • Task one Efficiency = $((1/77) + (1/150)) / 2*1 = 0.0098$ goals/sec • Task tow Efficiency = $((1/58) + (1/40)) / 2*1 = 0.021$ goals/sec • Task three Efficiency = $((1/3) + (1/6)) / 2*1 = 0.25$ goals/sec • Task four Efficiency = $((1/92) + (1/36)) / 2*1 = 0.019$ goals/sec • Task five Efficiency = $((1/35) + (1/9)) / 2*1 = 0.069$ goals/sec • Task six Efficiency = $((1/7) + (1/2)) / 2*1 = 0.321$ goals/sec • Task seven Efficiency = $((1/6) + (1/4)) / 2*1 = 0.208$ goals/sec <table border="1"> <thead> <tr> <th>Task</th> <th>Efficiency</th> </tr> </thead> <tbody> <tr><td>Task1</td><td>~0.0098</td></tr> <tr><td>Task2</td><td>~0.021</td></tr> <tr><td>Task3</td><td>0.25</td></tr> <tr><td>Task4</td><td>~0.019</td></tr> <tr><td>Task5</td><td>~0.069</td></tr> <tr><td>Task6</td><td>0.32</td></tr> <tr><td>Task7</td><td>~0.208</td></tr> </tbody> </table>	Task	Efficiency	Task1	~0.0098	Task2	~0.021	Task3	0.25	Task4	~0.019	Task5	~0.069	Task6	0.32	Task7	~0.208									
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		<p>Specialist:</p> <ul style="list-style-type: none"> • Task one Efficiency = $((1/72) + (1/170)) / 2*1 = 0.0098$ goals/sec • Task tow Efficiency = $((1/35) + (1/55)) / 2*1 = 0.023$ goals/sec • Task three Efficiency = $((1/4) + (1/11)) / 2*1 = 0.170$ goals/sec • Task four Efficiency = $((1/3) + (1/5)) / 2*1 = 0.266$ goals/sec • Task five Efficiency = $((1/18) + (1/34)) / 2*1 = 0.042$ goals/sec • Task six Efficiency = $((1/51) + (1/35)) / 2*1 = 0.024$ goals/sec • Task seven Efficiency = $((1/3) + (1/11)) / 2*1 = 0.212$ goals/sec  <table border="1"> <caption>Data for Task Efficiency (Specialist)</caption> <thead> <tr> <th>Task</th> <th>Efficiency (goals/sec)</th> </tr> </thead> <tbody> <tr><td>Task1</td><td>0.0098</td></tr> <tr><td>Task2</td><td>0.023</td></tr> <tr><td>Task3</td><td>0.170</td></tr> <tr><td>Task4</td><td>0.266</td></tr> <tr><td>Task5</td><td>0.042</td></tr> <tr><td>Task6</td><td>0.024</td></tr> <tr><td>Task7</td><td>0.212</td></tr> </tbody> </table> <p>Admin:</p> <ul style="list-style-type: none"> • Task one Efficiency = $((1/48) + (1/23)) / 2*1 = 0.032$ goals/sec • Task tow Efficiency = $((1/55) + (1/24)) / 2*1 = 0.029$ goals/sec • Task three Efficiency = $((1/37) + (1/30)) / 2*1 = 0.0301$ goals/sec • Task four Efficiency = $((1/17) + (1/18)) / 2*1 = 0.057$ goals/sec • Task five Efficiency = $((1/10) + (1/8)) / 2*1 = 0.112$ goals/sec  <table border="1"> <caption>Data for Task Efficiency (Admin)</caption> <thead> <tr> <th>Task</th> <th>Efficiency (goals/sec)</th> </tr> </thead> <tbody> <tr><td>Task1</td><td>0.032</td></tr> <tr><td>Task2</td><td>0.029</td></tr> <tr><td>Task3</td><td>0.0301</td></tr> <tr><td>Task4</td><td>0.057</td></tr> <tr><td>Task5</td><td>0.112</td></tr> </tbody> </table>	Task	Efficiency (goals/sec)	Task1	0.0098	Task2	0.023	Task3	0.170	Task4	0.266	Task5	0.042	Task6	0.024	Task7	0.212	Task	Efficiency (goals/sec)	Task1	0.032	Task2	0.029	Task3	0.0301	Task4	0.057	Task5	0.112
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Satisfaction	User surveys/interviews	<p>User satisfaction is measured through standardized satisfaction questionnaires which can be administered after each task and/or after the usability test session.</p> <ul style="list-style-type: none"> • Test Level Satisfaction <p>Test Level Satisfaction is measured by giving a formalized questionnaire to each test participant at the end of the test session. This serves to measure their impression of the overall ease of use of the system being tested. we used the System Usability Scale (SUS) questionnaire.</p>																												

		<p>Participants in both questionnaires will assess each question on a scale of 1 to 5 according to how much they agree with the statement they are reading. 1 indicates a severe disagreement, whereas 5 indicates complete agreement.</p> <p>Scoring Measure:</p> <ol style="list-style-type: none"> 1. Subtract 1 from the score for each of the questions with an odd number. 2. Subtract the value of each of the questions with an even number from 5. 3. Take these new values which you have found and add up the total score. Then multiply this by 2.5 <p>The Average System Usability Scale score is 80 (See appendix10)</p>
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Table 77 performance measures and feedback

14.6.3 Usability test results

Based on the outcome of the usability testing, it was discovered that the book appointment page in the parent application and the upload session report in the specialist application presented the majority of challenges for users. In order to resolve these issues and enhance the overall performance of the application, modifications will be implemented.

Application Changes After Usability Testing		
Description	Before	After
Parent		
After receiving feedback from the participant Nayel, it was determined that some parents were confused because they forgot to choose a child when booking an appointment. As a result, a warning message now appears to remind users to select a child.		
Specialist		
After receiving feedback from participant Lama, it was determined that some users were confused because they cannot add a space in the session report. As a result, we have changed the limitation for uploading session reports.		

Table 78 Usability test results

15. Expected Deployment

Displayed in this section is the deployment diagram of the *Ayadi* system. The system was built based on MVC and client-server architecture with external system Payment System. The *Ayadi* system node represents the client side which is the view that includes the components that are related to the user interface in our system for the users. The system server node represents the server side which includes all the business logic and the database management in our system.

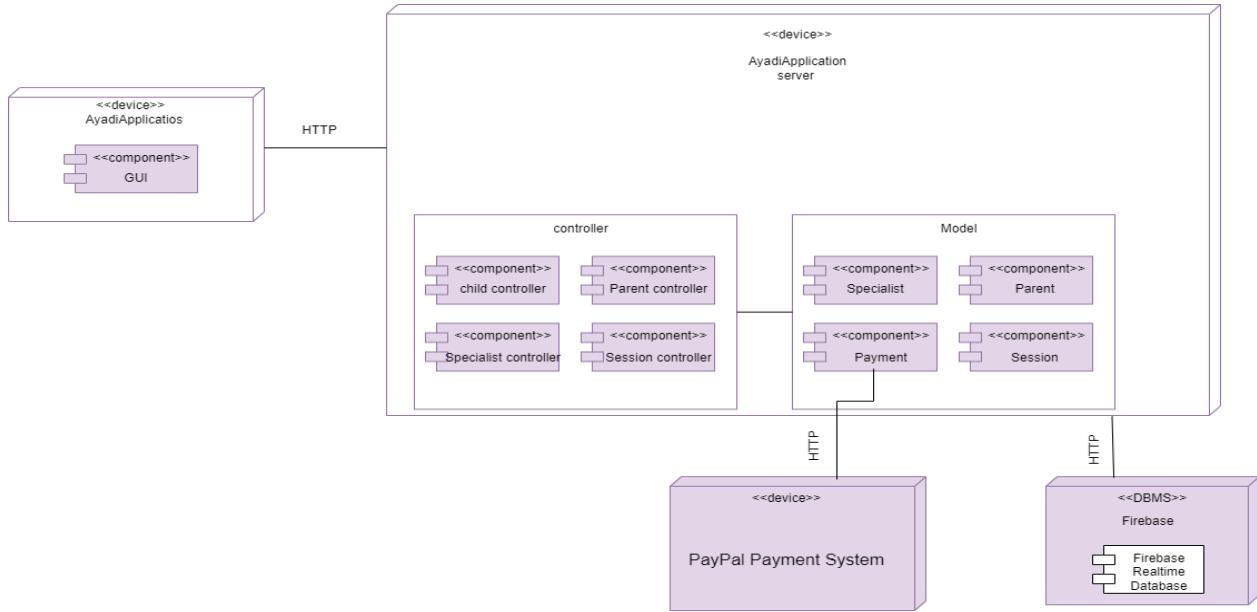


Figure 109 Ayadi expected deployment

16. Project Status

The purpose of the below table is to give a summary of the current status and progress of the project.

Phase	Start date	End date	Issues	Status
Proposal phase	19/12/2022	1/1/2023	During this phase, the team faced a challenge in finding sufficient resources and research that adequately described the need for parental consultation and guidance.	Completed
Analysis phase	3/1/2023	24/1/2023	During this phase, the team encountered a challenge in collecting requirements, specifically in defining the different areas of expertise within parenting consulting, because of the limited experience in this field.	Completed
Design phase	26/1/2023	15/2/2023	In this phase, the team faced a challenge in maintaining the consistency between diagrams and figures because of the short time in reviewing every team member's work and the difference between each team member's drawing styles.	Completed
Implementation phase	12/3/2023	28/5/2023	The implementation phase presented a significant challenge for us, as we encountered several difficulties in implementing all the functions of the system. Despite these obstacles, the team persevered and ultimately succeeded in successfully implementing all the necessary functions of the system.	Completed
Testing phase	28/5/2023	6/6/2023	During this phase, the team accomplished all deliverables as planned and met the expected outcomes. To ensure the system's reliability and performance, the team employed various software testing techniques such as unit testing, functional testing, branch testing, and nonfunctional testing. Furthermore, usability testing was conducted to ensure that the system meets the end-user's expectations and requirements.	Completed

Table 79 Project Status

17. Limitations Of the System

Our system, *Ayadi*, was successfully developed and tested. However, we encountered several limitations during the implementation and testing phases. The most significant limitation we faced was time. We built our system from scratch to a fully functional system in only 12 weeks, which was a challenging timeline.

In addition, we initially planned to use Apple Pay as our payment API, but later discovered that it was not free, and a subscription was required through an Apple developer account[28]. As a result, we had to switch to PayPal payment gateway, which required additional resources and caused some delays.

Furthermore, since our application's primary language is Arabic, we faced limitations in terms of font types. It was challenging to find suitable fonts for the Arabic language. Additionally, adapting our pages to support the Arabic language required more effort, as Flutter's default layout is from left to right. We had to invest additional resources to ensure proper right-to-left layout support for our Arabic-speaking users, which made some tasks take longer to implement than usual.

Overall, despite these challenges, we were able to overcome them and successfully deliver our system. We remain committed to improving and refining *Ayadi* to meet the needs of our users.

18. Future Work

We are planning to potentially expand the Ayadi application in different scopes in the future. For instance, we aim to make the system cross-platform, we also plan to create an Apple developer account to implement Apple Pay and enable faster user verification during login using OTP. additionally, we intend to make the system support other languages. Moreover, we want to add more features to the system, here is a list of them:

- improve the process of searching for a specialist by adding sorting and filtering tools.
- uploading files and recording voice notes in the chat.
- Emailing the specialist about any new update on the system's rules and regulations such as the income policy.

19. Conclusion

Ayadi is a system designed to establish an integrated communication channel between parents and specialists, aiming to offer solutions, guidance, and steps for child-rearing issues at any time and from any location.

After conducting Extensive research on similar systems and meeting with our target customers to comprehend the domain better, valuable insights were gathered. Based on this research, a comprehensive project plan and requirements were formulated. Subsequently, classes, use cases, and interface mockups were designed, and test scenarios were written to ensure the system's functionality.

during the implementation phase, it was identified that certain modifications were necessary, such as reducing the number of collections in the database to enhance app performance. These changes were documented, and the system was rigorously tested using various software testing techniques to ensure adherence to requirements and specifications.

The team is optimistic that *Ayadi* will play a pivotal role in meeting the needs of parents and specialists, providing them with an effective platform to communicate and resolve child-rearing problems.

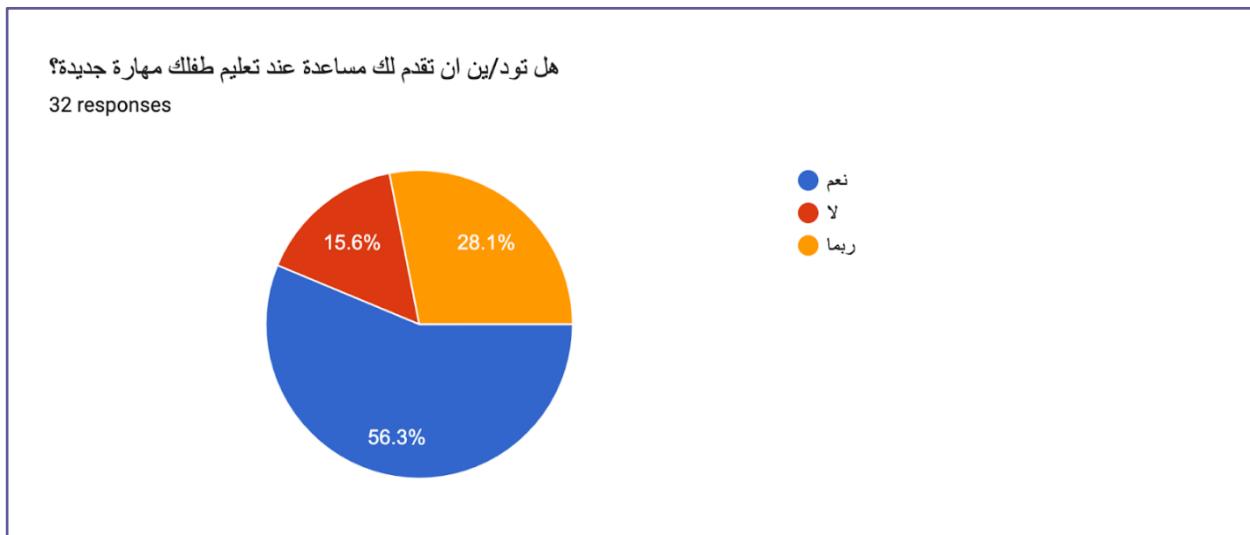
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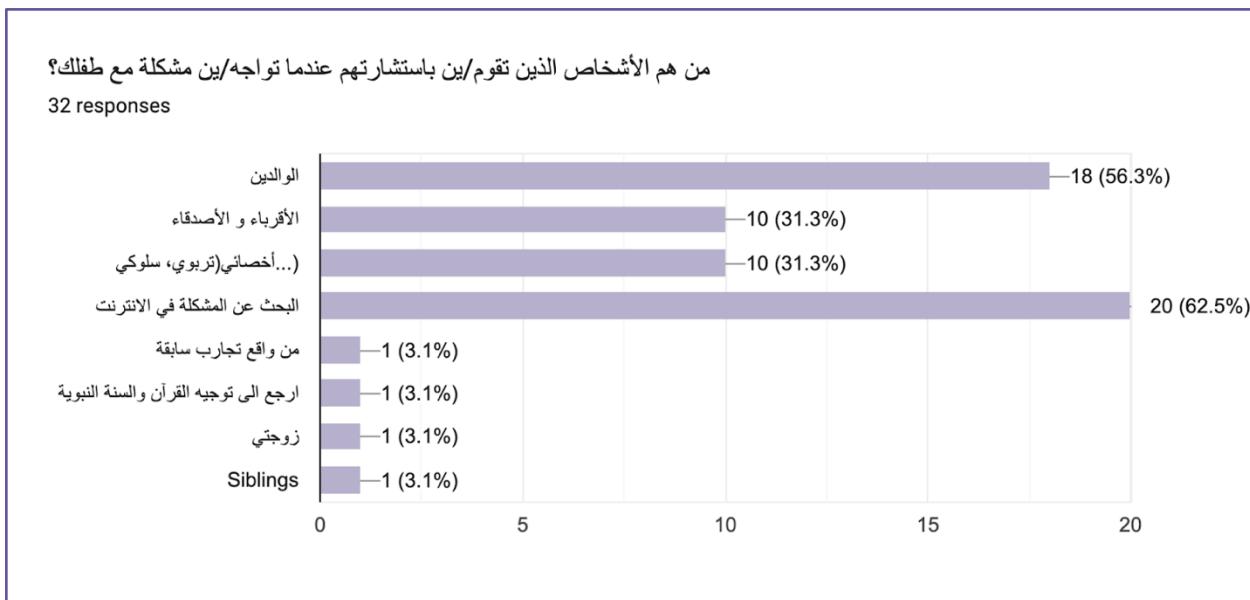
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21. APPENDIX



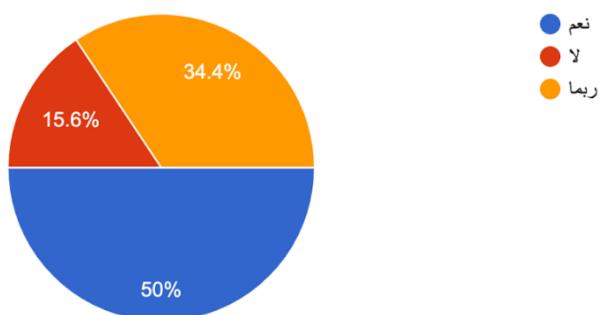
Appendix 1 Survey question1



Appendix 2 Survey question2

إذا كنت ترید/ین استشارة لطفالك، هل تواجه/ین صعوبة في تحديد الأخصائي المناسب؟

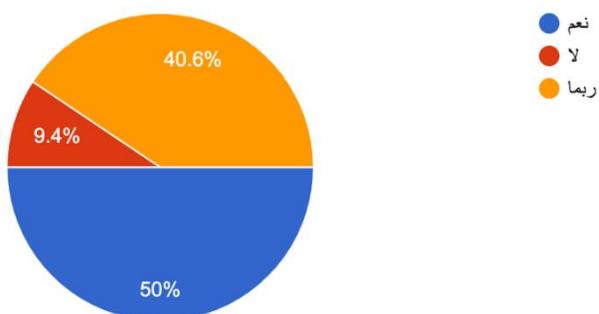
32 responses



Appendix 3 Survey question4

إذا كنت تراجع/ین مع أخصائي، هل تواجه/ین صعوبات في عملية حجز المواعيد

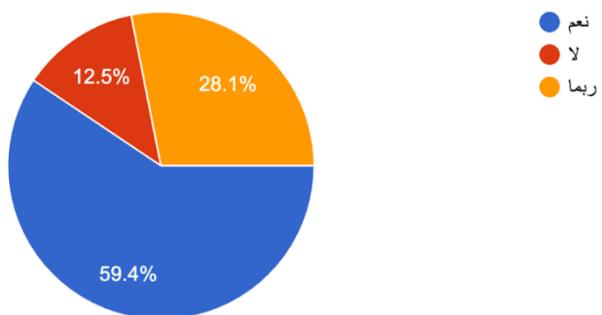
32 responses



Appendix 4 Survey question 5

(...) هل واجهتك اسباب تمنعك من الذهاب إلى احدى الجلسات استشارية (ضيق الوقت، بعد المكان، صعوبة إيجاد الموصفات، السفر

32 responses



Appendix 55 Survey question 6

Parent

مرحباً — كيف الحال نحن فريق تطبيق ابادي نود ان نشكرك على وقتك وعلى المشاركة معنا اليوم سمعناك بهذه سريعة عن ماذا سنفعل اليوم أو لا سنسألك بعض الأسئلة التي تخصك وعن مدى معرفتك وخلفتك عن الموضوع بعد ذلك سنطلب منك تجربة بعض المهام في تطبيقنا. هذا الاختبار هو خطوة أساسية في تطوير تطبيقنا لذلك المصداقية والثقة مهمان للغاية لذا من فضلك حاولي التصرف كما لو كنت تستخدمنا التطبيق بغيرك دون ان يشاهدك احد وفكري بصوت علي اثناء استخدامك تطبيقنا. نريد بالفعل سماع افكارك وملاحظاتك حول التجربة. إذا كان هناك شيء غير مفهوم بالصفحة او لا يعمل بشكل صحيح فلا تتردد في اخبارنا سنتقبلها بكل رحابة صدر

وأخيرا هل تمانع/ين تسجيل اختبار اليوم؟
جميل نتمنى لك تجربة ممتعة

أسئلة ما قبل الاختبار للأخصائي

هل تقوم بالاستشارات التربوية والسلوكية عادة؟
هل تفضل استخدام الاستشارة عن طريق تطبيق بدلا من الذهاب للمعيادة؟
هل استخدمت تطبيق الاستشارات من قبل؟

شكرا لك على ا gioyek نحن الان جاهزون لبدء الاختبار لكن قبل ذلك نود تذكيرك ببعض النقاط او لا تذكرني اتنا اليوم نقوم بتجربة البرنامج ذاته لذا إذا كان هناك شيء لا يعمل لا تقلقى فقط تكون مشكله برمجية لدينا وليس شيء خاطئ قمت به تذكرني لا يوجد اجوبة خاطئة هنا

السيناريو:

قم بتسجيل حساب جديد
قم بإضافة طفل جديد
قم بالبحث عن اخصائي جديد
قم بحجز موعد جديد
قم بتعديل يوم مواعيك الحالي
قم باستعراض الملف الشخصي
قم بتسجيل الخروج

أسئلة ما بعد الاختبار:

كيف تصنفين تجربتك بشكل عام مع ابادي؟
كم مرة مستخدمنا تطبيقنا؟
ما رأيك بالصفحة الرئيسية؟
ما هو أكثر شيء نال على اعجابك أثناء استخدام التطبيق؟
ما الذي فاجأك بالتجربة ان وجد؟

شكرا لك على مشاركتنا في هذا الاختبار
هل هناك اي شيء نريد/ين اضافته قبل ان ننتهي؟

جميل شكرنا لك مرة اخرى على وقتك وعلى المشاركة في هذه التجربة معنا
سنكون مسامعينك اليوم معنا مفيدة لنا جدا. الى اللقاء

Appendix 6 Parent Usability testing script

Specialist

مرحبا — كيف الحال نحن فريق تطبيق ابادي نود ان نشكرك على وقتك وعلى المشاركة معنا اليوم سمعتيك نبذة سريعة عن ماذا سنفعل اليوم أولاً سنسألك بعض الأسئلة التي تخصك وعن مدى معرفتك وخلفيتك عن الموضوع بعد ذلك سنطلب منك تجربة بعض المهام في تطبيقنا. هذا الاختبار هو خطوة أساسية في تطوير تطبيقنا لذاك المصداقية والثقة مهمان للغاية لذا من فضلك حاولى التصرف كما لو كنت تستخدمنا التطبيق بمفردك دون ان يشاهدك أحد وفكري بصوت عالى اثناء استخدامك تطبيقنا. نريد بالفعل سماع افكارك وملاحظاتك حول التجربة. إذا كان هناك شيء غير مفهوم بالصفحة او لا يعمل بشكل صحيح فلا تتردد في اخبارنا سنتقبلها بكل رحابة صدر

وأخيرا هل تمانع بين تسجيل اختبار اليوم؟
جميل تمنى لك تجربة ممتعة

أسئلة ما قبل الاختبار للأخصائي

هل تفضل تقديم الاستشارات عن بعد بدلاً من الاستشارة الحضورية؟
هل استخدمت تطبيق للاستشارات من قبل؟
هل قدمت استشارة عن بعد من قبل؟

شكرا لك على ا gioinyk نحن الان جاهزون لبدء الاختبار لكن قبل ذلك نود تذكيرك ببعض النقاط
أولاً تذكرني اتنا اليوم نقوم بتجربة البرنامج ذاته إذا كان هناك شيء لا يعمل لا تقلقي فقط تكون مشكله برمجية لدينا وليس شيء خاطئ قمت
به تذكرني لا يوجد اجوية خاطئة هنا

السيناريو:

قم بتسجيل حساب جديد
قم بضبط جدولة مواعيدهك
قم باستعراض المواعيد القائمة
قم باستعراض الملف الشخصي للطفل
قم برفق تقرير للمعلم بعد الجلسة
قم بتعديل الملف الشخصي
قم بتسجيل الخروج
أسئلة ما بعد الاختبار:

كيف تصنفين تجربتك بشكل عام مع ابادي؟
كم مرة مستخدمنا تطبيقنا؟
ما رأيك بالصفحة الرئيسية؟
ما هو أكثر شيء نال على اعجابك أثناء استخدام التطبيق؟
ما الذي فاجأك بتجربة ان وجد؟

شكرا لك على مشاركتنا في هذا الاختبار
هل هناك اي شيء تريدين اضافته قبل ان ننتهي؟

جميل شكرنا لك مره اخرى على وقتك وعلى المشاركة في هذه التجربة معنا
ستكون مساهمتك اليوم معنا مفيدة لنا جدا. الى اللقاء

Appendix 7 Specialist Usability testing scrip

Admin

مرحبا — كيف الحال نحن فريق تطبيق ايادي نود ان نشكرك على وقتك وعلى المشاركة معنا اليوم ستعطيك نبذة سريعة عن مادا سنفعل اليوم او لا سئالك بعض الأسئلة التي تخصك وعن مدى معرفتك وخلفتك عن الموضوع بعد ذلك سنطلب منك تجربة بعض المهام في تطبيقنا. هذا الاختبار هو خطوة أساسية في تطوير تطبيقنا لذلك المصداقية والدقة مهمان للغاية لذا من فضلك حارلي التصرف كما لو كنت تستخدمين التطبيق بمفرنك دون ان يشاهدك أحد وفكري بصوت عالي اثناء استخدامك تطبيقنا. نريد بالفعل سماع افكارك وملاحظاتك حول التجربة. إذا كان هناك شيء غير مفهوم بالصفحة او لا يعلم بشكل صحيح فلا تتردد في اخبارنا سنتقبلها بكل رحابة صدر

وأخيرا هل تمانع/ين تسجيل اختبار اليوم
جميل نتمنى لك تجربة ممتعة

أسئلة ما قبل الاختبار للمشرف

هل كنت مشرف عن نظام من قبل؟
هل استخدمت او تعاملت مع تطبيق للاشتراكات من قبل؟

شكرا لك على اجوبيك نحن الان جاهزون لبدء الاختبار لكن قبل ذلك نود تذكريk ببعض النقاط
ولا تذكرني اتنا اليوم نقوم بتجربة البرنامج ذاته لذا إذا كان هناك شيء لا يعمل لا تقلقى فقط تكون مشكله برمجية لدينا وليس شيء خاطئ قمت به تذكرني لا يوجد اجوبة خطأ هنا

السيناريو:

قم بتسجيل الدخول كمشرف للنظام
Email: ayadi@admin.com
Password: 123456789
قم بقبول طلب اخصائي جديد
قم باستعراض أطفال الوالدة
قم باستعراض تقييم الاخصائيين
قم بتسجيل الخروج

أسئلة ما بعد الاختبار:

كيف تصنفين تجربتك بشكل عام مع ايادي؟
ما هو أكثر شيء نال على اعجابك أثناء استخدام التطبيق؟
ما الذي فاجأك بالتجربة إن وجد؟
شكرا لك على مشاركتنا في هذا الاختبار

هل هناك اي شيء تريده/ين اضافته قبل ان ننتهي؟

جميل شكرنا لك مره اخرى على وقتك وعلى المشاركة في هذه التجربة معنا
ستكون مساهمتك اليوم معنا مفيدة لنا جدا. الى اللقاء

Appendix 8 Admin Usability testing script

Usability testing's recorders:

All the recorded sessions have been uploaded in this link: ([Usability records](#)).

Appendix 9 usability testing's records

اختبار قابلية الاستخدام لتطبيق أيادي

قياس مستوى الرضا عن الاختبار (SUS) مقياس

Image title

الاسم *
Short-answer text

العمر *
Short-answer text

الجنس

ذكر
 أنثى

اعتقد أني أرحب في استخدام هذا التطبيق بشكل متكرر:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

لقد وجدت التطبيق معدناً بشكل غير ضروري:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

اعتقدت أن التطبيق سهل الاستخدام:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

اعتقد أني سأحتاج إلى دعم فني حتى أتمكن من استخدام هذا التطبيق:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

لقد وجدت أن الوظائف المختلفة في هذا التطبيق متكاملة بشكل جيد:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

اعتقدت أن هناك الكثير من التناقض في هذا التطبيق:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

لقد وجدت أن معظم الناس يتعلمون استخدام هذا التطبيق بسرعة كبيرة:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

لقد وجدت أن استخدام التطبيق مرتفع للغاية:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

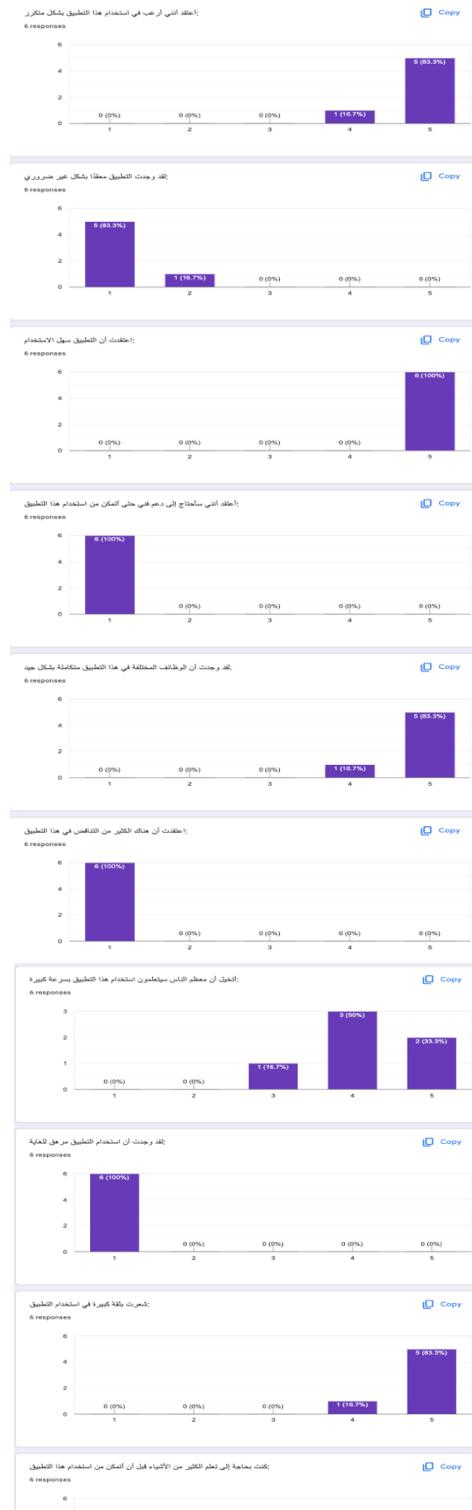
شعرت بضيق كبرى في استخدام التطبيق:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

كنت بحاجة إلى تعلم الكثير من الأشياء قبل أن أتمكن من استخدام هذا التطبيق:

1	2	3	4	5
لا أتفق	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
				أتفق

Appendix 10 Usability testing Evaluation Questioners



Appendix 11 Usability testing Evaluation Questioners results

Walkthrough Table

Task	Author	Reviewed By	Feedback
Introduction	Dina	Mais, Abeer	Clear
Domain Analysis	Lina	Khawlah	none
Risk/Constraints	Khawlah	Dina	none
Project Plan	Mais	Abeer	Clear
Quality Assurance Plan	Abeer	Lina	none
Requirements	All team	All team	need to be more organized
Problem Complexity	Mais	Khawlah	none
Design Class	Abeer, Mais	Dina, Lina	Specialist must have an email attribute

System Architecture	Lina	Abeer, Khawlah	Very good
UI	Lina	Abeer	Very creative UI
Database Schema	Dina	Lina	Clear and well defined
Algorithms	Dina	Mais	Well defined algorithm
Deployment	Abeer	Khawlah	Very clear
Prototype Description	All Team	All Team	none
Testing	Khawlah, Abeer	Lina, Dina	none
Project Status	Dina	Mais	none
Limitation of the system	Abeer	Mais	none
Future work	Khawlah	Dina	none
Conclusion	Lina	Dina	none

Appendices	All team	All team	none
References	All team	All team	none

Table 80 Walkthrough table

Appendix 12 Walkthrough

inspection Table

Task	Author	Inspector	Feedback
Introduction	Dina	Dr. Manal Bin Khonain	Before proposing a solution and defining objectives, it's essential to clarify and support the problem statement with relevant studies or surveys.
Domain Analysis	Lina		none
Risk/Constraints	Khawlah		none
Project Plan	Mais		Clear

Quality Assurance Plan	Abeer		none
Requirements	All team		needs to be more clear and better organized as it has some ambiguity.
Problem Complexity	Mais		Good
Design Class	Abeer, Mais		none
System Architecture	Lina		Good
UI	Lina		none
Database Schema	Dina		Clear
Algorithms	Dina		none
Deployment	Abeer		Clear
Prototype Description	All Team		none
Testing	Khawlah, Abeer		none
Project Status	Dina		none

Limitation of the system	Abeer		none
Furute work	Khawlah		
Conclusion	Lina		none
Appendices	All team		none
References	All team		none

Table 81 inspection Table

Appendix 13 inspection

No.	Risk	Management strategy
1	Conflict of deliverables deadlines	We used Notion, which helped us stay organized and on track with a specific timeline. By setting clear goals and deadlines for each task, we were able to prioritize our workload and allocate sufficient time for GP2 and other commitments
2	Team members have limited knowledge of required technologies.	We implemented several strategies. Firstly, we utilized external resources such as YouTube tutorials and other online resources to help team members learn about the new technologies. These resources provided a wealth of knowledge and information that team members could access in their own time. In addition, we encouraged collaboration among team members on challenging new tasks. By working together and sharing knowledge and expertise, team members were able to learn from each other and

		develop new skills. This approach also helped to build a sense of camaraderie and teamwork among team members.
3	The project domain is not well understood due to insufficient knowledge.	We Conducted thorough research and analysis of the project domain. This can include reviewing relevant literature, conducting market research, and analyzing existing data to gain a better understanding of the domain.
4	The idea may not have the attention of users	To enhance user engagement and meet the needs of the target audience, we have incorporated the most frequently used features into the product. By prioritizing the features that are crucial to users and making them easily accessible, we can create a more user-friendly and relevant product. This approach involves gathering user feedback, streamlining the user interface
5	The project process is challenging to manage.	We used management tools to effectively manage the project and ensure that it progressed smoothly. Additionally, we have implemented weekly meetings to review project status and track the progress. These meetings provide an opportunity to discuss any issues or challenges that arise, brainstorm solutions, and make necessary adjustments to keep the project on track.

Table 82 risk and constraints
Appendix 14 risk and constraints

These requirements were canceled:

FQ1.The Specialist shall be able to postpone scheduled appointments.

This requirement was cancelled because the specialist has the ability to set their schedule as desired. If there is a need to not enter the session, the specialist can always delete the appointment.

FQ2.The Specialist shall be able to view a chart that illustrates the child's progress.

This requirement was cancelled due to the system's many requirements, and because of time constraints one of the requirements had to be canceled. This decision was made to ensure that there would be sufficient time to implement the remaining requirements.

These requirements were added:

FQ1.The admin shall be able to view a the specialist IBAN.

We later realized that in order for the specialist to receive his/her earnings, the admin needs to have the specialist IBAN to add it to the payment getaway or transfer the amount manually.

FQ2.The Parent shall be able to view his/her wallet.

This feature was necessarily to add, due to the fact if an appointment was canceled, the parent needs to be refunded.

Appendix 15 Functional Requirement Updates

The system Use Cases were edited slightly after changing some of the system's requirements.

1. Specialist use case:

Postpone appointment use case was removed following the requirements changes, in addition to the payment getaway actor that verifies the Bank information since these information will be added manually by the admin to the payment getaway then verified later, or transforming the amount manually.

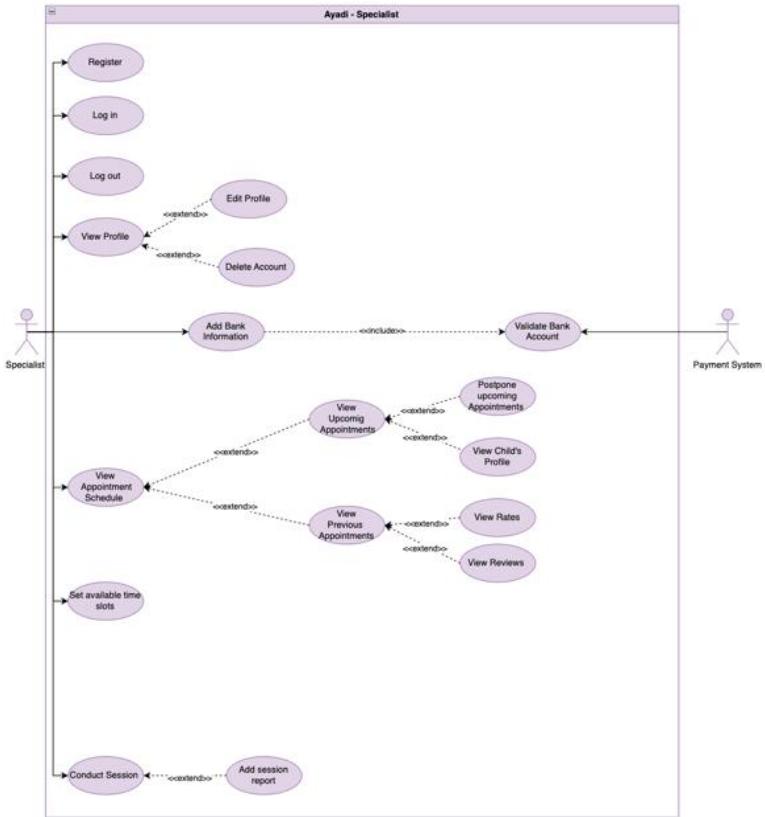


Figure 110: earlier version of the specialist use case diagram

2. Admin use case:

The new requirement view specialist IBAN was added following the requirements changes.

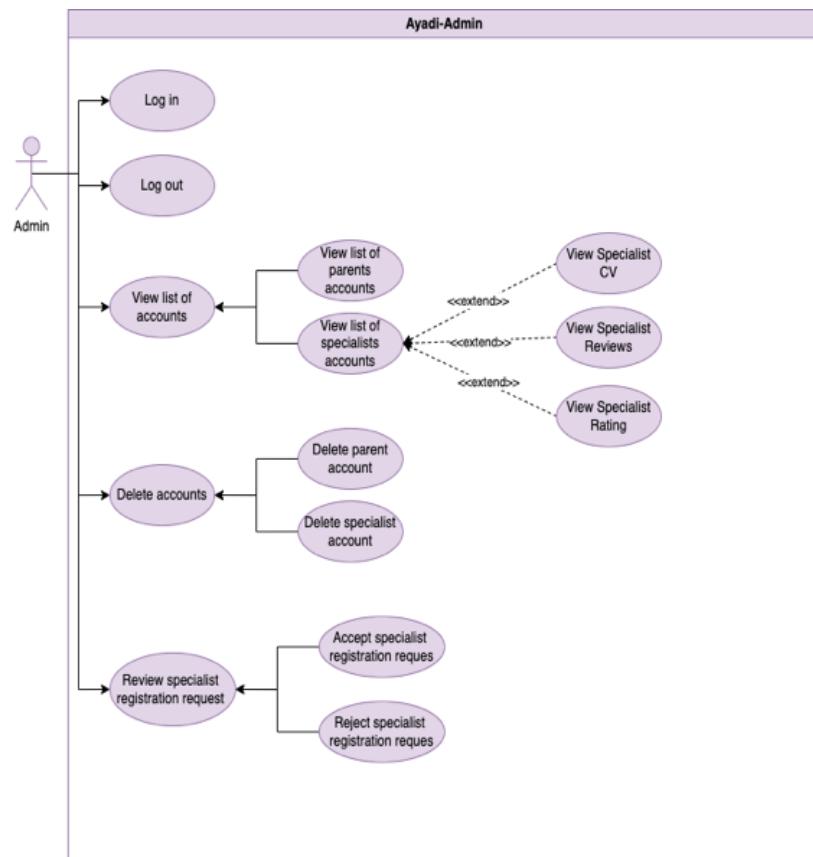


Figure 111: earlier version of the Admin use case diagram

Appendix 16 use case Updates

Design Updates:

1. Component Diagram

In the database, the collection **Appointment** and **Report** were canceled, and their fields were added to the session collection (as discussed in the Database Updates) due to this, the Appointment and Report component were removed.

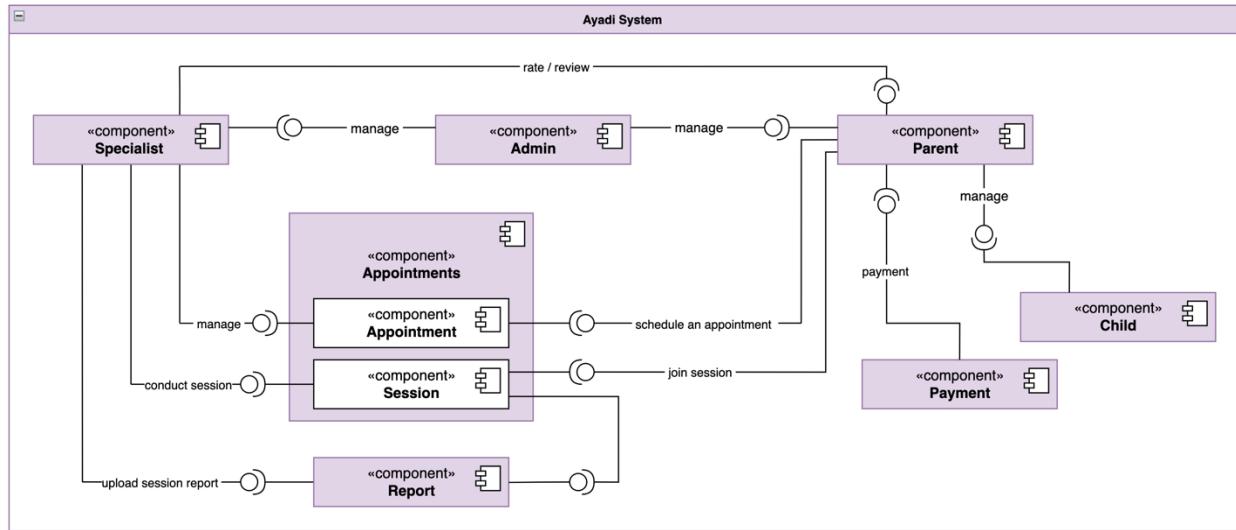


Figure 112: earlier version of the component diagram

2. Class Design

In the database, the collection **Appointment** and **Report** were canceled, and their fields were added to the session collection (as discussed in the Database Updates) due to this, the Appointment and Report classes were removed.

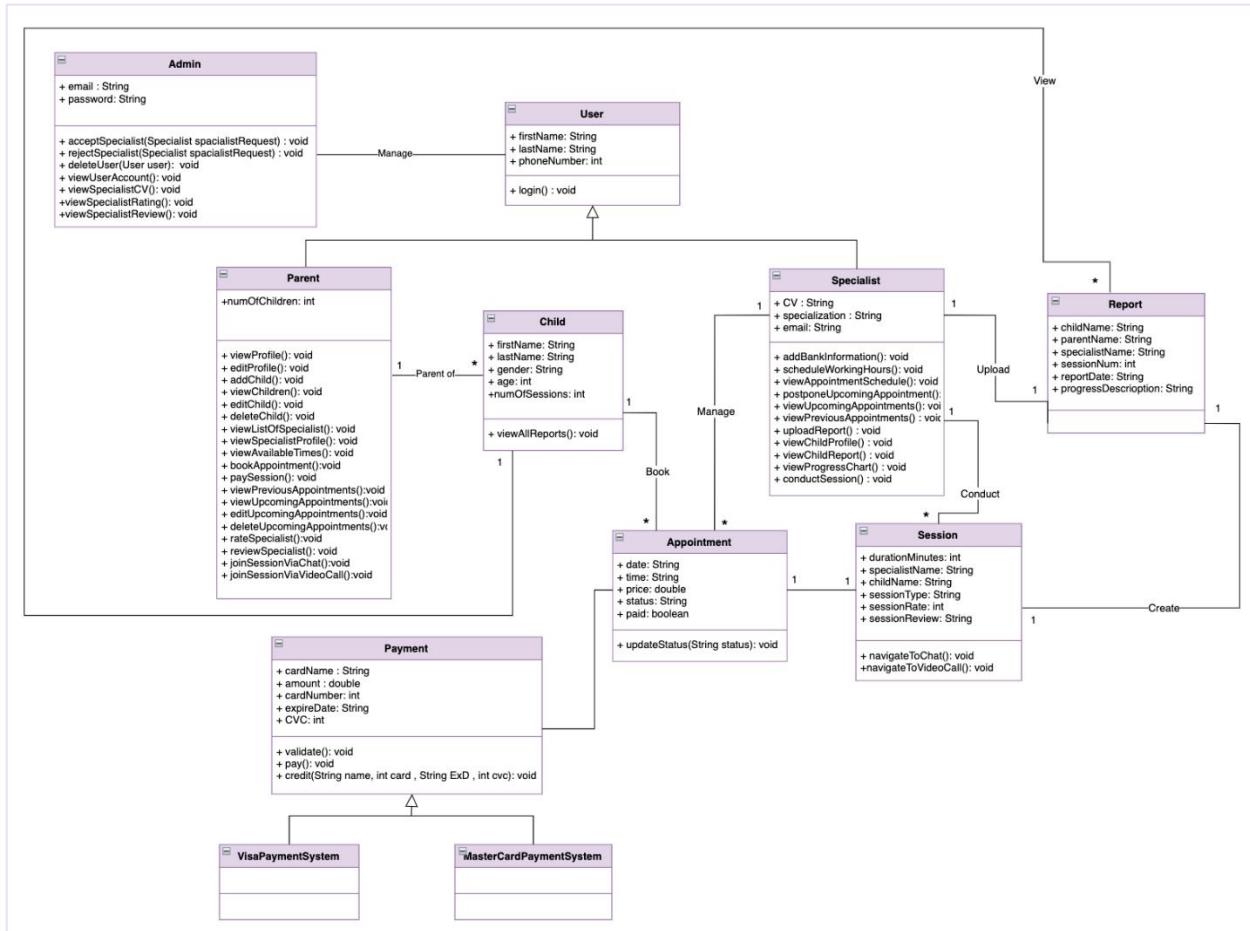


Figure 113: earlier version of the class design

3. Deployment Diagram

In the database, the collection **Appointment** and **Report** were canceled, and their fields were added to the session collection (as discussed in the Database Updates) due to this, the Appointment and Report components were removed.

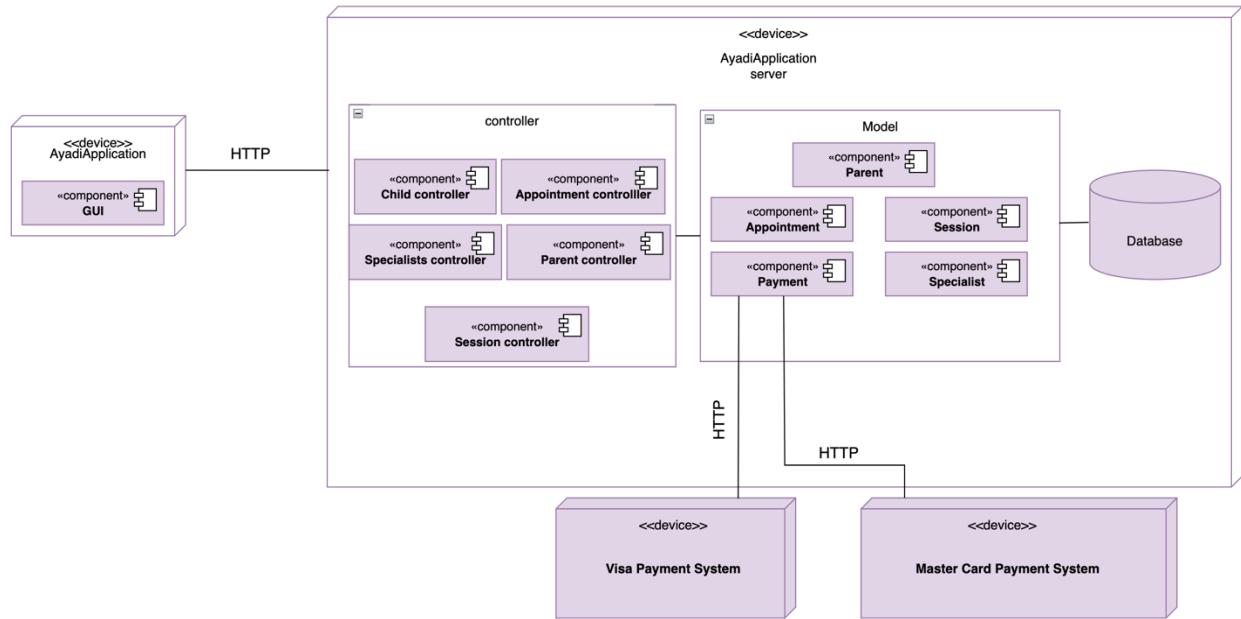


Figure 114: earlier version of the Deployment Diagram

4. Postpone Appointment Use Case description, Analysis Diagram, and Sequence Diagram

Due to the requirement Postpone Appointment being cancelled, the Use Case description, Analysis Diagram, and Sequence Diagram for this requirement use case were replaced by Edit Appointment use case

1. Postpone Appointment Use Case description

Use-Case Description		
System Ayadi System		
Use-Case Name Postpone upcoming appointment		
Primary Actor Specialist		Secondary Actors Parent
Description This use case allows specialists to postpone their upcoming appointment.		
Relationships <ul style="list-style-type: none"> • Extends: None. • Includes: None. 		
Pre-Conditions <ol style="list-style-type: none"> 1. The specialist must have an account. 2. The specialist must have logged in successfully. 3. The specialist must have an upcoming appointment. 		
Basic Flow		
Primary Actor Specialist	System	Secondary Actor Parent
1. This use case begins when the specialist selects postpone for specific upcoming appointment. 3. The specialist selects his/her available time slots. 4. The specialist submits his/her selection. 6. The specialist confirms the order.	2. The system displays available time slots for the specialist. 5. The system displays a message requesting the specialist to confirm changes. 7. The system displays a success message to the specialist.	8. Parent will receive a notification inform him/her with the new appointment date and time
Alternative and Exceptional Flows <ol style="list-style-type: none"> 3.1 Missing field <ul style="list-style-type: none"> If the specialist misses a required fields in step 3, then: <ol style="list-style-type: none"> 3.1.1 The system displays an error message indicating misses' field(s). 3.1.2 Resuming step 3. 6.1 Operation canceled <ul style="list-style-type: none"> If the specialist cancels the operation instead in step 6, then: <ol style="list-style-type: none"> 6.1.1 The use-case ends with a failure condition. 		
Post-Conditions <ul style="list-style-type: none"> • Successful Condition: The appointment has been postponed successfully. • Failure Condition: No appointment postponed. 		

Figure 115: the deleted version of the postpone appointment use case description

2. Postpone Appointment Sequence Diagram

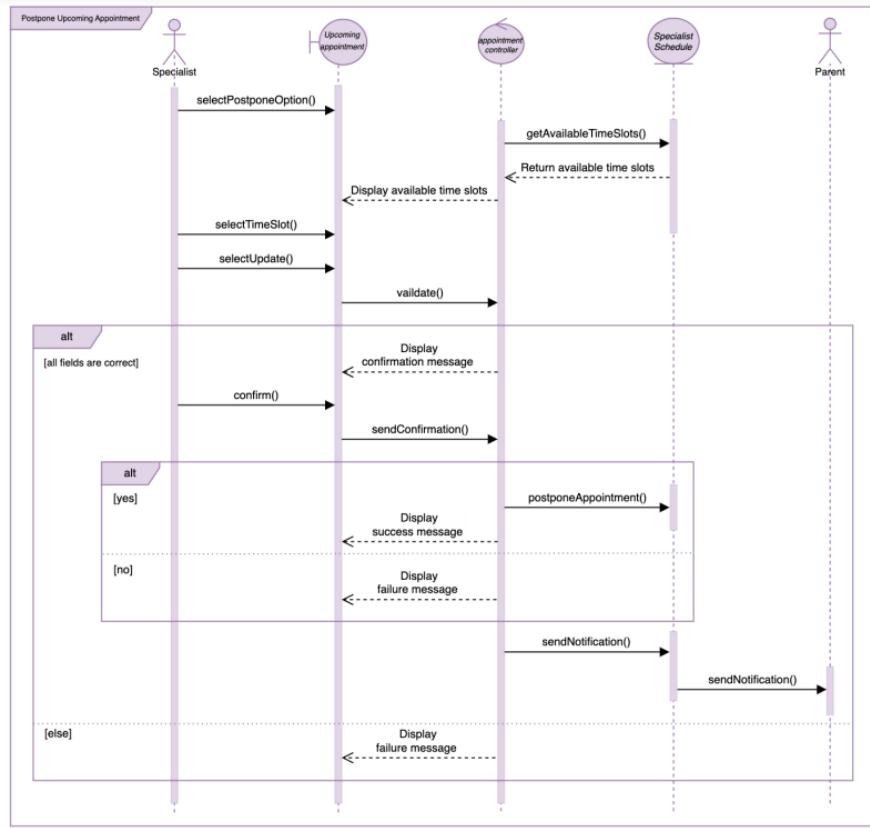


Figure 116: the deleted version of the postpone appointment Sequence Diagram

3. Postpone Appointment Analysis Class Diagram

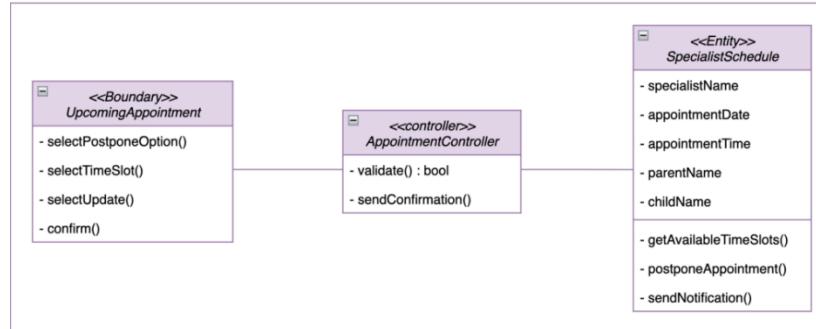


Figure 117: the deleted version of the postpone appointment Analysis Class Diagram.

Appendix 17 Design Updates

Algorithm Updates:

While developing our system, we added two extra algorithms which are:

- 1- Video call button enabled only when the session has been started and disabled when the session has been done.
- 2- Calculating appointments times based on the specialist's schedule to be 45-minutes appointments.

Also, our previous algorithm's pseudo code has been updated, the figure below shows the old version:

```
1 //session countdown function
2 This program will calculate the time left for a session every minute to notify the user
3
4 function TimeLeft(maxMinutes)[
5
6     while session is not completed{
7
8
9         if maxMinutes > 0:      //Case 1: the session is still going
10
11             if maxMinutes == (maxMinutes/4): // Case 1.1: the session has the fourth of the original time until it ends
12                 print maxMinutes + " until the end of session"
13                 notify_parent_and_specialist(maxMinutes)
14             End if
15
16             maxMinutes--
17         End if
18
19
20
21
22         if maxMinutes == 0: // Case 3: the session has ended
23             Session completed
24             print "session ended"
25         End if
26
27         Sleep for 1 minute
28
29
30     }
31
32 ]
```

Figure 118 earlier version of algorithm

Appendix 18 Algorithm Updates

Database Updates:

In the database schema, the main changes involved removing the Appointments and Reports Collections. The main reason behind this change was to improve the performance of our system. Since the Appointment, Report, and Session Collections were very similar, they were often needed together when writing the code. This led us to call three collections in many places, which negatively affected the performance of our system.

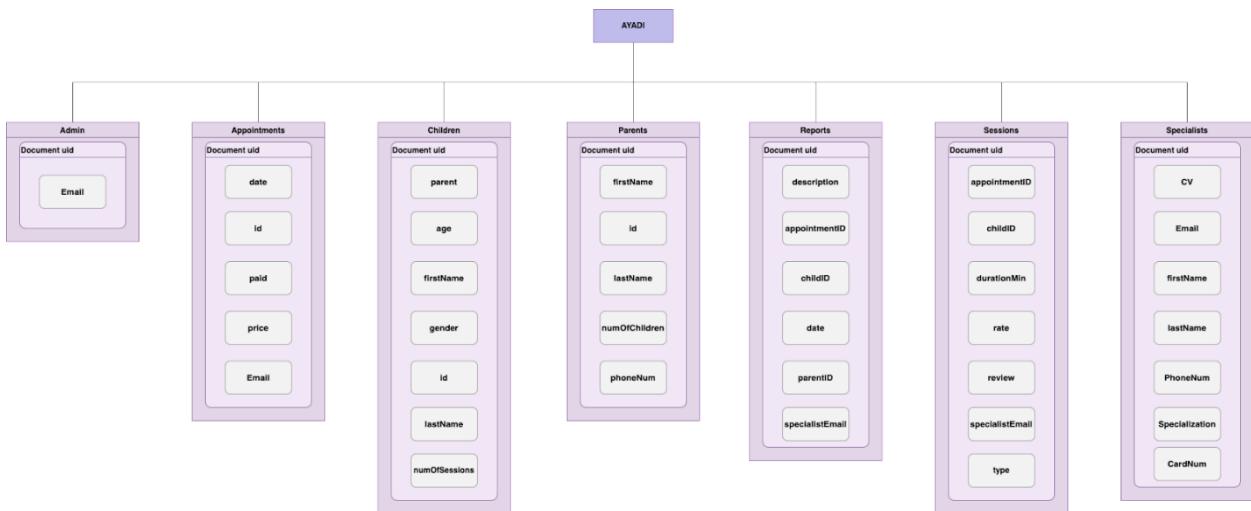


Figure 119: earlier version of the database schema

Appendix 19 Database Schema Updates