Attendance Management System - Carmey Gil Center

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המכללה האקדמית להנדסה בכרמיאל
בראודה

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Abstract

The Carmey Gil Center, a rehabilitative employment facility, supports individuals with intellectual, physical, and sensory disabilities. The center currently faces challenges in manually tracking attendance and lacks an effective system for monitoring the emotional well-being of its participants. These issues hinder operational efficiency and the personalized care provided at the center, making it necessary to implement a customized, accessible solution.

This project introduces a comprehensive computerized attendance system tailored to the unique needs of the center's service recipients. The system will automate attendance tracking by enabling service recipients to select their image from a group list, followed by recording their emotional state through an intuitive emoji-based interface. The service recipients interface is designed with accessibility in mind, using large buttons, simple navigation, and multilingual support to accommodate the diverse needs of the center's participants. The system will be deployed on new touch-screen devices, which will be purchased and installed at the center.

By automating attendance and emotional state tracking, the system will not only reduce the administrative burden on staff but also enhance the accuracy of records and provide critical emotional data to support timely interventions. This solution is designed to increase operational efficiency, improve care quality, and ensure that the system is accessible to all participants at the Carmey Gil Center.

1.   Introduction

Intellectual disability involves significant challenges in cognitive functioning and adaptive behavior, which can impact a person's ability to learn, communicate, and interact with others. This condition affects around 1-3% of the global population, with causes ranging from genetic and environmental factors to medical conditions, and it can vary widely in severity [7]. Individuals with intellectual disabilities often struggle with daily tasks that require cognitive and adaptive skills, making it essential to develop systems and tools that address their unique needs.

The Carmey Gil Center serves individuals with a range of disabilities, including intellectual, physical, and sensory impairments. One of the key challenges faced by the center is the time-consuming manual process of tracking attendance. This task requires staff members to divert their attention from other critical responsibilities, leading to inefficiencies in daily operations. Additionally, the lack of a system to monitor the emotional well-being of attendees hinders the center's ability to provide comprehensive, personalized care. A more efficient and integrated approach is needed to support both the staff and the individuals they serve, ensuring that all aspects of care, including emotional monitoring, are addressed effectively.

Current attendance management systems often rely on manual processes or advanced technologies that are not fully accessible to individuals with disabilities. For example, systems like FaceFirst [11]. Use facial recognition for attendance tracking, which is primarily designed for industrial applications and does not account for the cognitive and physical challenges faced by people with disabilities. Moreover, these systems typically lack the capability to monitor emotional states, which is essential in environments such as the Carmey Gil Center. This gap highlights the need for a more inclusive and tailored solution that our system aims to provide.

In our project, we are focused on creating a customized computerized attendance system designed specifically to meet the needs of individuals with intellectual disabilities. This system

not only tracks attendance but also monitors emotional well-being, providing tailored support to help them navigate their daily routines with greater ease and independence.

1.1 Flagship Project

Flagship projects are important projects that show off new ideas and set new standards in their field. These projects have a big impact on society. They use the latest technology and new ways to solve problems. Flagship projects show strong leadership and creative thinking. They often lead the way for new developments in the future.

Attendance system for Carmey Gil Center as a prime example of a flagship project, reimagining support for individuals with disabilities. This innovative system transcends traditional attendance tracking by incorporating sophisticated emotional state monitoring. Utilizing advanced technologies alongside a user-friendly, emoji-based emotional feedback interface, the system provides real-time insights to caregivers, enabling them to offer timely, personalized support tailored to each participant's emotional state.

This groundbreaking integration of accessibility features and emotional intelligence sets new benchmarks in disability care. By marrying cutting-edge technology with individualized care, the project represents a significant leap forward. Its dual focus on enhancing operational efficiency while prioritizing personalized care solidifies its status as a flagship initiative in the realm of assistive technology.

2.   Literature Review

2.1 Usable Design for Inclusive Population

Developing user-friendly interfaces for individuals with disabilities demands a profound understanding of their unique needs and preferences. Research indicates that mobile applications featuring simple, customizable interfaces such as those allowing adjustments to font size and language selection significantly enhance user engagement and satisfaction [2]. Key design principles play a crucial role in promoting independent task execution. These include implementing large, easily identifiable buttons, providing clear, concise instructions, and creating intuitive navigation paths. Adherence to these principles substantially aids users in their interactions with the system [4]. In essence, the thoughtful design of system interfaces, guided by principles tailored for individuals with special needs, helps users overcome physical or intellectual barriers. This approach enables them to utilize the system with the same efficacy as any other user.

2.2 User-Centered Design - UCD

User-centered design (UCD) is an approach that focuses on involving users at all stages of development to ensure that the system meets their needs optimally. This approach emphasizes a deep understanding of the users, including their needs, abilities and limitations, and involves them in the product or system development process. In the UCD method, extensive research is carried out on the users, data is collected regarding their preferences and challenges, and tests are carried out with the users to check the suitability of the product for their needs. This process is found to be particularly effective when developing applications for people with cognitive disabilities, because it allows us to examine how the interfaces affect the users, to improve the user experience and make it more intuitive [2]. Technologies developed using a user-centered approach can be seen. In certain gaze-based technology,

the unique needs of people with cerebral palsy are used as a main driver for the development of technologies that allow them to communicate and act more effectively [5]. The direct involvement of users with intellectual disabilities in the design process is an important thing in order to create solutions that fit their real needs [9]. The integration of users throughout the development process increases the effectiveness of the product and ensures that it will meet the needs and be adapted to the disabilities of the specific users for whom it is intended.

2.3 Development Process of Assistance Technology for Users with Disabilities

The development of applications for users with disabilities demands a comprehensive, user-centered approach. This process emphasizes the critical importance of thoroughly understanding users' specific needs, while incorporating iterative development cycles and ongoing user feedback [1]. The approach extends to adapting existing technologies for simple use by those with special needs. A study on a technological medicine system illustrates this point, where users struggled to access medical information due to inadequate adaptation, necessitating researcher intervention [3]. Creating specialized interfaces for individuals with special needs requires careful attention to accessibility. A study presenting a system teaching route-learning to people with special needs highlights key accessibility design principles. These include limiting the number of required actions, providing text alternatives for images, and ensuring clear, user-friendly navigation [5].

2.4 Testing Process of Assistance Technology for Users with Disabilities

Rigorous testing methods are essential when evaluating software for adults with intellectual disabilities. One research compares various evaluation techniques, such as heuristic evaluation, user testing, and automated readability evaluation. During heuristic evaluation, experts evaluate the software based on predefined usability principles and ensure that it meets certain accessibility standards. User testing, on the other hand, focuses on direct interaction with the target audience, where participants complete tasks using the software and allows evaluators to collect qualitative and quantitative data on usability, comprehension, and satisfaction. By combining these methods, the study provides a comprehensive understanding of the effectiveness of this software and highlights the importance of different evaluation methods for meeting the unique needs of adults with intellectual disabilities [6]. Furthermore, Incorporating accessibility considerations at the beginning of development ensures that accessibility is a fundamental aspect of design, not an added feature later on. Identifying and addressing potential issues from the start can prevent them from becoming more complicated and expensive to resolve later on. This method enables the creation of interfaces and user experiences that meet the varied needs of all users, leading to a more uniform and fair user experience. Furthermore, consistent testing with individuals who have disabilities during the development stages offers important insights, allowing for more precise customization of the product[10]. In light of these findings, our project will incorporate observations to gather data on system usage, conduct thorough testing of each component to preempt complex issues, and involve users with disabilities throughout the development process. This approach will ensure that our attendance tracking system not only meets accessibility standards but also truly enhances the experience for all users at Carmey Gil Center.

2.5 The Impact of Assistive Technology on the Characteristics of People with Special Needs

The impact of assistive technology on the independence and responsibility of individuals with special needs is significant. Research underscores its crucial role in enhancing perceived independence in daily activities [8]. Various technologies such as communication software, organizational and control devices, and physical tools such as writing aids and fine motor skill development tools empower users to perform tasks independently, boosting their self-reliance and confidence. The effectiveness of assistive technology in promoting adaptive skills is demonstrated in a study involving children with cerebral palsy. Tailored interventions

can markedly improve children's ability to perform everyday activities such as writing, drawing to express themselves, and holding small objects. [2]. These technological solutions enable us to assume more responsibilities and engage more actively.

3.   Engineering process

3.1 Workflow

Description of the Engineering Development Process: In our engineering development process, we followed a systematic and structured approach, encompassing several key stages, as outlined in the diagram below:
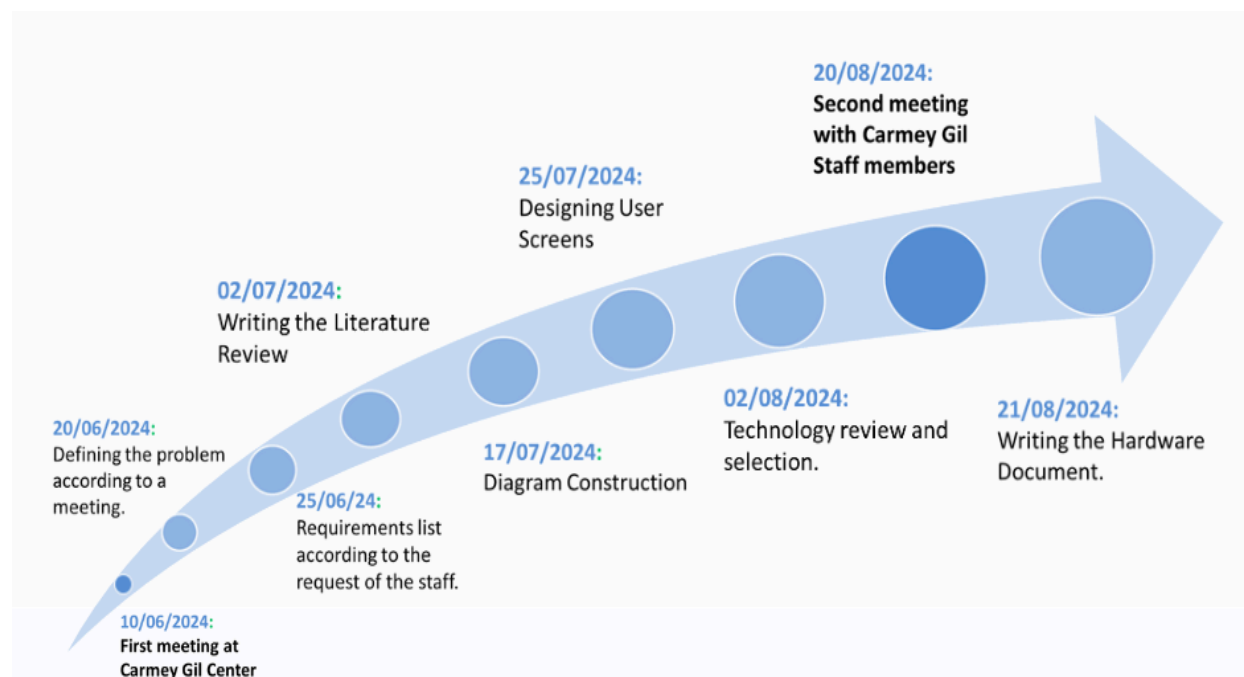

fig 1. Engineering process

3.2 Initial Meeting at Carmey Gil Center - Insights and Observations

To develop a system that best meets the unique needs of the staff and individuals with special needs at the Carmey Gil Center, we held a meeting with the staff and toured the facility. The main issue identified by the staff was the time-consuming task of manually tracking attendance. Currently, each person's arrival is recorded by a staff member on a paper sheet. The staff emphasized the need for a computerized attendance system that would allow individuals to check in themselves, thereby freeing up staff time for other important duties. Additionally, the center's psychological consultant recommended that the system should include a feature for participants to log their emotional state at the beginning and end of each day. This feature would support the center's focus on the emotional well-being of its participants.
During the tour, we observed that the group rooms are designed with a visual-based approach

and minimal text, catering to the low literacy levels of many participants. As a result, we plan to design the attendance system with a strong emphasis on icons and graphics, minimizing text to ensure accessibility. The goal is to create a user-friendly, computerized attendance system that not only reduces the administrative burden on staff but also aligns with the center's commitment to supporting the emotional needs of its diverse participants.

fig 2. Attendance form of Carmey Gil Center

These pictures describe the work actions performed by the individuals in the center. In the panel on the right they are engaged in inserting ten screws into the corresponding holes. The picture on the left shows another task where they assemble a tool using a screwing motion.

fig 3,4. Example of works at Carmey Gil Center

These images showcase various walls within the group rooms, which will serve as inspiration for our system's design. In the image on the right, one can observe the daily schedule displayed in both Hebrew and Arabic.

fig 5,6,7,8. The group rooms in Carmey Gil Center

3.3 Technology Selection

To meet the objectives of the Carmey Gil Center, our system integrates carefully selected technologies that ensure a seamless, responsive, and efficient service recipient experience.

3.3.1 Frontend with React JS

We are planning to build the frontend of our system using React JS, a popular library known for its efficiency in creating dynamic service recipient interfaces. React's component-based architecture will enable us to design a responsive and intuitive interface that can adapt seamlessly to various devices, including touch-screen TVs. Given that most of our screens will prominently feature images, this adaptability is essential for addressing the diverse needs of the center's service recipients. Our design will prioritize accessibility, incorporating large buttons, minimal text, and clear, intuitive visuals to ensure easy navigation and interaction..[12]

3.3.2 Backend with Node.js, Express.js, and MongoDB

We plan to use Node.js for the backend because it efficiently handles multiple tasks at once, which is crucial for managing real-time data such as attendance logs and emotional state tracking. Paired with Express.js, it will help us manage HTTP requests smoothly and ensure the system runs efficiently. This setup offers a scalable and reliable backend that supports the system's main features. For storing and managing user data, we chose MongoDB due to its speed and flexibility. Its document-based structure makes it ideal for quickly handling the various data types our system needs to manage. [13]

3.3.3 Reporting and Analysis with D3.js

For reporting and data visualization, we integrated D3.js, a powerful JavaScript library that allows us to create interactive and visually appealing reports. These reports enable the staff to analyze attendance records and emotional state trends effectively. D3.js excels at converting raw data into dynamic, customizable visual representations, making it an invaluable tool for delivering insights in a format that is both accessible and actionable. The system includes options for exporting these reports in various formats, such as PDF and Excel, ensuring that the center's reporting needs are fully met.[14]

3.4 Key Functionalities

- service recipients can easily log their emotional states by selecting an emoji at the beginning and end of each day. The system monitors these entries to detect any patterns, helping staff provide timely support. If a service recipient reports a negative emoji, an email is immediately sent to the manager, ensuring swift action can be taken.
- Intuitive service recipient Interface: Built with React JS, the interface is designed to be fast, responsive, and accessible, catering to the diverse needs of service recipients at the center.
- Robust Backend Management: Using Node.js and Express.js, the backend efficiently manages all processes, including secure data storage in MongoDB, ensuring smooth and reliable system performance.

- Advanced Reporting Tools: The system leverages D3.js to create interactive reports, allowing staff to analyze data trends effectively and export reports in multiple formats as needed.

3.5 Constraints Impacting the Development Process

- **Technical Constraints:**

  Support for Multiple Devices: The system should be optimized for touch-screen TVs at the center, with flexibility for future expansion to desktops, tablets, and smartphones.

- **User Constraints**:

  Accessibility and Usability: The interface must be easy to use, with large buttons, minimal text, and intuitive icons to accommodate diverse cognitive and physical abilities.

- **Reading and language limitations:**

  The system should offer multilingual support and prioritize images that illustrate concepts over complex text to facilitate communication for service recipients with varying reading abilities.

- **Resource Constraints:**

  Limited Time: We must manage our time effectively, prioritizing critical features and dividing development into manageable phases.

  Budget Constraints: To stay within budget while meeting the system's requirements, we proposed specific hardware specifications that aim to balance performance with cost savings. By carefully selecting components, such as considering a local server versus cloud storage and choosing cost-effective touch-screen displays, we aim to minimize expenses while ensuring the system's functionality and reliability.

- **Process and Regulatory Constraints:**

  Security and Privacy Requirements: The system must ensure that users can only access data within their specific authorization levels. This means implementing strict access controls so that only authorized personnel can view or modify sensitive information, ensuring that each user interacts only with the data relevant to their role.

  Integration with Existing Systems: At this stage, we will carefully manage our time to ensure that in the next phase, we have sufficient time allocated for integration. This will help us guarantee that the system is seamlessly integrated with the existing infrastructure at Carmey Gil Center, ensuring smooth operation and compatibility.

- **Operational Constraints:**

  Post-Deployment Support and Maintenance: The support and maintenance plan for the system should ensure that staff receive proper training, comprehensive

documentation is provided, and there is a clear strategy in place for handling future updates and bug fixes.

Testing Allocation: We need to ensure that the development timeline includes dedicated time for testing the system. This will allow us to verify user adoption, accuracy, and reliability before final deployment, ensuring the system functions as intended under real-world conditions.

3.6 Data Structures

- **Service Recipient Profiles:** Stored in MongoDB, each profile includes: ID, name, picture, emotional state logs, and attendance records such as check-in and check-out dates and times.
- **Staff-Member Data:** name, username, password, mail, role, permissions.
- **Guide:** The system will store detailed information about each guide, including group information such as the unique group number and the list of members in the guide's group. It will also include the guide's personal information, like their picture, username, password, and a unique identifier (ID). Additionally, the system will store pictures and basic details of each group member associated with the guide's group.
- **Attendance Logs:** Records of check-in and check-out times, linked to service recipient profiles.
- **Emotional State Logs:** Entries of service recipient emotional states at the beginning and end of each day.
- **Alerts Logs:** alert time, alert type, status (if handled)
- **Report Log:** generation time, report type, export type, export time.

4. Work Creations

4.1 FR & NFR Requirements

4.1.1 Functional Requirements

Number	Requirements
1	The system shall identify users
1.1	The system shall identify staff members
1.2	The system shall identify service recipients by picture.
1.3	The system shall adding service recipient's picture
2	The System shall support alerts
2.1	The system shall provide feedback to the service recipientr's action.
3	The system shall support managing service recipients profiles
3.1	The system shall support adding service recipients profiles
3.2	The system shall support removing service recipients profiles
3.3	The system shall support editing service recipients profiles
3.4	The system shall support assign service recipient to staff member
4	The system shall support attendance marking.
4.1	The system shall log service recipients login times.
4.2	The system shall log service recipients logout times.
5	The system shall allow attendance tracking.
5.1	The system shall generate customized reports.
6	The system shall allow data-base management.
6.1	The system shall import data to other systems (PDF, Excel, PPT).

6.2	The system shall export data to other systems (PDF, Excel, PPT).
6.3	The system shall attendance tracking
7	The system shall changing font size
8	The system shall allow mood selection.
8.1	The system shall monitor the emotional state of service recipients.
8.2	The system shall identify unusual behavior patterns.
9	The system shall support multiple languages
10	The system shall support managing staff members.
10.1	The system shall support adding staff members.
10.2	The system shall support removing staff members.
10.3	The system shall support editing staff members.
10.4	The system shall support assigning staff members to groups.
10.5	The system shall support adding managers.

Table 1. functional requirements

4.1.2 Non-Functional Requirements

Number	Requirement	Type
1	To ensure a user-friendly interface for people with special needs, we will follow relevant standards like ISO 9241-171, which offers guidelines for making software accessible to users with disabilities.	Usability
2	Attendance registration will require no more than five steps within the application.	Usability

2.1	Compatibility with major modern web browsers, including Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari, will be ensured.	Compatibility
2.3	Upon logging into the system, the service recipient will be able to select their mood for the day by choosing an emoji that represents how they feel.	Usability
3	After completing the attendance process, the system will be ready for the next service recipients within two seconds at most.	Performance
4	The system will support up to 1000 users without any degradation in performance.	Scalability
4.1	The System shall monitor performance metrics such as response time and error rates	Maintainability
4.2	The system will be available to perform operations at least 99% of the time each day.	Availability
5	The system will securely store all user data in a MongoDB database.	Security
5.1	The system will not allow access to the database during a server failure	Maintainability
6	The system should record and store user activity logs	Maintainability

Table 2. non-functional requirements

4.2 Diagrams

4.2.1 Use Case Diagram

This diagram shows the interactions between users and the system, and covers key functionalities such as logging in, marking attendance and recording emotional states. The diagram shows all the actions that each user can perform in the system, the possible actions that he can perform in any action that he wants to perform, such as the options to choose how to export a report that a team member creates. In addition, actions are shown that the user must perform, for example, in order to complete the login process, the staff member must identify himself with a correct username and password. In addition, it is possible to see authorization between the manager and the team member, which means that the manager can perform, in addition to his own actions, all the actions that a staff member can perform.
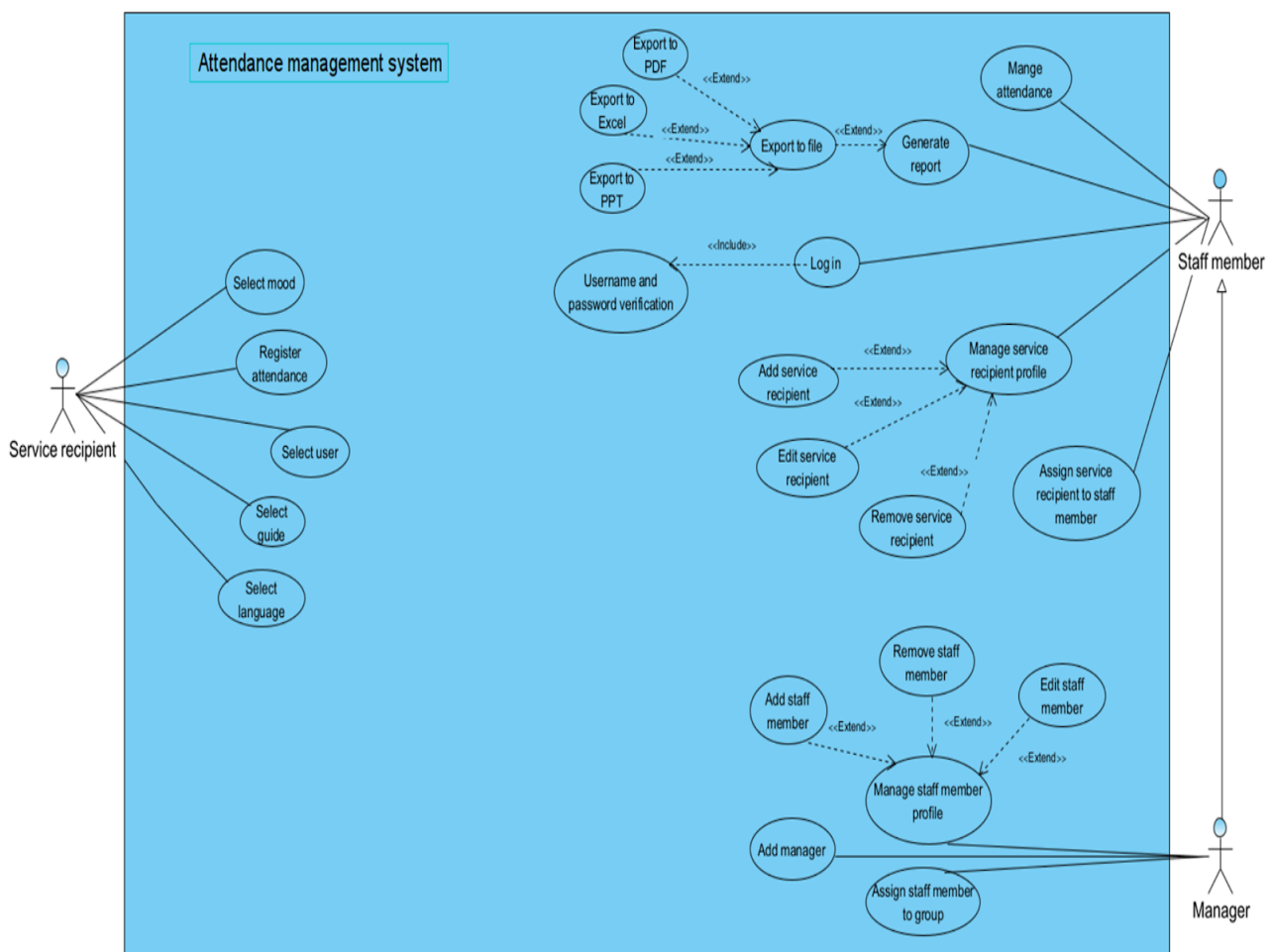

fig 9. Use Case diagram

4.2.2 Class Diagram

This diagram details the system's structure, including classes, attributes, methods, and relationships.
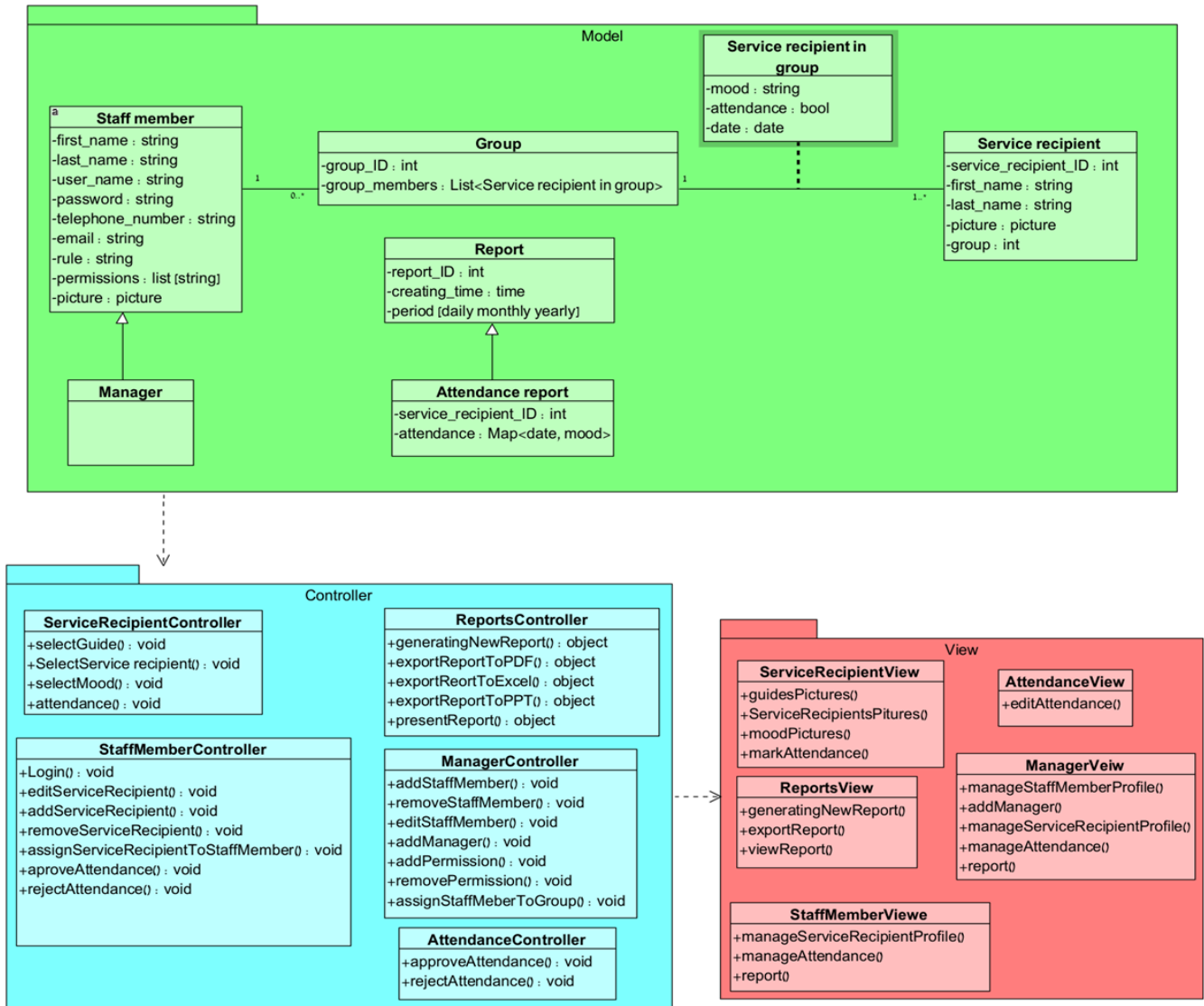

fig 10. Class diagram

4.2.3 Activity Diagram

●   This diagram maps out the workflow and processes within the system, showing the sequence of activities and how they interact.
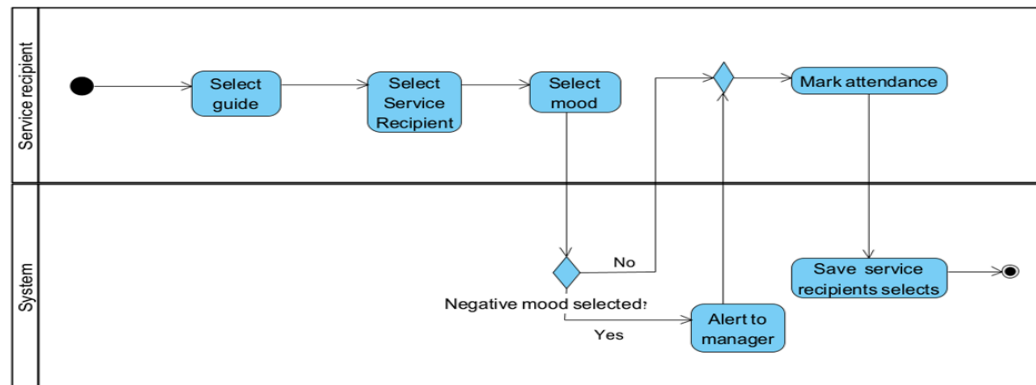

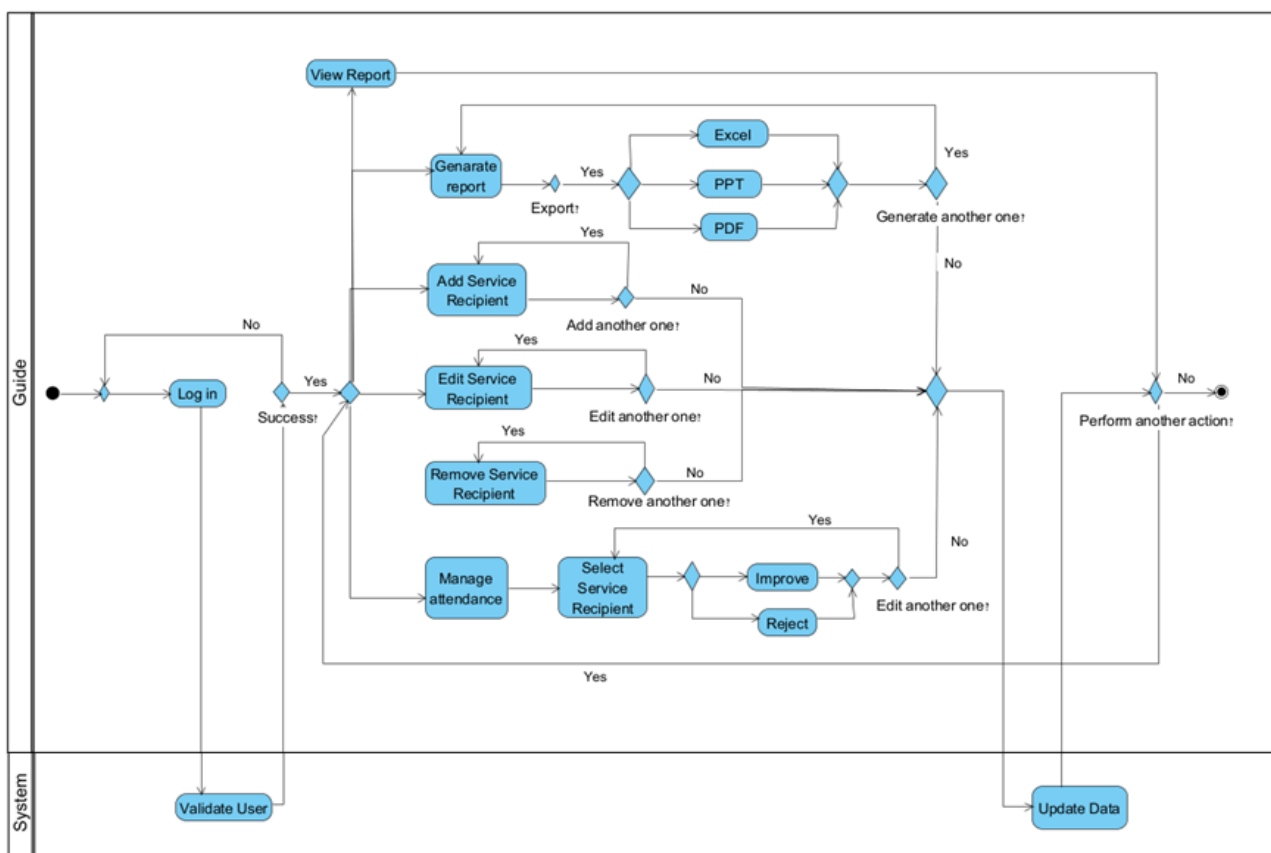*fig 11. Activity diagram - interact between service recipients to the system.*

fig 12. Activity diagram - interact between guides to the system.
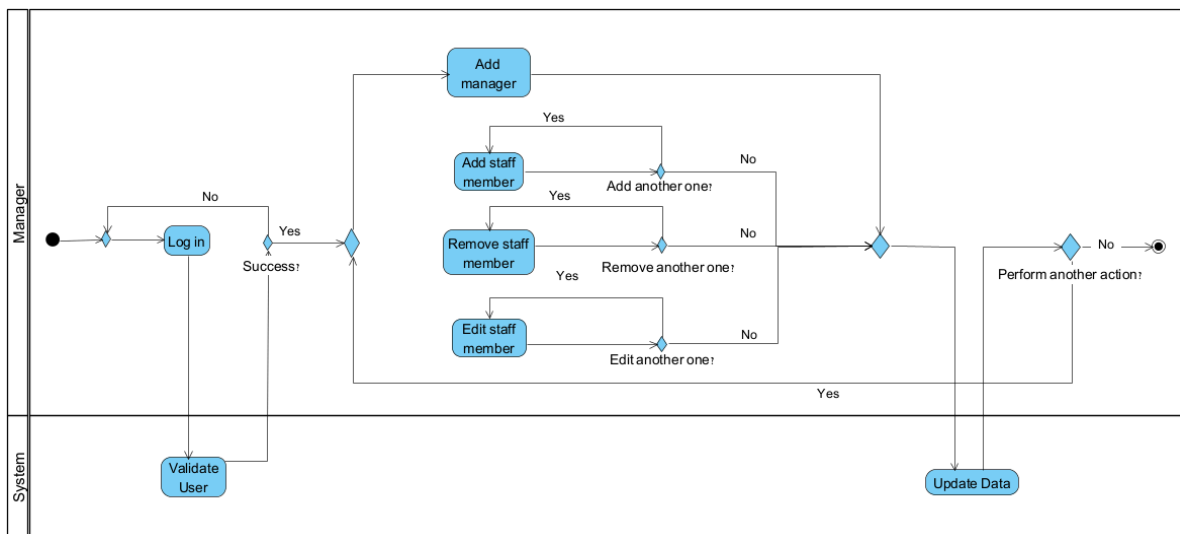
fig 13. Activity diagram - interact between managers to the system.

4.3 Screens

4.3.1 Main Screen of the System

Currently, the system is intended for use on a single screen where the attendance registration process and all other staff member actions will be performed. The opening screen present two options:
Login as a staff member for staff members and the manager.
Continue the attendance registration process for service recipients.

fig 14. Main screen of the system.

4.3.2 Guide Image Selection Screen

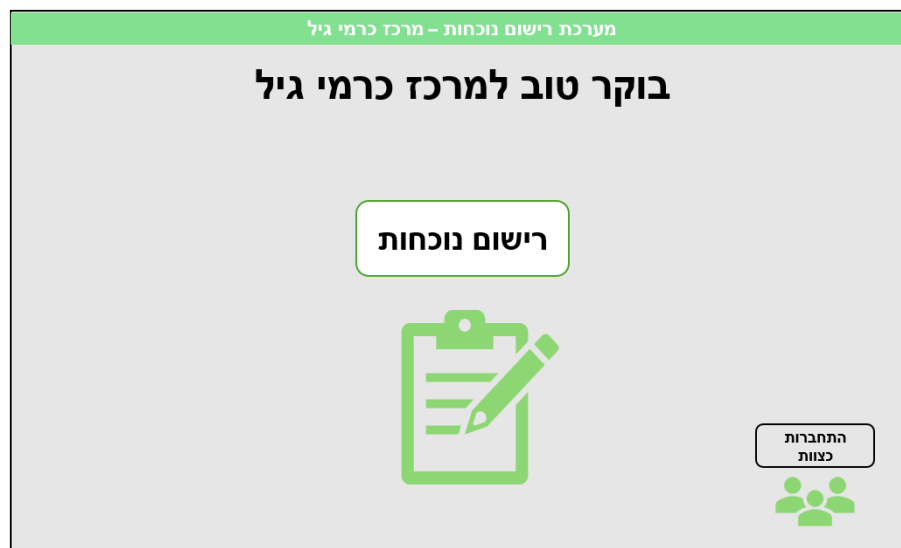The screen displays pictures of all the Carmey Gil guides. The service recipient selects the image of the guide who leads their group. After choosing their guide, the service recipient clicks 'Continue' to proceed to the service recipient selection page. Additionally, the screen features a globe icon for language selection, allowing service recipients to switch to another language, accommodating the needs of service recipients from diverse linguistic backgrounds.

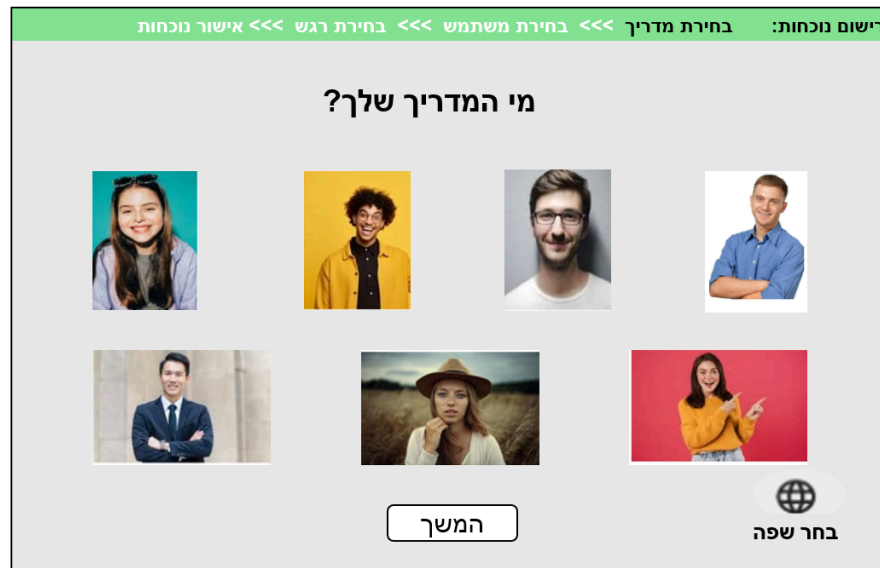*fig 15. Guide's Image Selection Screen*

4.3.3 Service Recipient Image Selection Screen

The screen displays pictures of all the service recipients who belong to the group of the guide that was selected in the previous screen. After choosing their own photo, the service recipient clicks 'Continue' to proceed to the emotion selection page.
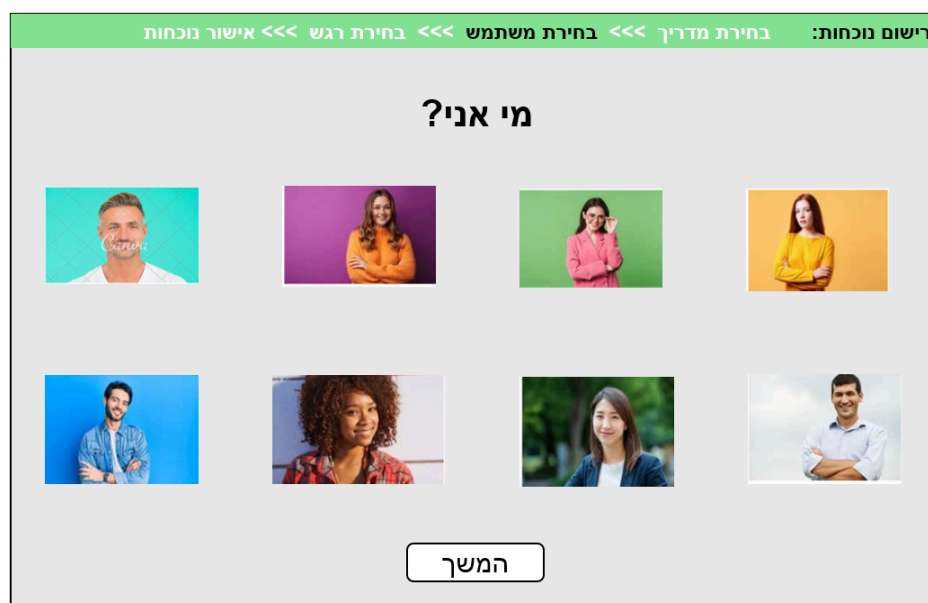
fig 16. Service Recipient's Image Selection Screen

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4.3.4 Emotional Selection Screen

The screen shows a range of emotions represented by emojis and accompanying words. The service recipient selects the emoji that best describes their current emotional state and clicks on the finish button to finish the process.

fig 17. Emotional State Selection Screen

4.3.5 Staff Member - Login Screen

The staff login screen features input fields for username and password. After entering their credentials, the staff member clicks the 'LogIn' button. Upon successful authentication, they are directed to their main screen, which is tailored to their specific role in the center.

fig 18. staff member and manager - Login Screen

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4.3.6 Guide Main Screen

This screen exemplifies the main screen for a guide in our system. After successful login with their username and password, the guide will access a screen similar to this one. The interface will display the options to the guide within the system:
service recipient management, attendance, reports.
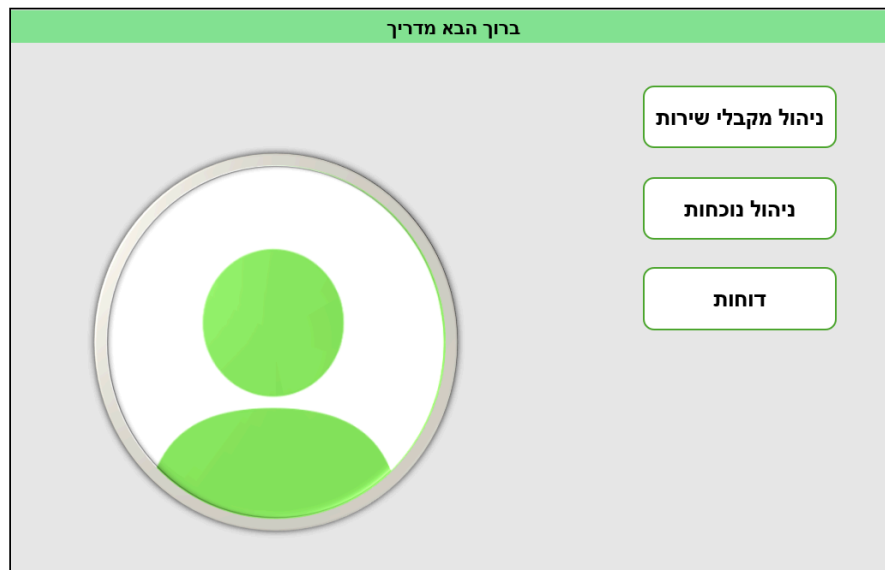
fig 19. Guide main screen

4.3.7 Service Recipient Management Screen

This screen appears when a staff member selects 'Add service recipient' within the service recipient management section. The screen includes fields for entering new service recipient information: full name, group number, picture.
The staff member will complete these fields during the process of adding a new service recipient to the system.

fig 20. Service Recipient Management Interface

4.4 Second Meetings with Carmey Gil Staff Members

Based on the conversation with the staff and the tour of the group rooms from our initial meeting at the Carmey Gil center, where we got to know the place, the staff, and the people with special needs, we reconvened after about two months to present our progress in planning the system.

In this second meeting, we presented diagrams conveying the overall system concept, planned features, and service recipient interactions. Noticing the team's difficulty in understanding the diagrams, we showed actual screen designs, which greatly improved comprehension. The staff provided feedback, with service recipient authentication emerging as a key topic. Our initial ideas of username/password or facial recognition were deemed unsuitable due to complexity for users with special needs, and costs. Voice authentication was also rejected due to accuracy concerns and potential noise disruption.

The final decision was for staff to use username/password login, while service recipients would select their guide's picture, then their own from the group, and finally choose an emoji representing their mood.The meeting's second half focused on hardware and implementation. We realized we needed to consider Carmey Gil's existing infrastructure and financial constraints more thoroughly. This highlighted the need for a comprehensive investigation of all factors affecting system implementation, to ensure a cost-effective solution and successful deployment in the next project phase.

Additionally, we prepared a hardware document for Carmey Gil to guide them on what equipment to purchase to support the system.

5. Expected Achievements

5.1 Project Aims and Key Deliverables

Our primary goal is to develop a comprehensive computerized attendance system for the Carmey Gil Center. This system will enhance the efficiency of tracking attendance and monitoring emotional states while being accessible and user-friendly for individuals with intellectual, physical, and sensory disabilities.

5.1.1 Key Achievements

Upon completion, the project will achieve the following:

- **Automated Attendance tracking:** We will implement a system that accurately records attendance for up to 1,000 users. This system will utilize a database to log attendance, ensuring a logging accuracy rate of 95% or higher, thus reducing manual tracking time by at least 70%. Additionally, by digitizing the attendance process, the system will significantly reduce the risk of errors and eliminate the possibility of losing physical attendance sheets, ensuring that records are always accurate and readily accessible.
- **Emotional State Monitoring:** A feature that allows service recipients to log their emotional state at the start and end of the day. The system will analyze these logs, and when the algorithm detects that a service recipient has selected an "unusual" or concerning emotional state, the system will immediately send an alert to the staff, allowing for timely intervention.
- **User-Friendly Interface:** We will design and deploy an interface tailored to the needs of service recipients with various cognitive and physical abilities. The interface will include large buttons, minimal text, and intuitive navigation, aiming for a service recipient satisfaction rate of 90% based on usability testing with actual service recipients. We will employ the System Usability Scale (SUS) for quantitative

assessment and conduct observational usability tests to gather qualitative feedback, ensuring the interface meets the specific needs of the target users.

5.1.2 Success Criteria

User Adoption:

- Goal: Achieve at least 85% independent usage of the system by both service recipients and staff at the Carmey Gil Center within the first month.

- Measurement: Usability testing sessions will be conducted before finalizing the project, observing ease of navigation and collecting feedback through surveys and interviews. Adjustments will be made based on this feedback to ensure the system is ready for broader adoption.

Accuracy:

- Goal: The system should log attendance and emotional states with at least 95% accuracy.
- Measurement: A one-month trial will be conducted where system logs are cross-referenced with manual logs maintained by staff. Discrepancies will be identified and addressed to fine-tune the system's accuracy before final deployment.

Reliability:

- Goal: Ensure the system operates reliably under continuous internet connectivity, maintaining consistent performance with no major interruptions.
- Measurement: Monitor the system during the testing phase, focusing on its ability to handle real-time data and maintain stable operation. Any issues identified will be resolved to meet the reliability standards required for deployment.

6. Testing Plan

6.1 Overview

- **Objective**: To ensure that the computerized attendance system for Carmey Gil Center functions as expected, providing accurate attendance tracking, emotional state logging, and seamless user experience, even for individuals with various disabilities.
- **Scope**: The tests will cover all features of the system: logging in as a service recipient - a process that includes selecting a guide, group member, emotion, logging in as a team member, managing service recipients, managing staff members, reports, presence and managing information in the database

6.2 Testing Approach

- **Manual Testing**: Test cases will be executed manually to validate the service recipient interface's accessibility and the reliability of emotional state logging. For example, testers will select an image of a guide, check that the images on the next page are of people from his group, then select a service recipient and emotion and check that the registration will be done correctly.

- **Continuous Code Testing:**
  Throughout development, we will integrate unit tests into our coding process to ensure each component functions as intended. As we write code for key features such as service recipient authentication, image selection, and emotion logging, we'll create automated tests to verify these functionalities in isolation. These tests will run continuously, providing immediate feedback on code stability and helping identify issues early. This approach significantly reduces the risk of bugs emerging in later development stages and ensures a more robust final product.

- **Test-Driven Development (TDD):**
  We will adopt a TDD approach throughout our development process. This method involves writing automated unit tests that define a feature's desired functionality before implementing the actual code. Only after creating these tests will we develop the corresponding code to pass them. By following TDD, we aim to:
    - Ensure thorough validation of each feature from the outset
    - Produce cleaner, more reliable code
    - Maintain a high level of test coverage
    - Reduce the likelihood of defects
    - Create a codebase that's easier to refactor in the future

6.3 Test Cases

Test name	Test description	Expected result
Successfully login username & password as staff	Username: "bar@gmail.com" Password:"bar123" Press: "Login".	The system opens a screen according to the staff member's role.
fail login username & password as staff	Username: "ofir@gmail.com" Password:"bar123" Press: "Login".	The system will display that the username or password is incorrect and try again.
Guide selection	Service recipient click on Bar's picture	The system opens a screen of the users who belong to the guide's group.
Service recipient selection	Service recipient click on picture of Bar (guide) -> Service recipient click on picture of Ofir (A member of Bar's group)	The system opens a screen of the emotions emoji
mood selection	Service recipient click on picture of Bar -> Service recipient click on picture of Ofir -> Service recipient click on happy emoji	The system opens a "marking attendance" screen.

Alert on negative mood selection	Service recipient click on picture of Bar -> Service recipient click on picture of Ofir -> Service recipient click on sad emoji	The system opens a "marking attendance" screen. In addition, the system alerts the manager on the negative mood selected.
mark attendance	Service recipient click on picture of Bar -> Service recipient click on picture of Ofir -> Service recipient click on happy emoji -> Service recipient confirm attendance	The system displays the message "attendance has been registered".
Open report	Sign in to staff member -> click the "Reports" button -> click the "Open report" button -> Period: monthly Month: 9 -> click on "Open" button	The system displays the requested report.
Create report	Sign in to staff member -> click the "Reports" button -> click the "Create report" button -> Period: daily Year: 2024 Month: 9 Day: 8 -> click on "Create" button	The system displays the message "Daily report 8.9.2024 created."

Export report	Sign in to staff member -> click the "Reports" button -> click the "Export report" -> Report: Monthly 9/24 Export method: PDF -> click on "Export" button	The system displays the message " Report: Monthly 9/24 export on PDF"
Add service recipient	Sign in to staff member -> click the "Manage service recipients" button -> click the "Add service recipient" button-> First name: Avi Last: name: Levy ID: 123456789 Picture: Group: 7 -> click the "Add" button	The system displays the message "Service recipient Avi Levy was successfully added"
Remove service recipient	Sign in to staff member -> click the "Service recipients" button -> click the "Remove service recipient" button-> ID: 123456789 -> click the "Remove" button	The system displays the message "Service recipient Avi Levy has been successfully removed"

Add staff member	Sign in to manager -> click the "Manage staff member" button -> click the "Add staff member" button-> First name: Rotem Last: name: Gal ID: 987654321 Username: rotem123@gmail.com Password: rotem123 Email: rotem123@gmail.com rule: guide group 7 permission: Manage service recipients, Manage attendance, Generate report -> click the "Add" button	The system displays the message "Rotem Gal - guide group7, has been successfully added"
Remove staff member	Sign in to manager -> click the "manage staff member" button -> click the "Remove staff member " button -> ID: 987654321 -> click the " Remove" button	The system displays the message "Rotem Gal - guide group7, has been successfully removed"
Select language	click on globus icon -> click on Arabic	The system will display the pages in Arabic
The Login time is longer than 2 minutes	A service recipient does not complete the login process in 2 minutes	The system displays the message "Login failed, please restart" and opens a "Guide selection" screen

Table 3. test cases of our system

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8. Appendices

Below is the hardware documentation we prepared after the meeting:

8.1 Hardware List for Implementing the Attendance System

1. Server/Computer (Instructor's Office Server)

This is the computer that will store and manage all the data for the system, such as user logins, attendance records, and emotional state entries. You have two options: buying a physical computer (local server) or using cloud services to store data online.

Option 1: Local Server (Physical Computer)

- ■ **Processor (CPU):** Look for a computer with an **Intel Core i5** or **AMD Ryzen 5** processor. These processors are powerful enough to handle the tasks needed for the system.
- ■ **Memory (RAM):** The computer should have **8 GB of RAM**. This will help it run smoothly without slowing down when performing multiple tasks.
- ■ **Storage (SSD):** Choose a computer with a **512 GB SSD (Solid State Drive)**. This type of storage is fast and can hold all the necessary data, including user information, logs, and reports.
- ■ **Operating System:** Make sure the computer comes with **Windows 10 Pro** or **Windows 11**. These versions are easy to use and compatible with most software.
- ■ **Network Interface Card (NIC):** The computer should have a **Gigabit Ethernet** port. This allows it to connect to the internet reliably, which is essential for data transfer.
- ■ **Keyboard and Mouse:** You will need a simple keyboard and mouse to operate the server during setup and for any necessary maintenance. Any basic wired or wireless set will work.

Option 2: Cloud Storage (Online Data Storage)

- ■ Instead of buying a physical computer, you can use online services like **Google Cloud** or **Amazon Web Services (AWS)**. These services store and manage your data online, so you don't need to worry about hardware. However, this option involves monthly costs, which will depend on how much data you store and access.

2.Recommended TV for User Interaction
This TV will be used at the center, where users will interact with the system through a web-based application.

- ● **Screen Size:** Choose a **32 to 43-inch touch-screen TV**. This size is large enough for easy viewing and interaction.
- ● **Resolution:** The TV should be **Full HD (1920x1080)**. This ensures the screen is clear and easy to read.
- ● **Touch Technology:** Look for a TV with **capacitive touch**. This type of touch screen is very responsive and accurate, making it easy for users to interact with the system.
- ● **Web Browser Compatibility:** The TV should support popular web browsers like **Google Chrome** or **Mozilla Firefox**. This is important because the system will run through a web application.
- ● **Network Connectivity:** The TV should have strong **Wi-Fi or Ethernet** connectivity to ensure it can consistently access the web application.
- ● **Processor and Memory:** Ensure the TV has a fast processor and at least **2 GB of RAM**. This will allow the web application to load quickly and run smoothly.
- ● **Automatic Updates:** Choose a TV that can automatically update its operating system and browser to stay compatible with new web standards and security features.
- ● **Example Models:**
    - ○ **LG Touch Screen TV (32" or 43")**: Known for its reliable touch functionality and solid web browser support.
    - ○ **Samsung Touch Screen Display (32" or 43")**: Offers excellent display quality and supports modern web applications well.

3. Network Equipment

You'll need reliable network equipment to ensure smooth communication between the TV, server, and other devices. However, these components may not be necessary if the existing network is sufficient. Before buying, check the current network performance at the TV's location.

- **Router:** A good router, like the **TP-Link Archer AX6000** or **Netgear Nighthawk AX8**, will ensure strong and stable internet connections.
- **Ethernet Cables: Cat5e or Cat6 cables** are recommended for connecting devices directly to the internet for a more stable connection.

4. Backup Storage Device (Optional for Local Server)
If you decide to use a local server, having a backup is important to protect your data.

- **External Hard Drive:** A **1-2 TB external hard drive** (like the **Seagate Backup Plus**) can be used for regular backups of your data.
- **Alternative:** A **Network Attached Storage (NAS)** device (e.g., **Synology DS220j**) with RAID configuration can offer secure and automated backups.