SmartCaring Application for Twins' Ark Montessori and Day Care

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SmartCaring Application for Twins' Ark Montessori and Day Care

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UCSC

ABSTRACT

Twins' Ark Montessori and day care center is located in Bandarawela and it continues the operations since 2013. It offers child care services for the kids who are not yet qualified by the age for entering grade one in the formal schools. Around sixty kids are registered in Twins' Ark Montessori and day care center currently. Also, experienced and qualified teachers are conducting kindergarten programs.

All the staff of Twins' Ark and most of the parents face many difficulties due to insufficient information about the kids since working parents are very busy when dropping-off and picking-up their kids from daycare centers. Because of their busyness, they will lose their kids' most important information that they need to know. Information about meals, Snacks, toileting, activities, observations, payments, medications, kids 'moods are some of the most important information that they need to know on a daily basis.

Smart Caring Application was developed for the purpose of bridging the information gap between parents and staff of Twins' Ark Montessori and daycare center. It is a web-based, mobile-responsive software which provides features and facilities for the kids' parents and teachers so that they can interactively connect with the daycare. Parents can receive kid's information and reminders via this system while teachers can send notices to the parents easily.

For the successful completion of system development, it was selected agile approach as software development life cycle model. In addition to that Unified Modeling Language (UML) was used for the system designing and different tools such as wire-frame, creately,Star UML were used to draw the diagrams.

The system implementation was done using MVC architecture and the boostrap framework was used for developing the system with HTML, CSS, and JS. Also, PHP was used as a server-side scripting language for the development of this web based system and the development environment was created using XAMPP with Apache server and MySQL server.

The project was completed successfully so that the client would be able to continue their operation efficiently and effectively.

DECLARATION

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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This is to certify that this thesis is based on the work of Ms. H.M.P. Herath under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by:

Supervisor Name: Mr. A.Caldera

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Signature: Date:

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

Twins' Ark	:	Twins' Ark Montessori and day care
UI	:	User Interface
CMS	:	Content Management System
PHP	:	Hypertext Preprocessor
HTML	:	Hypertext Markup Language
CSS	:	Cascading Style Sheets
MVC	:	Model View Controller
RDBMS	:	Relational Data Base Management System
XML	:	Extensible Markup Language
SDLC	:	Software Development Life Cycle
PM	:	Project Manager
PC	:	Personal Computer
SMS	:	Short Message Services
IoT	:	Internet of Things

CHAPTER 1:   INTRODUCTION

1.1   Company Background

Twins' Ark Montessori and daycare center is located in Bandarawela and it continues their operations since 2013.It offers child care services for the kids who are not yet qualified by the age for entering grade one in the formal schools. Twins' Ark Montessori and daycare center offers developmental programs and kindergarten school which provides instructive programs for specific age groups of children. Kindergarten classes are usually conducting during morning hours and Twins' Ark offers more extended operating hours to facilitates parents who needs to keep their children in day care center more hours until they finish their works.

1.2   Motivation

When we consider about early childhood development, parent involvement for the child activities is most essential. But nowadays most of the parents are engage with any kind of a job.so they prefer to keep their kids in daycare centers until they are finishing their works. However, as parents, it is more important to know what is happening at the day care when they are away from daycare center.

But with the current life style of the people, most of the working parents are very busy when dropping-off their children to the day care and picking up them from the day care. So they will lose their kids' most important information that they need to know from the day care staff. Information about meals, Snacks, toileting, activities, observations, payments, medications, kids' mood are some of the most important information that parents need to know as daily. With this situation staff of the Twins' Ark are also face many difficulties when maintaining interactive communication with the parents.

As a solution for that, SmartCaring Application was developed to provide efficient and effective communication between daycare staff and parents.so that can be recognized as a major motivation to implement such a system for Twins' ark. In addition to that some of the minor issues were addressed by this system when developing complete system for Twins' ark. Accordingly, most of the manual works can be digitalized with this system.

1.3   Objectives

The main objective of SmartCaring Application is to bridge the kids 'information gap between parents and daycare staff by increasing parents' live engagement and better communication in Twins' Ark Montessori and Daycare by the first quarter of year 2020.

In addition to that followings are considered as sub objectives of the suggested system.

- Create a system to send daily meal plans.
- Create a system to share real-time pictures and videos with parents.
- Create a system to generate an emergency call.
- Create a system for making live interaction by parents using IoT technology.
- Create a system to manage calendar digitally.
- Create a system to manage digital notice board.

- Create a system to digital documentation by the day care staff.
- Create a system to generate reports in the Twins' Ark Montessori and Daycare

1.4 Scope

SmartCaring Application will help parents to keep their kids in touch every time that they able. As well as day care staff can improve their job with the digitalized environment. As per the client's requirements, supposed system will provide following facilities.

- ✓ The ability to register a new child in the system –should be able to register a new child in the system with their parents' or guardians' contact details. Followings are other mandatory details that required by the system when registering a child in the system.
  - o Name of the child
  - o Age, height, weight (for future health observations)
  - o Child's medications, allergies & food preferences

  Once the registration is completed, the system will automatically send an email/SMS to parent or guardian. That email/SMS includes information about the registration.

- ✓ Ability to create meal plans and manage them for individual child and send meal plan notifications.
  Meal plans are created by day care staff every week in the month and send meal plan notifications to parents daily. Every meal plan has substitutes and those substitutes are applying based on child's medications, allergies & food preferences.

- ✓ Ability to communicate with parents via text massage or e-mail to share real-time videos and pictures.
  Day care staff can be stored real-time video and pictures in a common virtual place so that every parent can access them at any time. Once the day care staff stores the photos and video in the common place, the automatic SMS will send to the parents' mobile. SMS includes the link which can be directed to the place where photos and videos are stored.

- ✓ Ability to generate an emergency call to parents.
  If any emergency will happen, day care staff can make a voice call through the system. That call reflected in the recipient's phone as an emergency call. Even the parent is in busy situation, he/she can give his/her attention since that is emergency.

- ✓ Ability to connect to the class room by parents.
  Parents can be connected to the class room over the internet and they can see the activities of children. Smart IoT devices are used to make the connection.

- ✓ Ability to maintain Calendar by daycare staff.
  Day care staff can be managed the calendar so that any parent can see it and get updated about any events and holidays.

- ✓ Ability to maintain digital notice board.

- ✓ Ability to digitally document Observations, learning stories, Health, sleep checks and etc.
Day care staff can input the information about the children for future usage.

- ✓ Ability to generate reports.
System will generate daily, monthly reports.

1.5   Structure of the dissertation

Chapter 2: Background

Requirement analysis will be done through this section. Under that existing system will be thoroughly analyzed. Also, this chapter will discuss similar existing systems that relate with the proposed system and how proposed system is differ from existing systems. further it will be discussed the available technologies for design the & implementation of SmartCaring Application with their pros and cons.

Chapter 3: Methodology

Software designing methodologies will be discussed in this chapter. Under that Design approaches, system designing diagrams, and user interfaces(UI), Major pseudo code segments will be included. Further Software designing tools and techniques and concepts also will be contained.

Chapter 4: Evaluation

Final Solution will be evaluated under this chapter. The evaluation will be done with respect to the project objectives. Also, problems encountered, testing results, user acceptances, and rejections also taken into consideration for the evaluation.

Chapter 5: Conclusion

This Chapter will conclude the work carried out during the project and the result of the project. Further, it will include future enhancements of the project and lessons which are learned through the implementation of the project.

CHAPTER 2: BACKGROUND

2.1 Introduction

Requirement gathering and analyzing is essential for understanding and defining the project scope. To gather requirements of Twins' Ark Montessori and daycare followings fact finding techniques were used.

1. Studying existing documents.
2. Observations from the working environment.
3. Interviewing users.

Studying existing documentation and observations were used as the primary fact-gathering techniques. Also reviewing the documentation of an existing system was useful to the identification of process flow of the system. Interviewing the people who are engaging with the main processes in the Montessori and Daycare was critical source to identify the exact expectations of the users.

2.2 Existing manual system

Currently, Twins' Ark Montessori and day care manages its every transaction manually while communication is done orally or using written notices.so current system can be categorized in to three sub sections. Refer Figure 2-1 Existing Manual System to see those sections.
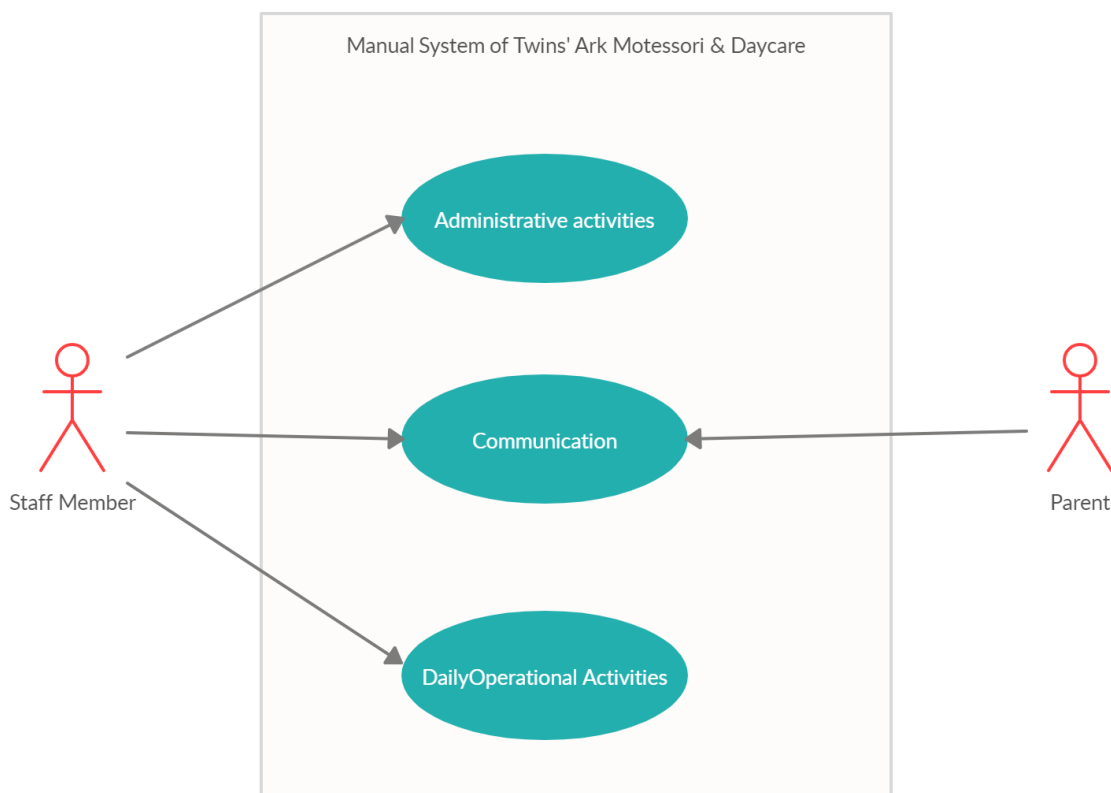
Figure 2-1 Existing Manual System

Under the admin module, a new child is registered in the system using registration number and keep their records in a MS Excel sheet. Based on the student's registration number and name everything is recorded manually.

When it comes to the daily operations of the Twins'Ark, everything is done manually. As an example, students' meal plans are created manually and inform parents about meal plan orally or using written notice in the book. Also if the parents are not received meal plan details, then they have to call any staff of Twins' Ark, or else, with the current situation, parents have to come to the Montessori to get that information. so everything about the kids can be collected/communicated over the telephone or orally at Montessori or using written note.

2.3 Drawbacks of the existing system

Drawbacks of the existing system in Twins' Ark can be discussed from two purspectives.one is from the parents' point of view and other one is drawbacks from the owners and staff members' point of view.

Drawbacks faced by owners and staff members of the Twins' Ark

- Staff members are assigned huge paper works as daily duties.
- Large spaces are required to maintain manuals.
- Some Confidential data are recorded on manuals and unauthorized parties can easily access to them.
- Some of the works are needed to be done repeatedly.
- Facing many difficulties when it is needed to communicate with parents.

Drawbacks faced by parents

- Building trust with the staff members is very poor.
- Parents are missing some of the information about their kids.
- Understanding a child's situation is very low due to inadequate knowledge and experiences sharing with teachers.
- Parents are missing some of the notices that teachers were sent.

2.4 Similar systems available in the market

There are plenty of mobile and web based day care management systems. Some of them were analyzed to check whether they are satisfying the system requirements of Twins arc Montessori and Daycare.

1. Smartcare Solutions

"Smartcare provides a cohesive platform to manage one or multi-site child care centers. This software, also known as child care management, simplifies the process of managing day care, preschool, and other programs. What's more, it helps you develop deeper relationships with both children and parents, ensuring long-lasting collaboration and a successful business model." [1].

Main features of smartcare products are shown in Figure 2-2 Smartcare Solutions [2].

Features

- All-in-one child care center management program
- Cloud-based record keeping
- Attendance management for children and staff
- Sign in/out for children and staff
- Sign in with QR code, PIN, or key tag
- Extensive real-time reports
- Real time class ratios
- Mobile-friendly
- Accessible on smartphones, tablets, and PCs
- Convenient smartphone parent app
- Secure family information and data storage
- Automated billing (weekly, monthly, custom)
- Payments processing

Figure 2-2 Smartcare Solutions

Drawbacks of the Smartcare Solutions

- Though it is having diversified features, they are not satisfying whole expectations of the Twins' Ark. As an example meals plan solution is not included in smartcare applications.
- Cannot customize as per the requirements of Twins' Ark.
- Regular price is $159 per month.
- Users need to be trained well, before using the system, since this is highly comprehensive system.

2. Procare Software

"Procare is a childcare management solution designed for childcare centers, daycare, after-school programs, school districts and child activity centers. Procare's modular format allows centers to choose the modules they need. The software helps users manage the tracking of family data and accounting, meals, payroll, employee data, activities, payroll, expenses, and attendance. Procare also offers modules that include tuition collection, classroom management, parent engagement, and cloud data hosting. Procare's Family Data is the core module of its solution, designed to help automate data collection and administrative tasks. The solution packages include family data, employee data, family accounting, attendance tracker, tuition express and Procare cloud." [3] Figure 2-3 Procare Child Care Management System shows one of the interface in Procare software[4]

Figure *2-3* **Procare Child Care Management System**

Drawbacks of the Procare software

- Procare is a windows based software.so without a personal computer no one can use the system.
- They have global target market. (U.S.A based).so their requirement quiet difference when compared to our local daycare system.
- User training is difficult to deliver for global customers.
- MyProcare is a parent portal available to Procare cloud customers, that serves two primary purposes. But it does not cover all the requirements of twins' Ark.

There are several daycare systems can be seen in the market. Even though it is having plenty of such similar systems in the market, it is hard to find a system which will be able to fulfill all the requirements of the Twins'Ark.But in this supposed system will be able to provide what Twins' Ark is actually needed.

2.5 Similar Technologies

Numerous development languages, frameworks, and database are available for implementing a web based system. So before starting the implementation of SmartCaring Application, following technologies were analyzed to select a proper developing language, framework and database. Table 2-1 Web Development Technologies

Frame works	
Node.js	It is a server-side javascript framework. But it is not only a framework it is a complete environment.
Laravel	It is a free, open source PHP web framework, intended for building

	state-of-art web applications following the MVC architectural pattern.
ASP.NET	It is one of the best Microsoft built web framework that is highly valued by developers as a powerful tool for creating dynamic websites
Angular.js	It is a JavaScript open-source web framework that was designed particularly for single page web applications using MVC architectural Pattern. It is a front-end framework.
Bootstrap	Is Mobile responsive front-end framework.
Wordpress	A CMS (content management system) built on PHP. Currently, about 20% of all websites run on this framework.
Drupal	A CMS framework built using PHP.
Progrmming Laguages	
Javascript	Used by all web browsers, Meteor, and lots of other frameworks
Java	Used by Android (Google) and a lot of desktop applications
PHP	Is a server scripting language and a powerful tool for making dynamic and interactive web pages.
XML	Is a markup language that defines a set of rules for encoding documents that is both human and machine readable.
DataBases	
MongoDB	MongoDB is a document database which means it stores data in chunks
MySQL	Is an open-sourced SQL database.
Oracle	Is an enterprise SQL database
MS SQL	Is RDBMS developed by Microsoft

Table 2-1 Web Development Technologies [5] [6] [7] [8] [9]

2.6 Technologies Adapted

After the analysis of different technologies, selected technologies were stated as bellow. though it is having several technologies which are more efficient than selected, the learning curve was considered when adapting to technologies.

- MySQL Database server
- Bootstrap Framework
- Hyper Text Markup Language 5 (HTML5)
- Cascading Style Sheets (CSS)
- JavaScript
- PHP
- XML

MySQL Database server

MySQL is the world's most popular open source database. MySQL can cost-effectively help you deliver high performance, scalable database applications. It provides fully manage database services, instant provisioning to deliver application faster. Data protection, Security updates and different features. [10]

Bootstrap Framework

Bootstrap is a front end user interface designing framework. It is capable of developing responsive web pages that can be viewed in any device. Responsive design creates websites that automatically adjust to look good and function well on any size screen. [8]

Hyper Text Markup Language 5 (HTML5)

HTML is the most basic building block of the web.it defines the meaning and structure of the web content .HTML 5 is the latest evolution of the HTML. The term represents two different concepts. It is a new version of the HTML with the new elements, attributes and behaviors and a larger set of technologies that allows the building of more divers and powerful web applications. [11]

Cascading Style Sheets (CSS)

CSS is a stylesheet language used to describe the presentation of a document written in HTML or XML.CSS describes how elements should be rendered on screen or other media. [11]

JavaScript

JavaScript is a lightweight, interpreted, or just in time compiled programming language with first class functions. JavaScript is a prototype-based, multi paradigm, single threaded, dynamic language, supporting object oriented imperative and declarative styles. Java script runs on the client side of the web, which can be used to design/program how the web pages are behave on the occurrence of an event. [11]

2.7 Comparison of SDLC approach

Main three types of SDLC models were taken in to consideration.

	Water fall Model	**Agile - SCRUM**	**Hybrid**
Brief Description	The waterfall is a linear methodology for developing software. The next stage cannot be started until it completed the previous stage. Also, changes are not accepted.	Agile software development focuses on keeping code simple, testing often, and delivering higher-value functional components of the application as soon as they're ready.	The hybrid development approach was developed by combining SCRUM and RUP features. This model initially sequential and then iterative throughout the development process.
Process of development	The waterfall model includes bellow stages Collecting requirements and analysis, system design, implementation, testing, and maintenance	Scrum projects make progress in a series of sprints, which are time-boxed iterations, no more than a month long. At the start of a sprint, team members commit to delivering some number of features that were listed on the project's product backlog. At the end of the sprint, those	The waterfall approach is using for the first few phases of the SDLC while the Agile approach is using the last phases of SDLC.

		features are coded, tested, and integrated into the evolving product or system. At the end of the sprint, a sprint review is conducted	
Advantages	Simple to understand and implement. Allows for progress to be measured throughout the project. encourages the documentation of the project. Easy to manage due to rigidity. Waterfall methodology is best; when the project is small, Known requirements that are unlikely to change, having specific deployment dates and projects with lots of dependent tasks.	You can adjust and iterate requirements along the way. It's also quite easy to add or delete features as the project moves along. Bugs are caught and fixed early. Clients can give input at the end of each sprint rather than wait until the entire project is finished scheduled time. Agile SCRUM methodology is best; when the Customer that are happy to regularly update their software.	Provides the benefits of both waterfall and agile methodologies. The hybrid model is best suited for projects which demand the team to deliver constantly changing requirements within a limited time frame
Disadvantages	Requirements should be clearly specified. There is no working prototype until later in the project to show the client. High amount of risk and uncertainty.	Scope creep can occur.	Needs a PM that enforces and manages process effectively.

Table 2-2 Comparison of Different SDLC models [12]

Based on the comparison of the above three models, the Agile model was selected to implement SmartCaring Application. There were two reasons for selecting an Agile.

- Since this is a new solution to Twins' Ark, requirements might be changed.
- Can produce working portion of software at every sprint.

Also waterfall and Hybrid models were rejected due to bellow reasons.

The waterfall model was too rigid for this project since it is difficult to make changes.

The Hybrid approach is most suitable if the requirement analysis, design and development is done by multiple people who is having expertise for each design, analysis and development separately.

2.8 Functional Requirements

- User Registration
  - Create new user, update user details, delete user.
- Create a system to send daily meal plans.
  - Create, update meal plans, generate meal plan notifications.
- Create a system to share real-time pictures and videos with parents.
  - Upload, view pictures and videos.
- Create a system to generate emergency call.
  - Make a call, stop Call.
- Create a system for making live interaction by parents using IoT technology.
  - Make a video call, stop video call.
- Create a system to manage calendar digitally.
  - Create and update calendar.
- Create a system to manage digital notice board.
  - Add and view notices.
- Create a system to digital documentation by the day care staff.
  - Create, Update, Delete Documents
- Create a system to generate reports in the Twins' Ark Montessori and daycare.
  - View Report

2.9 Non-Functional Requirements

- Security
  - Authorized users only allow to access the system.
- User Friendliness
  - System was designed so that anyone can understand the functionalities of system.
- Compatibility
  - The system was developed as mobile responsive web application.
- Reliability
  - Quality assurance process is done properly in order to provide a reliable system.
- Accessibility
  - Without PC, anyone can access the system via smart phone.
- Maintainability
  - Without affecting to core functionalities of the system, any new functions can be added, removed or modified.

CHAPTER 3:   METHODOLOGY

3.1 Introduction

This section is mainly discussing software development methodology, which was chosen for implementing SmartCaring Application. Similarly, software designing process and implementation process are taken into consideration through this chapter.

Software design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system. [13]

Software implementation is the process of converting a system specification in to an executable system.[14]

In this chapter system designing and implementation methodologies will be thoroughly discussed in order to describe the structure of SmartCaring Application.

3.2 Software Development Methodology

After the analysis of different software development methodologies (Refer section no 2.7) , Agile methodology was chosen for development of Smart Caring Application. Under that agile development, SCRUM principles are followed as much as possible to get better product.
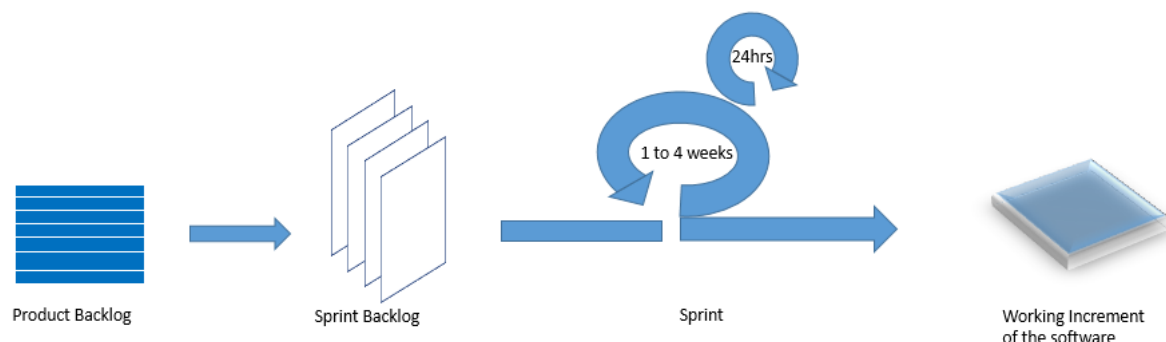
Figure 3-1 Agile- SCRUM Methodology

Agile – SCRUM is an iterative and incremental development methodology. It has series of sprints, which are having specified time box. The time box is no more than a month long. Initially, every sprint defines some number of product features that are listed on the product backlog. At the end of each sprint, specified features are coded, tested and integrated. Also sprint review is done after every sprint.

3.3 System Design Overview

Object oriented design process were used in this software designing phase. According to that, during software designing, initially identifies software components and their relationships, based on the customers' requirements. After that requirements are transformed in to design models. This design models are showing objects, object classes and relationships.

As an Object oriented design process following common activities were done.

- Use case modeling
- Identifying flow of activities
- Designing system architecture
- Database designing
- Identifying objects classes and its interactions
- Specifying object interfaces

3.3.1 Use Case Modeling

Use case represents, the capabilities that will provide to an actor by the system. So use case diagram can use to graphically show, how external parties are interacting with the system. Further use case narratives give more details of the use cases.

High level Use Case Diagram for Smart Caring Application
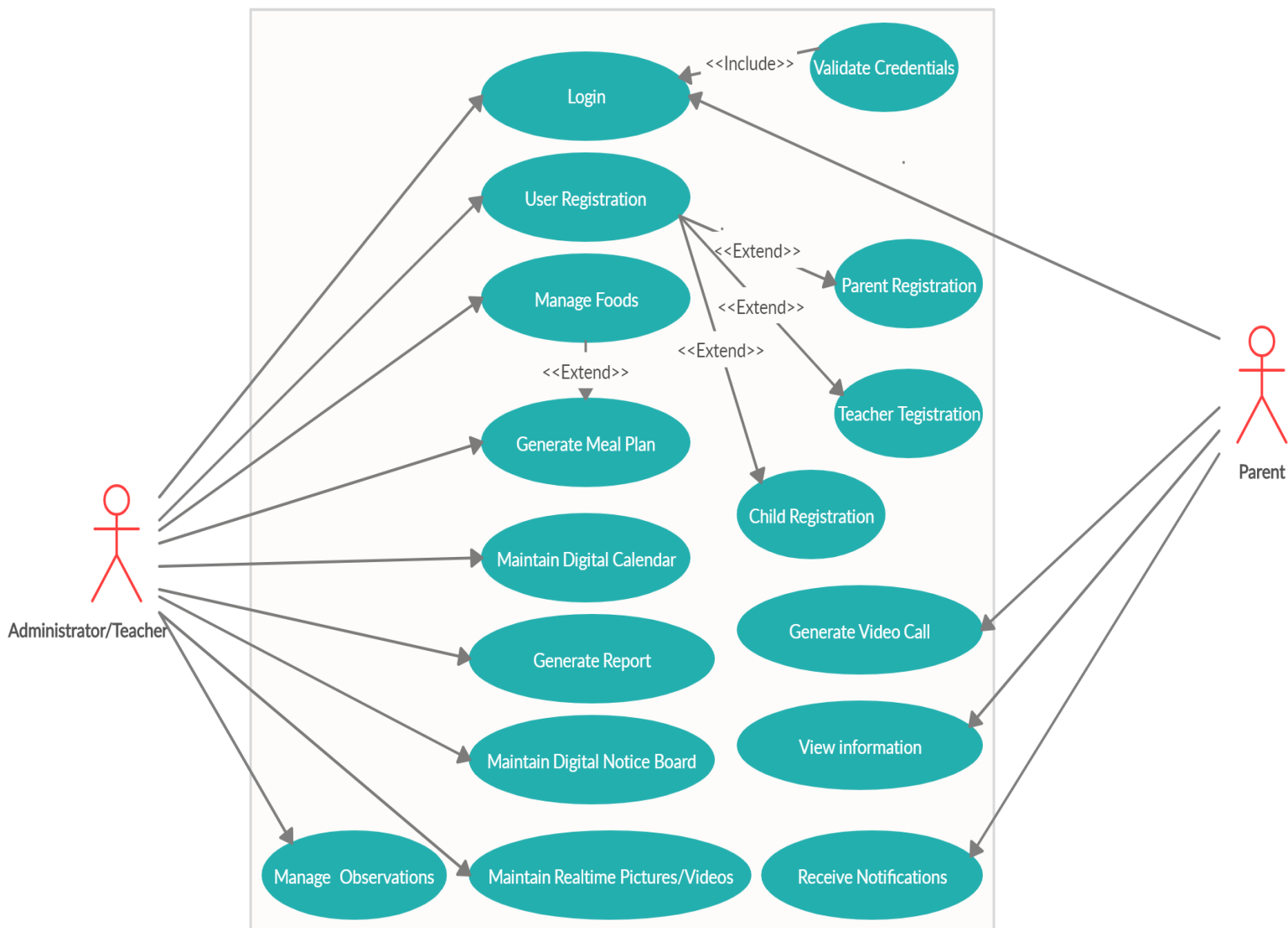
Figure 3-2 Use Case Diagram for whole system

Use Case Narratives

- **Use Case Description - Login**

Log in to the system is essential for every actor. Table 3-1 *Use Case Description - Login* shows use case description for login.

Use Case	Login
Actors	Administrator, Teacher, Parent
Description	
All registered users can login to the system	
Pre-Conditions	
Have a authorized Username and Password combination	
Flow of events	
1. Enter User Name (E-mail) and Pass word 2. If the e-mail/username and password combination is valid then they can log in to their respective "Home" page. 3. If the e-mail/username and password combination is invalid ,a relevant error massage is appeared.	
Post-Conditions	
Only the authorized persons have the access to the system. others cannot log in to the system.	

Table 3-1 Use Case Description - Login

- **Use Case Description - Teacher Registration**

Refer Table 3-2 *Use Case Description - Teacher Registration* for teacher registration use case description.

Use Case	Teacher Registration
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to register a new teacher in the system	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Navigate to the Teacher Registration Page. 2. Enter all mandatory Information. 3. Submit the information	
Post-Conditions	
If the teacher registration is done successfully in the system, then teacher will be notified by email/sms regarding the registration.	

Table 3-2 Use Case Description - Teacher Registration

- **Use Case Description - Generate Meal Plan**

Bellow Table 3-3 *Use Case Description - Generate Meal Plan* shows use case description for generating meal plan

Use Case	Generate Meal Plan
Actors	Administrator , Teacher
Description	

	Administrator or Teacher can be able to generate meal plan for a week
Pre-Conditions	
Logged in to the system as Administrator or Teacher and Relevant foods should be added to the system	
Flow of events	
1. Navigate to the Meal Plan Page in the system. 2. Assign meals for every day in the week (Excluding holidays) 3. Submit the Information	
Post-Conditions	
If the meal plan is created successfully in the system, then Parent will be notified by email/sms regarding the meal plan for next week.	

Table 3-3 Use Case Description - Generate Meal Plan

- **Use Case Description - Maintain Pictures and Videos**

Real-Time Pictures and Videos are uploaded by day care staff so that any registered user can view them. Refer Table 3-4 *Use Case Description - Maintain Pictures and Videos*

Use Case	Maintain Real-time Pictures and Videos
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to upload pictures	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Navigate to the Meal Plan Page in the system. 2. Upload images and submit	
Post-Conditions	
Notification will be sent to all parents	

Table 3-4 Use Case Description - Maintain Pictures and Videos

- **Case Description - Receive Notification**

Parents are receiving notifications via e-mail, SMS or Notification panel in the application. Refer Table 3-5 *Use Case Description - Receive Notification*

Use Case	Receive Notifications
Actors	Parent
Description	
Parents are receiving notifications via SMS, email or notification panel in the web portal	
Pre-Conditions	
Parents should be registered in the system with the given contact details	
Flow of events	
1. View notifications via SMS, email or notification panel in the web portal	
Post-Conditions	
None	

Table 3-5 Use Case Description - Receive Notification

Refer Appendix A- Use Case narratives for all use cases

Activity Diagram

Following activity diagram shows the work flow of meal plan module. Refer Figure 3-3 *Activity diagram for Meal Plan module*.

Figure 3-3 Activity diagram for Meal Plan module

3.3.2 System Architecture

represents system architecture of SmartCaring Application. It shows that, how the web application communicates with server. In this architecture, there is a separate database server is maintaining for handling complicated operations. This three tire architecture includes client tire (web browser), middle tire (web server) and third(database)tire. [15]
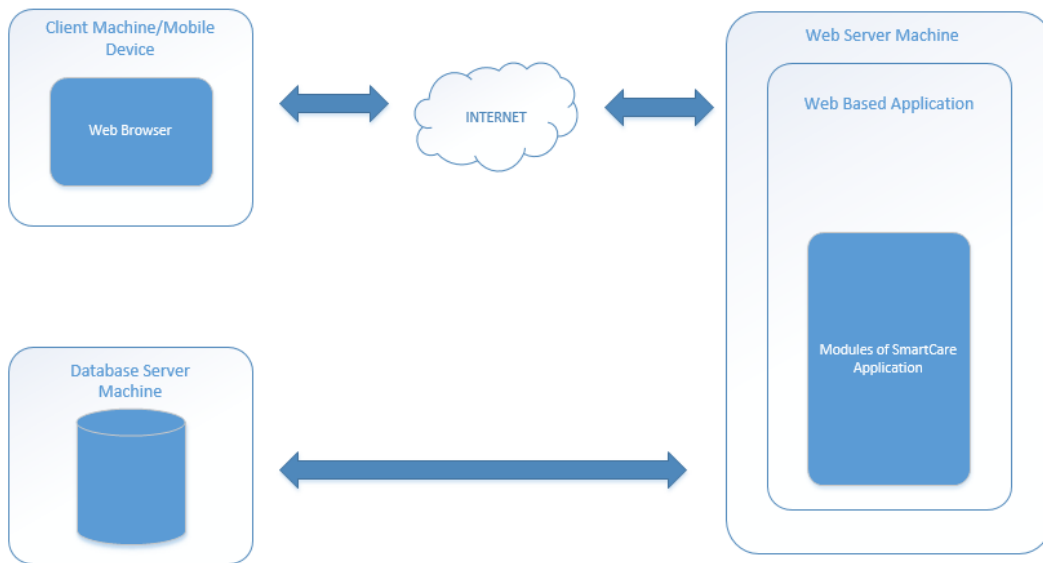
Figure 3-4 System Architecture of SmartCaring Application
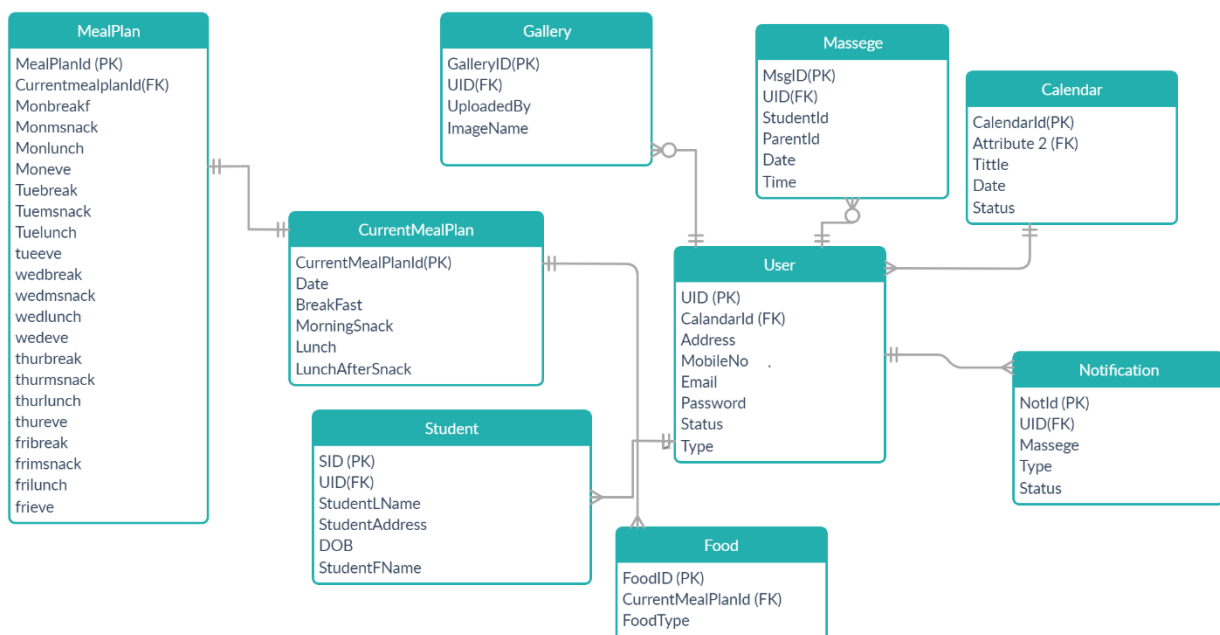
Figure 3-5 Entity Relationship Diagram

3.3.3 Database Designing

3.3.4 Objects Classes and its Interaction identification
Class Diagram

Objects, classes identification will graphically shows as bellow. Refer Figure 3-6 *Class Diagram for whole system*.
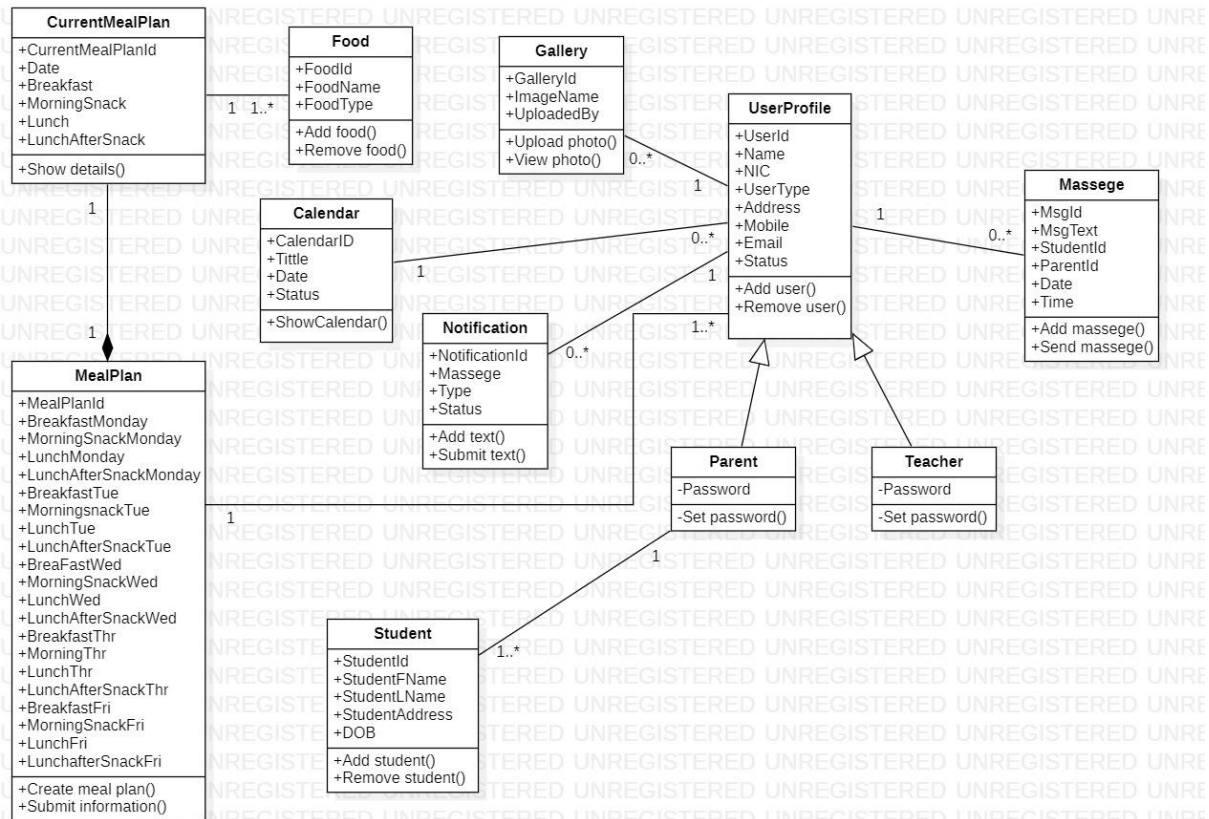
Figure 3-6 Class Diagram for whole system

Sequence Diagram

Bellow sequence diagram shows that, massage interaction between objects when managing admin and meal plan module.
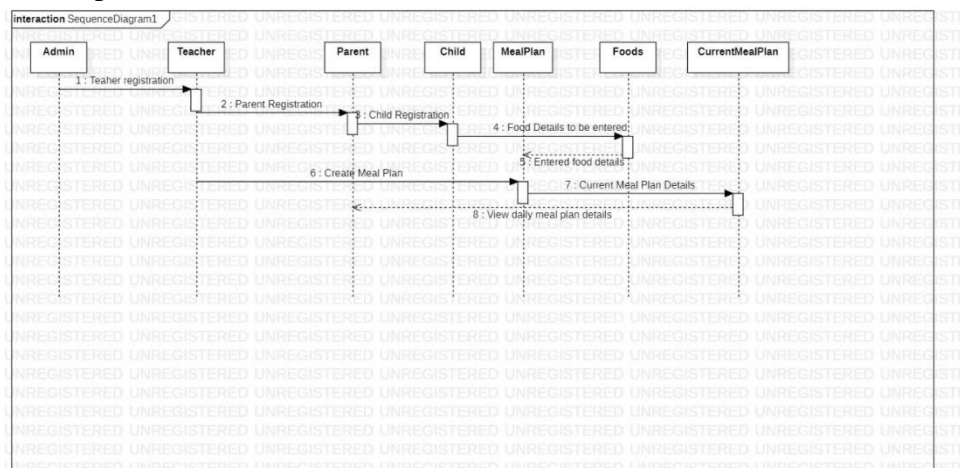
Figure 3-7 Sequence Diagram -Admin and Meal Plan module

Refer Appendix A - sequence diagram for other modules.

3.3.5   Interface specification

User interfaces are playing most vital role in any software application. Because it is the place where users can interact with the application. So designing user interfaces is most crucial part in the software designing phase.

To design user interfaces for SmartCaring application," Pencil" GUI prototyping tool was used. [16]

Login Interface In Login interface, user should be able to log in to the system by entering e-mail (Username) and password. Email field is used to enter the email address as a username. So when it is submitting, validations are automatically done for the email field. Password field is used for enter the password. So the characters are masked in the password field. Also sign in button can be used to log in to the system. Refer *Figure 3-8 User Interface - Log In.*
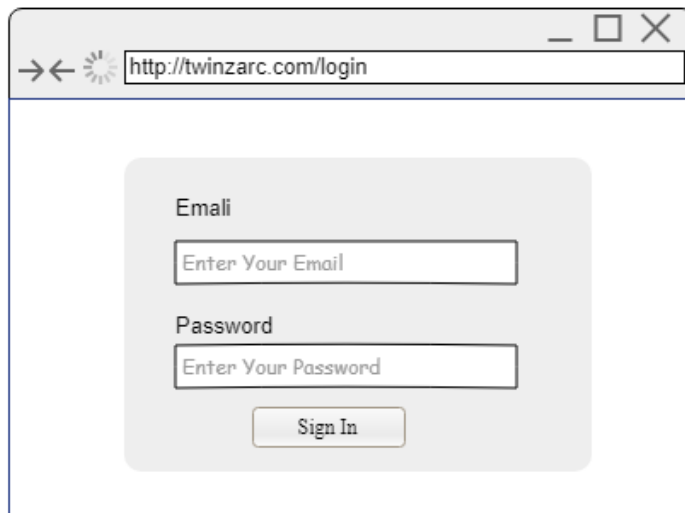
Figure 3-8 User Interface - Log In

Parent Registration Interface

Parent Registration can be used to register a new parent in the system. In this form accessibity to the system is provided for the parent. Text fields are used for entering parent name, NIC, address and mobile number. Email field is used to enter the email. Password input type is used to enter and re-enter the password. Submit button type is used to submit parent information to the database. Validations were done for some fields. (E.g when re-entered password should be similar to initial password.) Refer Figure 3-9 *User Interface - Parent Registration*.

Figure 3-9 User Interface - Parent Registration

Student Registration Interface

Childs' details are recorded under the Student registration form. Basic information and other information are grouped in to two sections. As input types for student registration form Text fields, drop down lists, date, file and buttons are used. To upload a photo, file input type is used. To enter date of birth date input time is used. To load gender and Parents, drop down lists are used. Refer Figure 3-10 User Interface - Student Registration.

Figure 3-10 User Interface - Student Registration

Meal Plan creation interface

Meal plans for the week are created every week. Using the table, the schedule outline is create as Figure 3-11 User Interface - Meal Plan. Already saved foods in the database, are loaded to every cell based on the food type. If there is a holiday, then meal plan is not allowed to enter food details on that section. Correctly completed meal plan information can be saved on the data base using submit button. Meal plan creation date can give in the date field.

Figure 3-11 User Interface - Meal Plan

3.4 System Implementation Overview

System implantation can be recognized as the process of ensuring that the information system is operational. That defines how the operational system will be built.

In this chapter file organization of the source code (design pattern of the software), implementation environment, implementation tools, and some of the pseudo code segments are included.

3.4.1 MVC Design patterns

System implementation and file organization of the system is done using MVC design pattern. This MVC design pattern is a common architectural pattern which used to design and create interfaces and the structure of the application. This pattern divides the application in to three parts (Models, Views and Controllers) that are dependent and connected to each other [17].This pattern motivates creating reliable, reusable and consistent codes for the application.

The file and folders structure of the MVC model can be seen as follows.
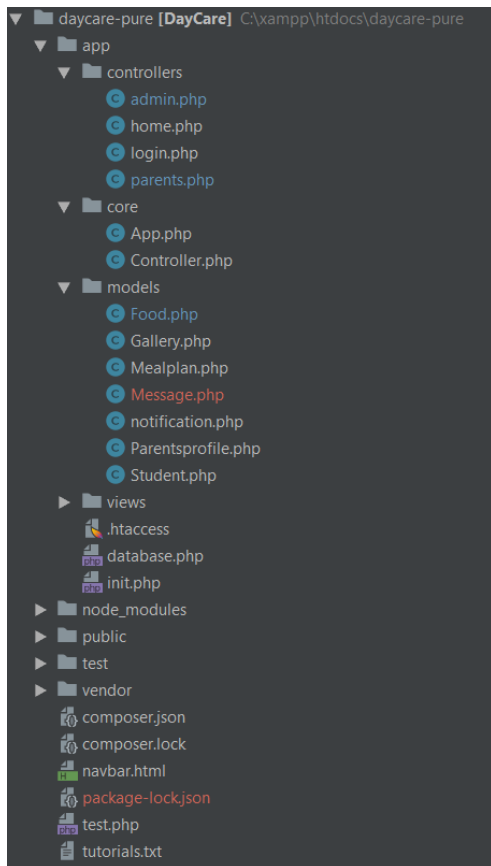
Figure 3-12 Folder Structure of the System

Model: Interacts with the database.it receives, retrieves and stores data for the user.

```php
<?php

use Illuminate\Database\Eloquent\Model as Eloquent;

class Parentsprofile extends Eloquent{

    public $timestamps = [];

    protected $fillable= ['parentName','nic','address','mobileno', 'email', 'password', 'status', 'type'];

    public function getlogin(){
        if(isset($_REQUEST['email']) && isset($_REQUEST['password'])){
            $email = stripslashes($_REQUEST['email']);
            $password = stripslashes($_REQUEST['password']);


        }
    }

}
```

Figure 3-13 Sample Code Segment for Model

View: Displays information to the user and integrates data from the controller.

```
1
2   <html>
3
4   <head>
5       <!-- Import Bootstrap -->
6       <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.4.1/css/bootstrap.min.css"
7           integrity="sha384-Vkoo8x4CGsO3+Hhxv8T/Q5PaXtkKtu6ug5TOeNV6gBiFeWPGFN9MuhOf23Q9Ifjh" crossorigin="anonymous"
8
9       <!-- Import custom css -->
10      <link rel="stylesheet" href="../../../daycare-pure/public/css/home.css">
11  </head>
12
13  <body>
14
15  <!--Import Navbar from partial folder-->
16  <?php
17  include($_SERVER['DOCUMENT_ROOT'].'/daycare-pure/app/views/partials/navbar/navbar.php');
18
19  ?>
20
21
22      <!-- Home page body -->
23      <header>
24          <div class="overlay">
25              <div class="row">
26                  <div class="col-md-6 mt-5">
27                      <h1>Happy childhood memories start here</h1>
28                      <p>Lorem, ipsum dolor sit amet consectetur adipisicing elit. Vero nostrum quis, odio veniam ita
29                          ullam
30                          debitis qui magnam consequatur ab. Vero nostrum quis, odio veniam itaque ullam debitis qui
31                          magnam
32                          consequatur ab.</p>
33                      <br>
34                  </div>
```

Figure 3-14 Sample Code Segment for View

Controller: Sends and receives data from the model and passes to the view.

```php
1       <?php
2
3   class Home extends Controller{
4
5       protected $user;
6       protected $gallery;
7
8       public function __construct() {
9           $this->user = $this->model( model: "Parentsprofile");
10          $this->gallery = $this->model( model: "Gallery");
11      }
12
13      public function homepage(){
14          $this->view( view: 'home/home');
15      }
16
17      public function login(){
18          $this->sessionforlogin();
19          $this->view( view: 'login/login');
20      }
21
```

Figure 3-15 Sample Code Segment for Controller

23

3.4.2 Development Tools

Integrated Development Environment(IDE)

PhpStom is used as integrated development environment for the development of SmartCaring Application. PhpStom supports all the PHP language features and it provides best code completion, refactoring, on-the-fly error prevention and more. Also it supports front end technologies like HTML 5, CSS, JavaScript, etc. [18]

Figure 3-16 PhpStom IDE

Development Environment

XAMMP is the most popular PHP development environment. As a development environment XAAMP was installed with Apache server and MySQL database server.
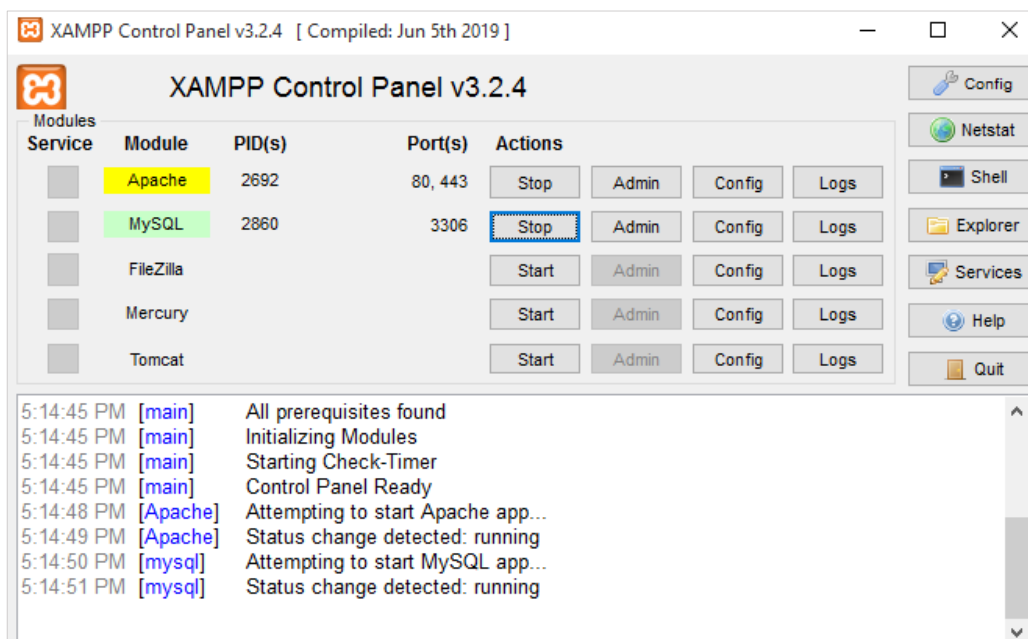
Figure 3-17 XAMPP Control Panel

3.4.3 Development of the system

Development Flow

When developing the SmartCaring Application following steps were done before starting the coding.

1. Create folders and file based on MVC architecture. (Refer Figure 3-12 *Folder Structure of the System*)
2. Create database connectivity.

```php
<?php

use Illuminate\Database\Capsule\Manager as Capsule;

$capsule = new Capsule();
$capsule->addConnection([
    'driver' => 'mysql',
    'host' => '127.0.0.1',
    'username' => 'root',
    'password' => '',
    'database' => 'daycare',
    'charset' => 'utf8',
    'collation' => 'utf8_unicode_ci',
    'prefix' => ''
]);

$capsule->bootEloquent();
```

Figure 3-18 Code segment for creating database connection

3. Create core function like view function, model function.

```php
<?php

class Controller{

    public function model($model){
        require_once '../app/models/'. $model .'.php';
        return new $model();
    }

    public function view($view, $data = [], $mdata = [], $sdata = []){
        require_once '../app/views/'.$view . '.php';
    }

}
```

Figure 3-19 Sample Code segment for Core functions

4. Started the coding for functionalities of the SmartCaring Application

3.4.4   Used API's

Twilio is a developer platform for communications. This Twilio Communication API is used to send and receive sms and voice call in SmartCaring system.

```php
public function sendsms($message){

    $account_sid =
    $auth_token = '
    ';

    $twilio_number = "+18636243789";

    $client = new Client($account_sid, $auth_token);
    $client->messages->create(
    // Where to send a text message (your cell phone?)
        to: '                ',
        array(
            'from' => $twilio_number,
            'body' => $message
        )
    );
}
```

Figure 3-20 Code Segment - API integration

3.4.5   Re-used existing codes

Codes are from Bootsnipp.com were reused. [19]

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3.4.6 Sample pseudo code for meal plan – allergy food details with respect to child

Step 1

Get meal details (SQL select query to get meals details from the last row of meal plan table).

Get food details (SQL select query to get all food details from the food table)

Get Student details (SQL select query to get student details from student table)

Create Meal array (Set all meals to an array)

```
$meal = $this->mealplan::orderBy('id', 'desc')->first();
$foods = $this->food::get();
$student = $this->student::get();
$mealfoodarray = $meal->toArray();
```

Figure 3-21 Code segment for step 1

Step 2

Create food list

Foodlist = get all **food** in **foods** variable and store them in array as key = food_Id and value = food_name

Foreach (foods as food) {

Foodlist[food_id] = food_name

}

// array structure => ([0] => Rice, [1] => Bread

```
foreach ($foods as $food){
    $foodlist[$food->id] = "$food->foodname";
}
```

Figure 3-22 Code Segment -Get food List

Step 3

Get students who are having food allergies as child using loop

- If **child_foodallergies** is not equal to null
  - **allergicfoodarray = child_ food_allergies (**splitting is done using "|" marks and add to an array)

array structure => allergicfoodarray = Array ([0] => 2 [1] => 3)

(child_ foodallergies stored in database as "1|6|5", We separate this from "|" and get number to allergicfoodarray)

foodallergies
2	3
1	3
1	2	3

- Get each item in allergicfoodarray as value (loop)
  If value in mealfoodarray, then add value to temp array. (to get all allergic foods of all student in the current meal plan to temp array.)

//array structure => temp = Array ([0] => 2 [1] => 3)

- If temp is not equal to null, then add firstname and lastname of child to the beginning of array. (using array_unshift function)
- Add all temp arrays to allergicchildarray.
- Pass allergichildarray to the view.

```php
foreach ($student as $child){

    if($child->foodallergies != ''){
        $alergicfoodarray = explode('|', $child->foodallergies );

        $temp = [];

        foreach ($alergicfoodarray as $value){

            if( in_array($value, $mealfoodarray)){
                array_push($temp, $value);
            }

        }

        if ($temp != null){
            array_unshift($temp,$child->firstname, $child->lastname);
        }

        array_push($alergicchild, $temp);


    }

}
```

Figure 3-23 Code segment - Food allergic students

Refer Appendix B – Output of the code

CHAPTER 4: EVALUATION

System evaluation is the process of determining whether the project objectives were satisfied or not. According to that, this chapter will evaluate project objectives. If any failures to achieve those objectives, it will be discussed with the reason. Further Testing process with the test plan will be discussed in this chapter. Problems encountered and client evaluation will also be included.

4.1 Project Objectives Evaluations

The main objective of SmartCaring Application is to bridge the kids 'information gap between parents and daycare staff by increasing parents' live engagement and better communication in twins' ark Montessori and daycare. So when it considers overall software with the features of it, communication between child's parents and daycare staff will be improved by every feature on it.

Following Table 4-1 *Evaluation of System Objectives* shows how far each and every objective were satisfied with the SmartCaring Application.

Objective	Level of objective satisfaction
Create a system to send daily meal plans.	High
Create a system to share real-time pictures and videos with parents.	High
Create a system to generate emergency call.	Medium
Create a system for making live interaction by parents using IoT technology.	Low
Create a system to manage calendar digitally.	High
Create a system to manage digital notice board.	High
Create a system to digital documentation by the day care staff.	High
Create a system to generate reports in the Twins'ark Montessori and daycare	Low

Table 4-1 Evaluation of System Objectives

According to the Table 4-1 *Evaluation of System Objectives* , some of the different objectives are having different levels of satisfactions. There are three reasons can be identified for them.

1. There is limited free API's that supports to pure PHP. (E.g Communication API's)
2. It is difficult to integrate IoT technology due to device expensiveness (E.g IP Cam)
3. There is an ability to generated plenty of reports based on the information which are available in the database. but it is not sufficient time to develop huge number of reports in the system.

4.2 Testing Process

Objectives of the testing

1. Improving quality of the system so that customer will be delighted.
2. Improving the process of development of software so that problems can be prevented before they become a major issue.

In order to achieve above objectives, both black box and white box testing are conducted to assure the quality of product. Therefore, the internal logic of the coding and external functionality of the system were tested. [19]

Since this is agile based software following test plan was executed at the end of every sprint.

Type of testing	Test method
Unit testing	Every testable code segment will be tested during development.
Regression testing	Regression testing is done to confirm that a recent program or code change has not adversely affected existing features.
System testing and Sprint Review	Test whether system requirements were satisfied or not.
User Evaluation(UAT)	User Evaluation was done at customer site

Table 4-2 Test Plan

Following test cases were planned to test the output of every sprint.

Table 4-3 *Test Cases - Amin Module* shows the all test cases for admin module.

#	Page /Function	Test Description	Expected Result
1.		Login without entering username/email AND password	Prompt user to enter required fields.
2.		Login without entering username/email OR password	Prompt user to enter required field
3.	Login	Login with invalid username/email AND password	Indicate error by notifying email or password is incorrect
4.		Login with invalid username/email OR password	Indicate error by notifying email or password is incorrect
5.		Login with correct username/email and Password	Log in to the system
6.	Logout	Logout from the account	Logout from the user account and redirect to the home page
7.		Submitting student records without adding mandatory values	Student information submission should fail without mandatory values
8.	Student Registration	Use invalid format on the fields and submit the information (E.g: enter DOB using string values)	Information submission should fail with invalid values.
9.		Enter all information correctly and submit	Student Information should submit and save on the database
10.		View each student's information using search bar	All saved students' information should be shown

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11.		Submitting Parent records without adding mandatory values	Parent Information submission should fail without mandatory values
12.		Use invalid format on the fields and submit the parent information(E.g enter email as abbc.com)	Information submission should fail with invalid values
13.	Parent Registration	Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"
14.		Enter all information correctly and submit	Parent Information should submit and save on the database
15.		Load parent name on the "parent name" field of the student registration page	All saved parents' name should be loaded to the student registration page.
16.		Submitting Teacher records without adding mandatory values	Teacher Information submission should fail without mandatory values
17.	Teacher Registration	Use invalid format on the fields and submit the Teacher information(E.g enter email as abbc.com)	Information submission should fail with invalid values
18.		Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"
19.		Enter all information correctly and submit	Teacher Information should submit and save on the database

Table 4-3 Test Cases - Amin Module

All the test cases related to meal plan management were listed as bellow. Refer Table 4-4
Test Cases - Meal Plan Management.

#	Page /Function	Test Description	Expected Result
20.		Submit food information without adding any values	Information submission should fail without adding any values
21.		Submit information without adding food type	Information submission should fail without adding food type
22.	Create a new food	Submit exist food with food type	Validation massage should be shown as "this food is already exists"
23.		Submit food information giving valid food name and food type	Food information should submit and save on the database successfully
24.		Load food details to the relevant cages of meal plan page.	All saved food details should load on the relevant cage on the meal plan based on the food type.

#	Page /Function	Test Description	Expected Result
25.	Delete food	Delete any food already saved and listed on the foods page.	Selected food should be deleted from the database
26.	Create a Meal Plan	Submitting meal plan without filling all the fields (except holiday)	Meal plan should not create successfully
27.		Filling meal plan details for a holiday submit the meal plan details.	Indicate the message saying "date is marked as a holiday"
28.		Submitting a meal plan without entering a date.	Meal plan should not create successfully while showing error massage
29.		Submitting meal plan with correctly filled fields	New meal plan should be created successfully for a given week
30.		Submitting meal plan for same week	It should not be able
31.	View Current Meal Plan	Viewing currently available meal plan by navigating to the current meal plan page	Current meal plan page should be shown meal plan which is created for the current week
32.		Viewing food allergy details with respect to current meal plan by navigating to the current meal plan page	It should be shown food allergies of the students with respect to the currently available meal plan
33.	Tomorrow meal plan	Viewing Tomorrow meal plan via parent's login	It should be shown tomorrow meal plan to the parents.
34.		Highlighting food allergies of the student and showing substitutes for them	In parent login, it should be able to show food allergy details with respect substitutes

Table 4-4 Test Cases - Meal Plan Management

All the test cases related to the image sharing module were listed under Table 4-5 *Test Cases - Image Sharing Module*

#	Page /Function	Test Description	Expected Result
35.	Upload Images	Submitting information without uploading image	Prompt error message
36.		Submitting image once it is uploaded	Image submission should be done successfully
37.	View gallery	Navigate to gallery page to view images via parent login	Uploaded images should be shown in gallery page
38.		Navigate to gallery page to view images via teacher login	Uploaded images should be shown in gallery page

Table 4-5 Test Cases - Image Sharing Module

Test Cases related to notification module is listed as bellow. Refer Table 4-6 *Test Cases - Notification Module*

#	Page /Function	Test Description	Expected Result
39.	Send Manual notification	Submitting manual notification details without entering any data	Notification submission should fail
40.		Submitting manual notification entering the message correctly	Notification submission should be done successfully
41.	Generate automatic notifications	Generate SMS/email notification regarding user registration	SMS/email should be successfully sent to the user
42.		Generate SMS/email notification regarding tomorrow meal plan	SMS/email should be successfully sent to the user
43.		Generate SMS/email notification regarding image sharing	SMS/email should be successfully sent to the user

Table 4-6 Test Cases - Notification Module

Test Results

Above mentioned test cases were tested under two phases (phase I and phase II). Test results for admin module were listed.

#	Page /Function	Test Description	Expected Result	Test Result	
				Phase I	Phase II
1.	Login	Login without entering username/email AND password	Prompt user to enter required fields.	Passed	Passed
2.		Login without entering username/email OR password	Prompt user to enter required field	Passed	Passed
3.		Login with invalid username/email AND password	Indicate error by notifying email or password is incorrect	Passed	Passed
4.		Login with invalid username/email OR password	Indicate error by notifying email or password is incorrect	Failed (Directed to blank page)	Passed
5.		Login with correct username/email and Password	Log in to the system	Passed	Passed
6.	Logout	Logout from the account	Logout from the user account and redirect to the home page	Passed	Passed
7.	Student Registration	Submitting student records without adding mandatory values	Student information submission should fail without mandatory values	Failed (Validations were not added when testing)	Passed
8.		Use invalid format on the fields and submit the information (E.g:	Information submission should fail with invalid values.	Passed	Passed

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		enter DOB using string values)			
9.		Enter all information correctly and submit	Student Information should submit and save on the database	Passed	Passed
10.		View each student's information using search bar	All saved students' information should be shown	Passed	Passed
11.	Parent Registration	Submitting Parent records without adding mandatory values	Parent Information submission should fail without mandatory values	Failed (Validation were not added when testing)	Passed
12.		Use invalid format on the fields and submit the parent information(E.g enter email as abbc.com)	Information submission should fail with invalid values	Passed	Passed
13.		Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"	Passed	Passed
14.		Enter all information correctly and submit	Parent Information should submit and save on the database	Passed	Passed
15.		Load parent name on the "parent name" field of the student registration page	All saved parents' name should be loaded to the student registration page.	Passed	Passed
16.	Teacher Registration	Submitting Teacher records without adding mandatory values	Teacher Information submission should fail without mandatory values	Failed (Validation were not added when testing)	Passed
17.		Use invalid format on the fields and submit the Teacher information(E.g enter email as abbc.com)	Information submission should fail with invalid values	Passed	Passed
18.		Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"	Passed	Passed

19.		Enter all information correctly and submit	Teacher Information should submit and save on the database	Passed	Passed

Table 4-7 Test Result - Admin Module

Refer Appendix C to see all test results.

4.3 Problems encountered

- **Lack of knowledge and experience**

It was the main challenge that I faced from the beginning to end of this project. Due to limited knowledge and long learning curve about latest technologies and frameworks (E.g: Larval Framework, Node.Js),It was unable to develop this system using those technologies. because of that, it wasn't be able to obtain the benefits of having new technologies.

- **Resource Limitations**

Resource limitation can be recognized as a problem beyond the control of me. even it is a feature of the system, it was unable to integrate IoT technology because of the prices of the hardware (IP cam). Also it was difficult to find free communication API which is supported to pure php. Because most of the API's are only supported for the frameworks like Node.js, Lareval. Anyhow Twilio communication API was used with some limitations.

- **Scope related issues**

To cover the whole scope of the system was a challenge due limited period of time. If there are many improvements came in to the mind when developing the system, they were keeping as future works.

- **Requirement specification issues**

When collecting requirements, it was difficult to specify what is actually need and what is not. Because Twins' Ark did not have any implemented system before.so they were newest to this field. To resolve that, domain knowledge and experiences that I gain through IT field was used.

4.4 Client Evaluation

The locally hosted SmartCaring Application is checked and tested by the owners of the Twins'Ark Montessori and Daycare. Actual data were entered to find out whether the system is satisfying the functional and non-functional requirement of the system properly.

The owners are most interested on some of the features like meal plan notification and image sharing options, and etc. Based on the testing which was done by the user, they have good impression about the overall functionalities of the system. That was recognized by the user evaluation form which was designed for evaluating the system by user. Refer Figure 4-1 *User Evaluation Form*.

USER EVALUATION FORM

Checked by: ....

Job Role   : ....

Please kindly fill the relevant fields in the following table, indicating your level of satisfaction about the overall system functions. Your honest feedback will be given benefits for achieving the objective of the system.

Rating			
Excellent	Good	Average	Poor
A	B	C	D

No	System Feature	Rating
1	Log In and Log Out	
2	Users Creation	
3	Child Creation	
4	Search Child option	
5	Meal Plan Creation	
6	View Current Meal plan	
7	View Food Allergy details	
8	Meal Plan notification	
9	View Meal Plan details by parent	
10	Create Food	
11	Delete Food	
12	Digital Notice Board	
13	Digital Calendar	
14	Image sharing (Gallery)	
15	Make a video call by parent	
16	Make an emergency call	
17	Users' Dash board	
18	Email and SMS notifications	
19	Sending Manual notices	
20	Appearance of the system	
21	Understandability of the system	

Special Narration:

Signature: ....   Date: ....
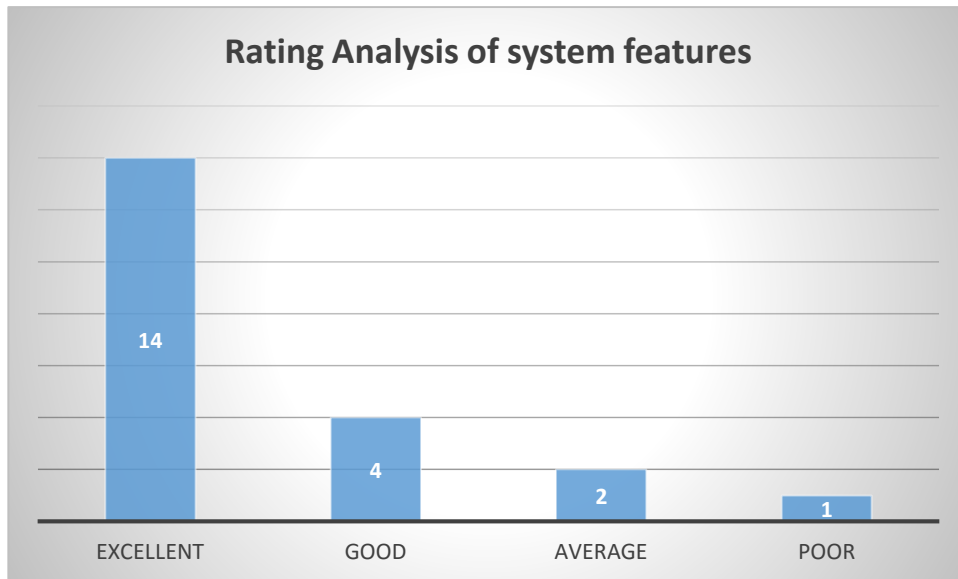
Figure 4-1 User Evaluation Form

Figure 4-2 User Feedback Analysis

Above (Figure 4-2 *User Feedback Analysis* chart shows that how the user (owner) gave feedback for this system in evaluation form.

CHAPTER 5: CONCLUSION

Tiwns' Ark Montessori and Daycare is located in Bandarawela and currently they are not using any automated system for any task. Mobile responsive SmartCaring application is mainly developed to bridge the communication gap between parents and daycare staff. Through the developed system, parents can engage with the day care more easily.

So, even it is having some future improvements of the system, it is able to conclude that every phase of the SDLC were completed successfully.

5.1 Lessons learned

When developing the system, it was able to apply most of the theories which I was learning throughout the past few years. So Applying those theories in to practice, was helpful me to expand the knowledge further. In addition to that, working with MVC architecture, Integrating API's to the system and how to work with bootstrap are the core knowledge areas that I gained throughout the system development.

It was used several tools when developing the system. As an example, Phpstome IDE,Pencil wire frame designing tool, selenium testing tool are the technologies that I have never used before.

Also I have gained some knowledge about project management and report writing through this project.

5.2 Deficiencies of the system

- The Parent cannot interact with the day care by using IoT technology.
  Due to expensiveness of the devices and services, this operation could not be implemented. as an example, video calls can be implemented by embedding IP cameras in the web application. however, that can be implemented only if it is purchased and get the API's and integration technology.
- Parents are not allowed to enter massages and notices on the notice board.
  With the limited time period, this could not be able to implement.
- Emergency call with notifications are not handle as a phone call.
  Emergency call option is already available in the system. But when it is receiving by parent, it is not appearing on the phone as an emergency call.
- Storage issues might be happened based on the hosting cost.
  The huge hosting cost might be involved.
- It is difficult to generate more reports with the time constraint of the development.

5.3 Future improvement of the work

- Payment management module (including payment gateway) and Attendance module will be integrated as a future enhancement.
- Parent privileges can be expanded further so that parent can enter any massages or notices in the system.
- Improving report generation module including more reports.

- Improving digital calendar module so that automating holiday and special events reminders.
- Enhancing the system by the IP camera integration so that parent can collaborate with the class via IoT technology.

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Appendices

Appendix A: System Analysis and Design Documentation
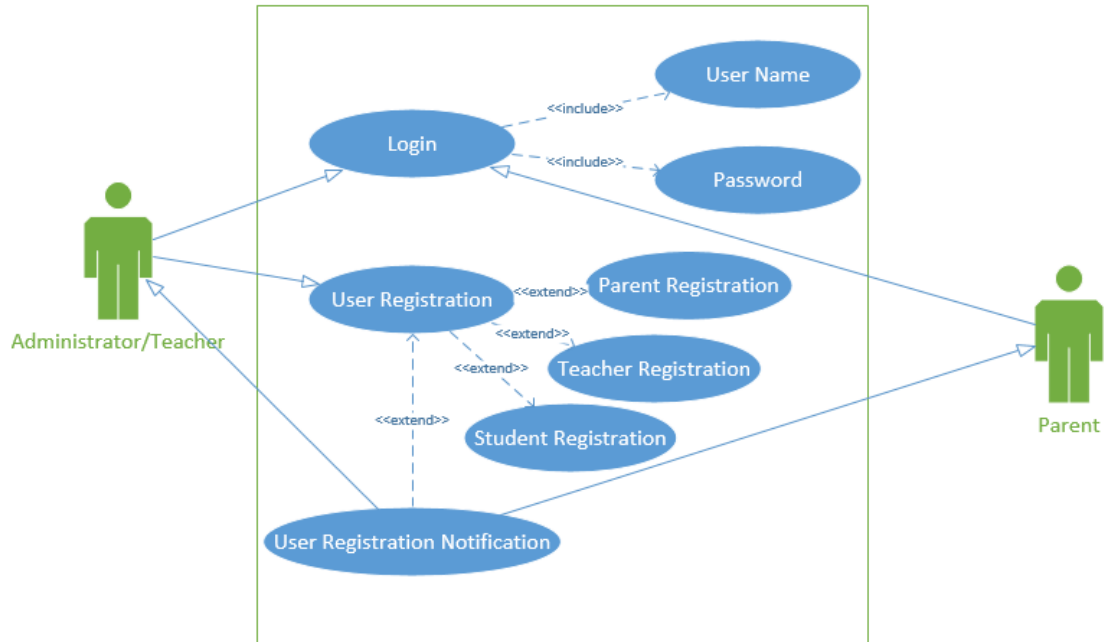**Use Case Diagrams for Main Modules of SmartCaring Application**
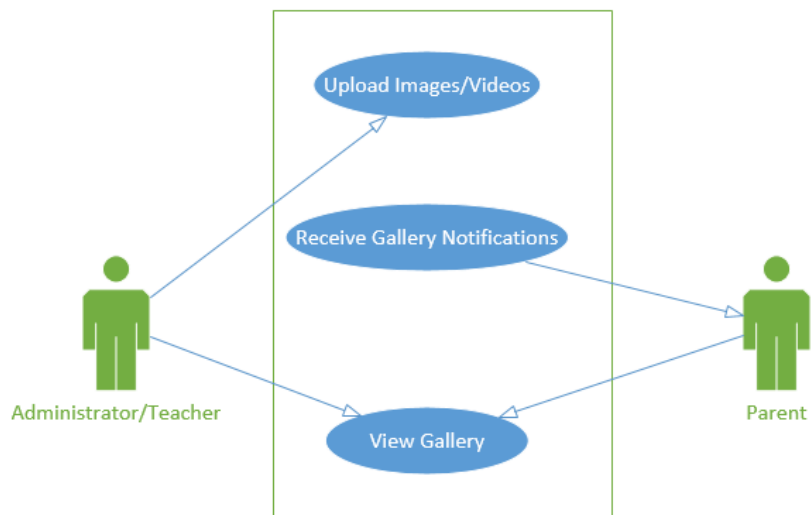

Figure A. 1 Use Case Diagram - Admin Module

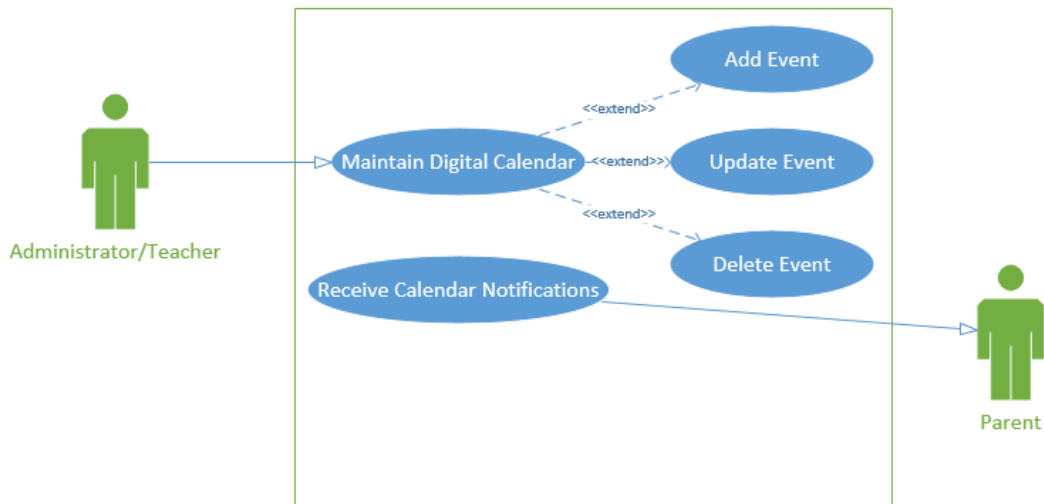**Figure A. 2 Image/Video Sharing Module**

Figure A. 3 Event Management
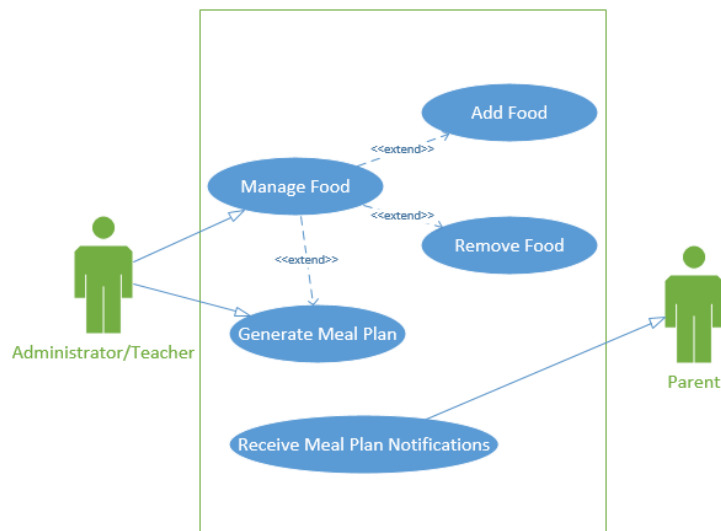
Figure A. 4 Meal Plan Module

Use Case Narratives

- **Login**

Use Case	Login
Actors	Administrator, Teacher, Parent
Description	
All registered users can login to the system	
Pre-Conditions	
Have a authorized Username and Password combination	
Flow of events	
4. Enter User Name (E-mail) and Pass word	
5. If the e-mail/username and password combination is valid then they can log in to their respective "Home" page.	

6.	If the e-mail/username and password combination is invalid ,a relevant error massage is appeared.

Post-Conditions

Only the authorized persons have the access to the system. others cannot log in to the system.

Table A. 1 Use Case Narrative - login

- **Register Teacher**

Use Case	Teacher Registration
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to register a new teacher in the system	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Navigate to the Teacher Registration Page. 2. Enter all mandatory Information. 3. Submit the information	
Post-Conditions	
If the teacher registration is done successfully in the system, then teacher will be notified by email/SMS regarding the registration.	

Table A. 2 Use Case Narrative - Teacher Registration

- **Parent Registration**

Use Case	Parent Registration
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to register a new Parent in the system	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Navigate to the Parent Registration Page. 2. Enter all mandatory Information. 3. Submit the information	
Post-Conditions	
If the Parent registration is done successfully in the system, then Parent will be notified by email/SMS regarding the registration.	

Table A. 3 Use Case Narrative - Parent Registration

- **Student Registration**

Use Case	Student Registration
Actors	Administrator , Teacher
Description	
Administrator or Teacher can be able to register a new Child in the system	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	

1. Navigate to the Student Registration Page.
2. Enter all mandatory Information.
3. Submit the information

Post-Conditions
If the Student registration is done successfully in the system, then Parent will be notified by email/SMS regarding the registration their children.

Table A. 4 Use Case Narrative - Student Registration

- **Manage Foods**

Use Case	Manage Foods
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to manage foods in the system.	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	

1. Navigate to the Foods Page in the system.

2. If user wants to add a new food then enter food name, food type and submit the information.
3. If user wants to delete food then select a relevant food and press delete button.

Post-Conditions
Added foods are loaded on the relevant cage of meal plan

Table A. 5 Use Case Narrative - Manage Foods

- **Generate Meal Plan**

Use Case	Generate Meal Plan
Actors	Administrator , Teacher
Description	
Administrator or Teacher can be able to generate meal plan for a week	
Pre-Conditions	
Logged in to the system as Administrator or Teacher and Relevant foods should be added to the system	
Flow of events	

1. Navigate to the Meal Plan Page in the system.
2. Assign meals for every day in the week (Excluding holidays)
3. Submit the Information

Post-Conditions
If the meal plan is created successfully in the system, then Parent will be notified by email/SMS regarding the meal plan for next week.

Table A. 6 Use Case Narrative –Create a Meal Plan

- **Maintain Real-Time Pictures and Videos**

Use Case	Maintain Real-time Pictures and Videos
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to upload pictures	
Pre-Conditions	

Logged in to the system as Administrator or Teacher	
Flow of events	
3. Navigate to the Meal Plan Page in the system.	
4. Upload images and submit	
Post-Conditions	
Notification will be sent to all parents	

Table A. 7 Use Case Narrative - Maintain Real-time pictures and videos

- **Maintain Digital Calendar**

Use Case	Maintain digital calendar
Actors	Administrator, Teacher
Description	
Administrator or Teacher can be able to maintain digital calendar	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Navigate to the event management page	
2. Enter event tittle	
3. Mark the date	
4. Select event type	
5. Submit information	
Post-Conditions	
Marked holidays are appeared on the meal plan and show holidays on noticeboards	

Table A. 8 Use Case Narrative - Maintain Digital Calendar

- **Maintain Notice Board**

Use Case	Maintain notice board
Actors	Administrator , Teacher
Description	
Administrator or Teacher can be able to maintain Notice board	
Pre-Conditions	
Logged in to the system as Administrator or Teacher	
Flow of events	
1. Enter a Notice and submit	
Post-Conditions	
None	

Table A. 9 Use Case Narrative -Maintain Notice board

- **Generating Reports**

Use Case	Generating Reports
Actors	Administrator , Teacher
Description	
Administrator or Teacher can be able to generate reports	
Pre-Conditions	
Logged in to the system as Administrator or Teacher and relevant data need to exits in the system	
Flow of events	

	2. Navigate to report generator
	3. Select report type
	4. View report
Post-Conditions	
None	

- **Receive Notifications**

Use Case	Receive Notifications
Actors	Parent
Description	
Parents are receiving notifications via SMS, email or notification panel in the web portal	
Pre-Conditions	
Parents should be registered in the system with the given contact details	
Flow of events	
1. View notifications via SMS, email or notification panel in the web portal	
Post-Conditions	
None	

Table A. 11 Use Case Narrative -Receive Notifications

- **View child profile**

Use Case	View child profile
Actors	Parent
Description	
Parent can view profile of the child	
Pre-Conditions	
Logged in to the system as a parent	
Flow of events	
1. Select the child	
2. View profile details	
Post-Conditions	
None	

Table A. 12 Use Case Narrative -View Profile details

- **View Gallery**

Use Case	View Gallery
Actors	Parent, Teachers
Description	
Parents and teachers can view profile the Galley	
Pre-Conditions	
Logged in to the system	
Flow of events	
1. Select Gallery from the navigation bar	
2. View profile details	

Post-Conditions
Upload the Photos

<p align="center">**Table A. 13 Use Case Narrative - View Gallery**</p>

Activity Diagrams

Activity Diagram for User Registration can be shown as follows. Refer Figure A. 5 Activity Diagram - User Registration.
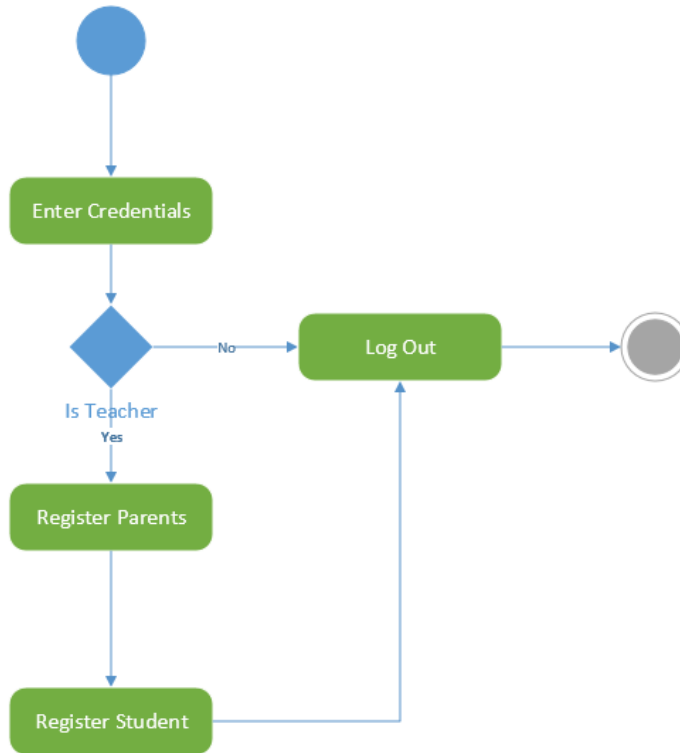
Figure A. 5 Activity Diagram - User Registration

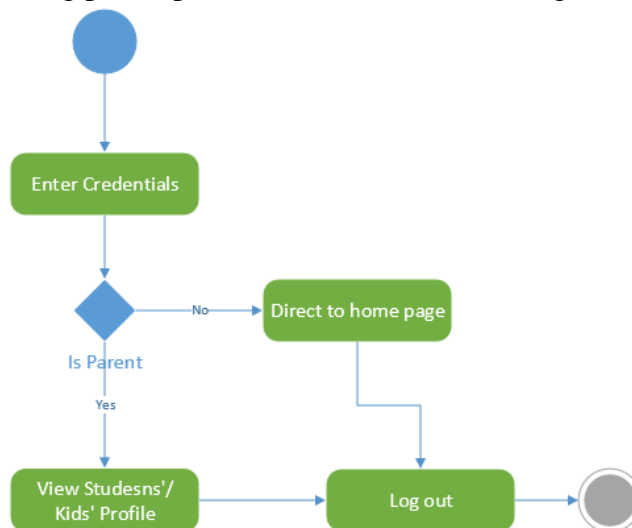Activity diagram for viewing parent profile is shown as bellow. Figure A. 6 Activity Diagram - View Profile.

<p align="center">**Figure A. 6 Activity Diagram - View Profile**</p>

Activity diagram for notification module is shown as bellow. Refer Figure A. 7 Activity Diagram - Notification Module.
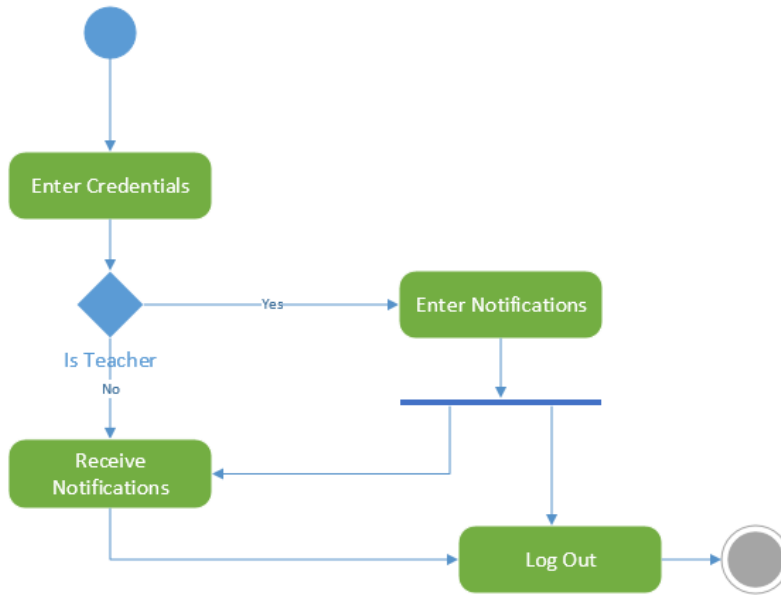
Figure A. 7 Activity Diagram - Notification Module

Activity diagram for event management module is as follow. Refer Figure A. 8 Activity Diagram - Event Management Module.
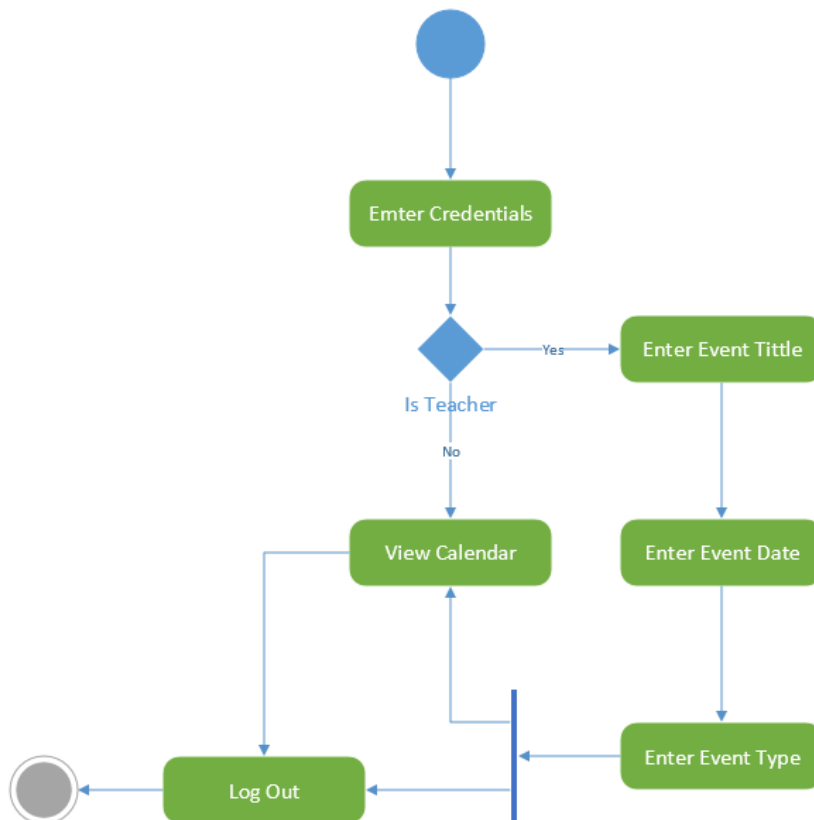
Figure A. 8 Activity Diagram - Event Management Module
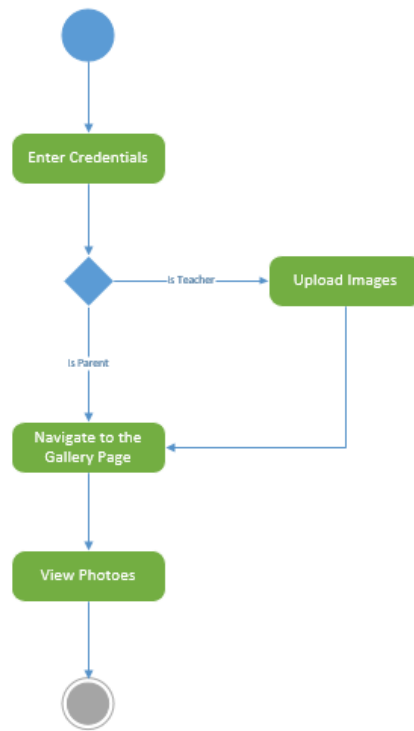
Figure A. 9 Activity Diagram - Image Sharing

Figure A. 10 Activity Diagram - Make a call

Sequence Diagrams

Sequence diagram for image sharing is as follows. Refer Figure A. 11 Sequence Diagram - Image Sharing
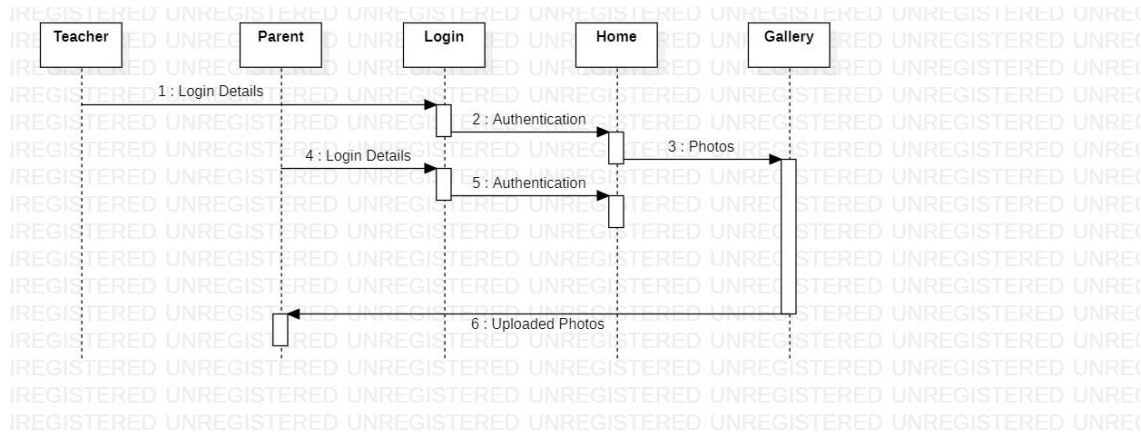
Figure A. 11 Sequence Diagram - Image Sharing

Sequence diagram for Notification module is as follows. Refer .Figure A. 12 Sequence Diagram - Notification Module
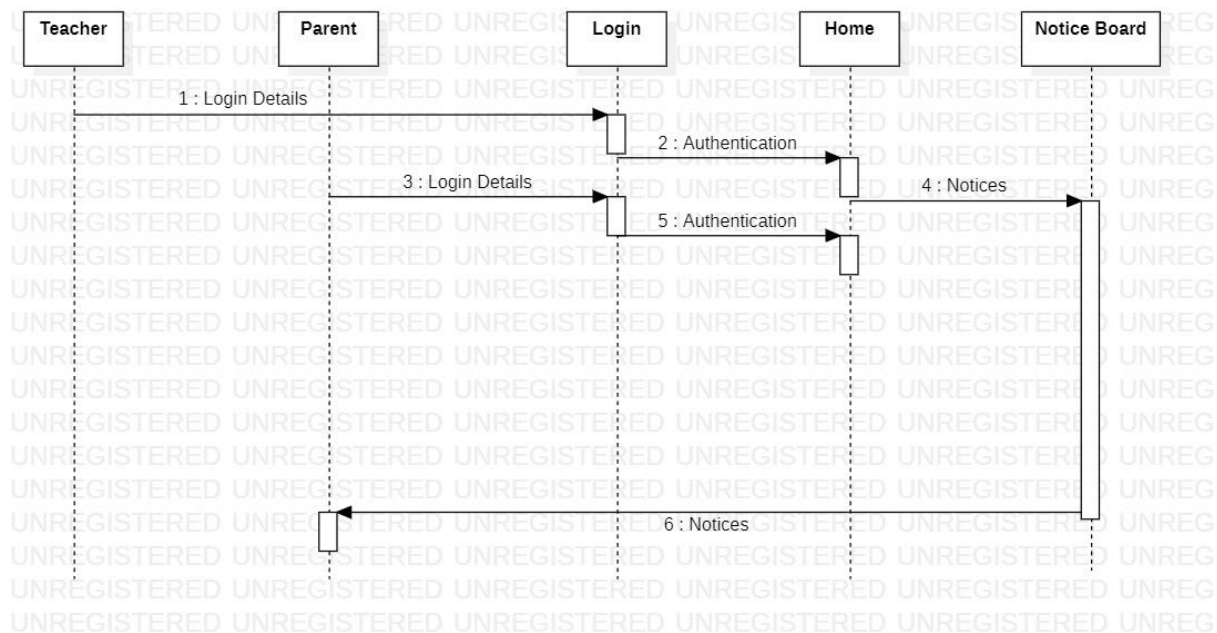
Figure A. 12 Sequence Diagram - Notification Module

Appendix B: User Documentation

- **System Login**

  Giving a valid email and password you can log in to the system. The user name (email) and password can obtain after the registration as a user. Figure B. 1 *User Interface - User Login* shows the system login interface. Login with the correct email and password combination will direct to the home page of SmartCaring Application. The home page appearance will be based on the user, who logged in to the system.
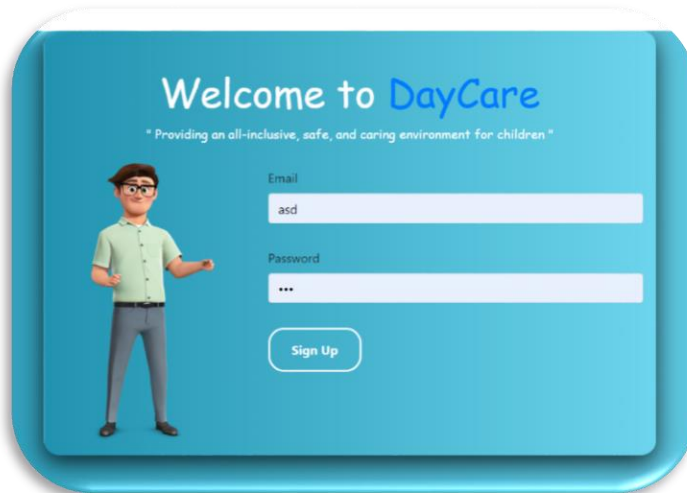
Figure B. 1 User Interface - User Login

- **Parent Registration**

Parent registration can be done using following interface by an administrator or a teacher. All fields of the parent registration interface, considered as mandatory. It is required to enter valid data with the appropriate format when filling all fields. Once the registration is completed, automatic email or SMS will send to the parent with username and password.
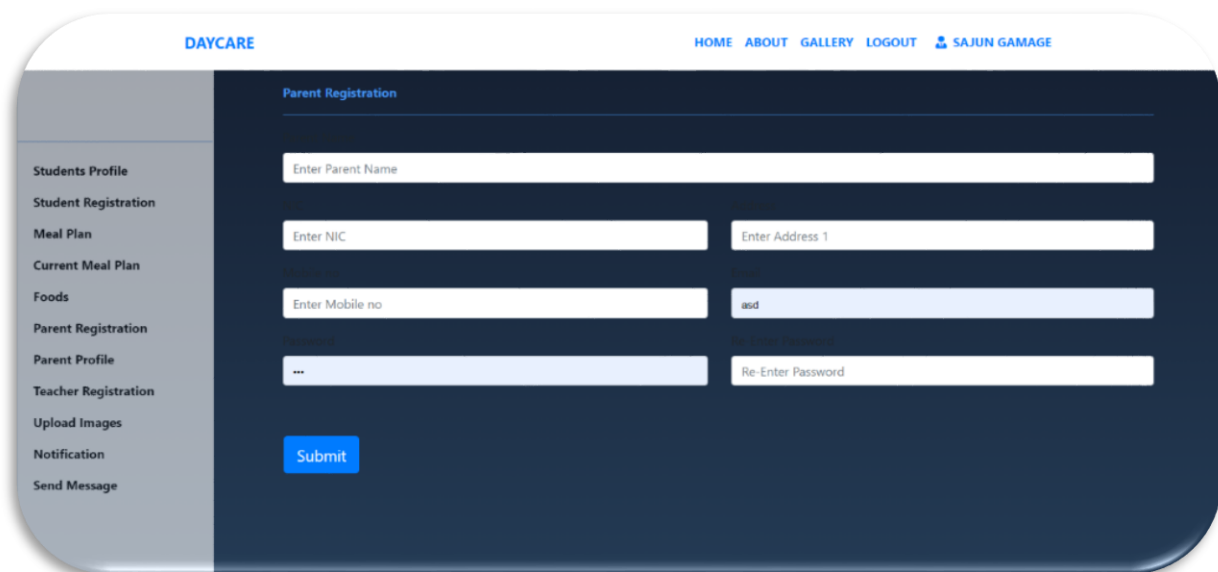
Figure B. 2 User Interface - Parent Registration

- **Student Registration**

A new student/kid can be registered in the system using following interface. Refer Figure B. 3 User Interface - Student Registration. Students' personal information and other information which relate to Twins' Ark will keep in the system using this interface. The photograph of the child also can upload through this interface. A unique ID will be generated for each child, once the registration is completed.

Figure B. 3 User Interface - Student Registration

- **Search Student**

Figure B. 4 User Interface - Student Search

Any child who registered in the system can search using this search bar. Refer Figure B. 4 User Interface - Student Search.

- **Food Management**

Any food which is recommended to give kids, can add in to the system using this interface. Figure B. 5 User Interface - Food Management. Also using this interface, added foods can be removed. Each food can be categorized in to four based on the time that are going to give to kids. Breakfast, Morning Snack, Lunch and Lunch after Snack are known and food types. No and duplicate foods are allowed to enter.
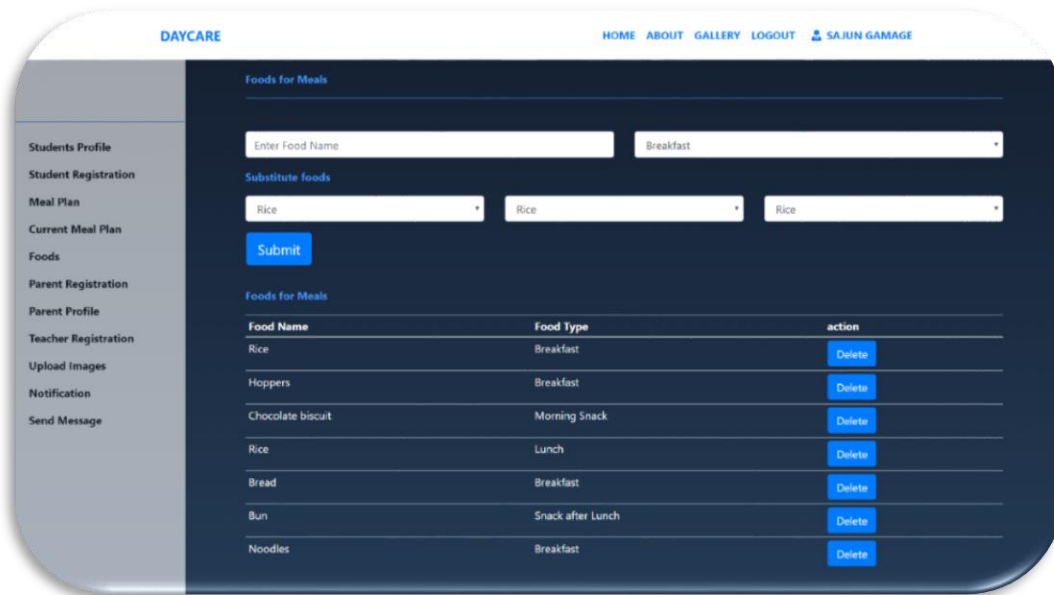

Figure B. 5 User Interface - Food Management

- **Meal Plan Creation**

Meal plan can be created for whole week. Entered foods under food management interface, can recall using this interface. If there is a holiday, you are not allowed create meal plan for that
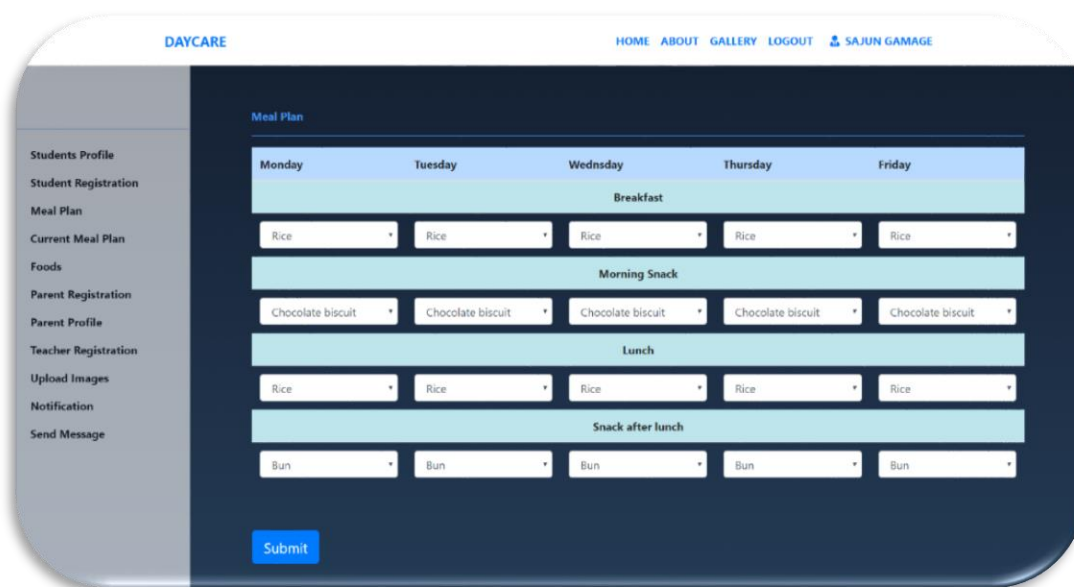

Figure B. 6 User Interface - Meal Plan Creation

day. Once you created the meal plan for a week, then parents are received tomorrow meal plan details as daily basis. Refer Figure B. 6 User Interface - Meal Plan Creation.

- **View Meal Plan Details with Food allergy details**

Meal plan details can view by teachers or administrators using bellow interface. Refer Figure B. 7 User Interface - View Meal Plan.This interface shows weekly meal plan and the kids' food allergy details with respective allergic foods of kids.

Figure B. 7 User Interface - View Meal Plan

- **Upload image**

    Photos can be uploaded to the system by teachers so that any user can see gallery at any time. Once images are uploaded to the system, users are received notifications to their mobile phone. Figure B. 8 User Interface - Upload Image shows that image uploading page of the SmartCaring Application.

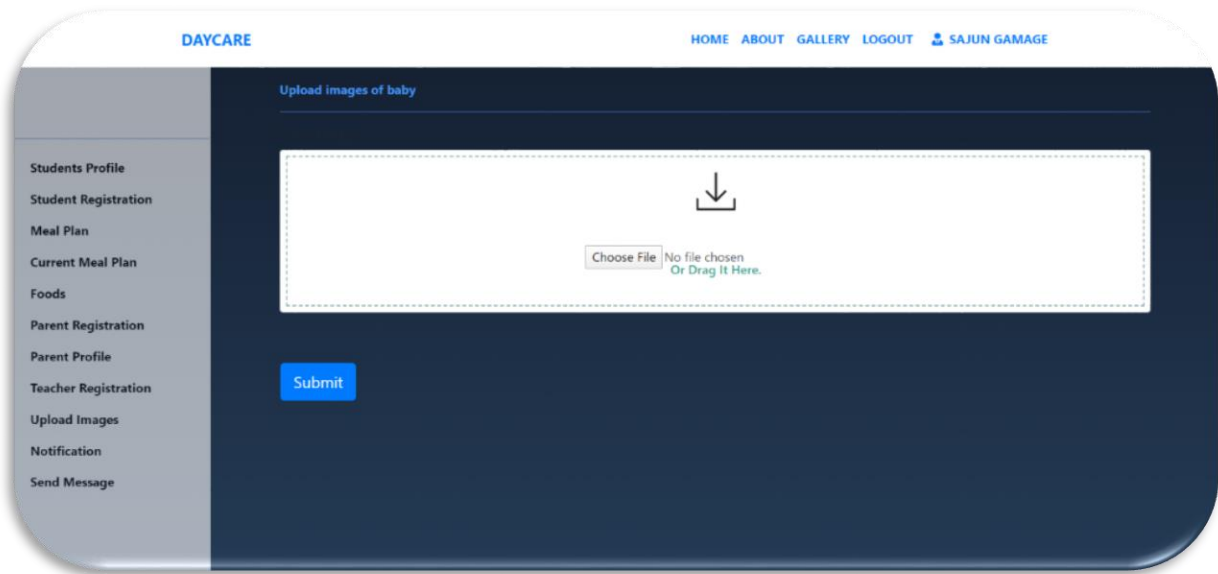**Figure B. 8 User Interface - Upload Image**

- **Manual Notification**

Twins' Ark staff can enter any notices via bellow interface. Refer Figure B. 9 User Interface-
Manual Notification. Those notices are sent to the parents as notifications and also parents
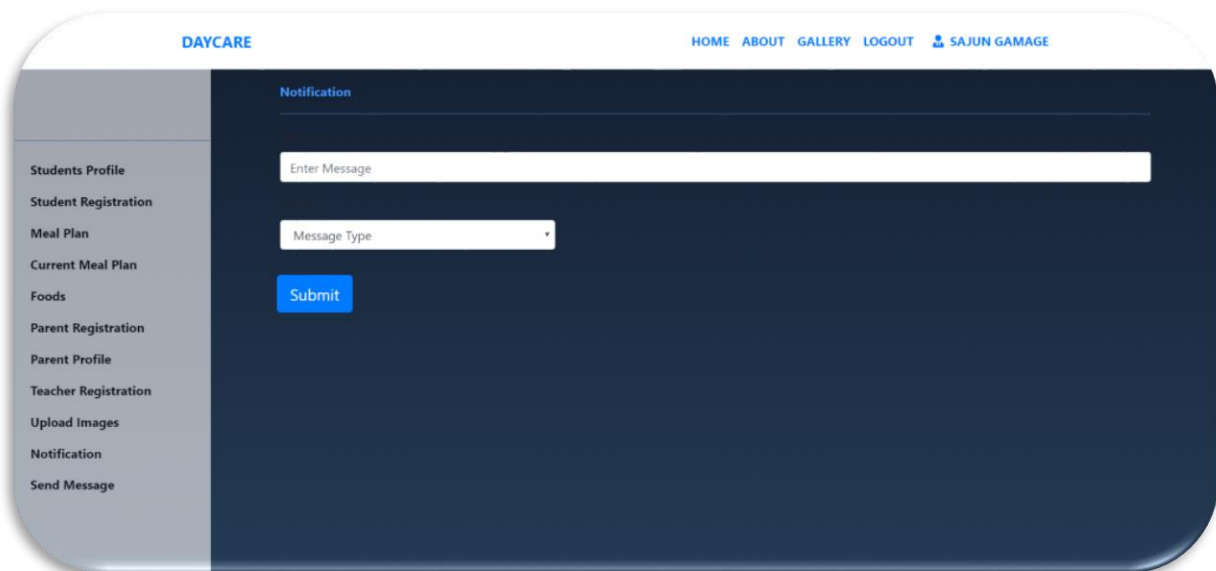can see those notices via notice board (Dash board).

Figure B. 9 User Interface- Manual Notification

- **Managing Digital Calendar**

Twins'Ark staff can manage the calendar. When there is a holiday, then they can mark calendar and also if there are any events in Twins' Ark then staff can mark calendar so that parent can see the calendar via parent dashboard.
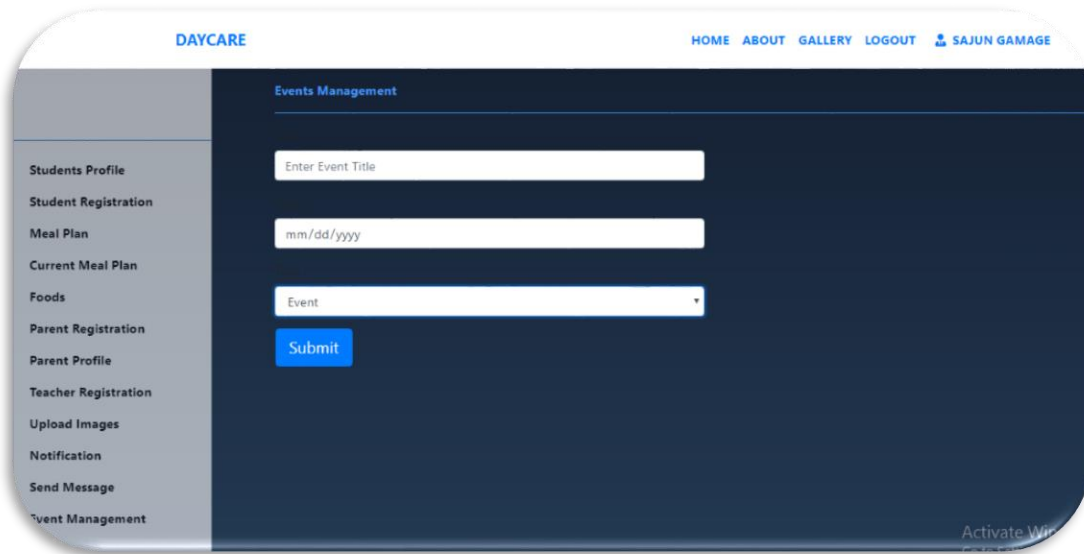
Figure B. 10 User Interface - Event Management Page

- **Galley**

All the users can see the photos from gallery view. Refer Figure B. 11 *User Interface - Gallery Page*.
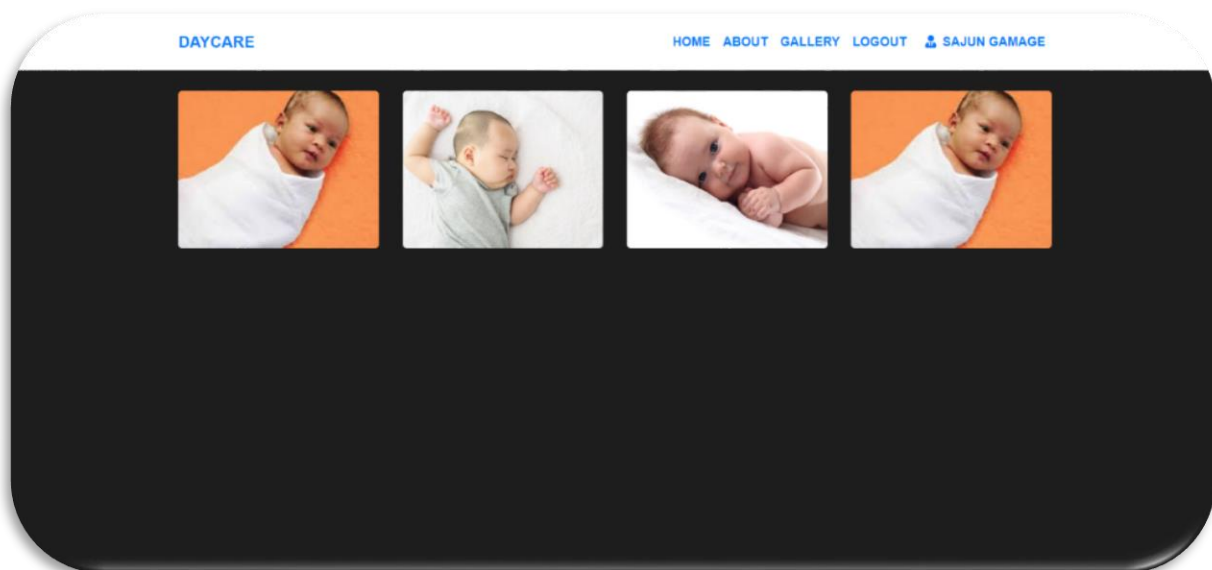
Figure B. 11 User Interface - Gallery Page

- **Parent Dash Board**

Parent dash board can use to view every information available for each student. Digital Notice board, Calendar, Meal details are the main information that provide through parent dash board. Also it contains call option at the bottom. Refer Figure B. 12 User Interface - Parent Dash Board.

Figure B. 12 User Interface - Parent Dash Board

Appendix C: Test Results

Test result related to admin module. Refer Table C. 1 Test Results - Admin Module
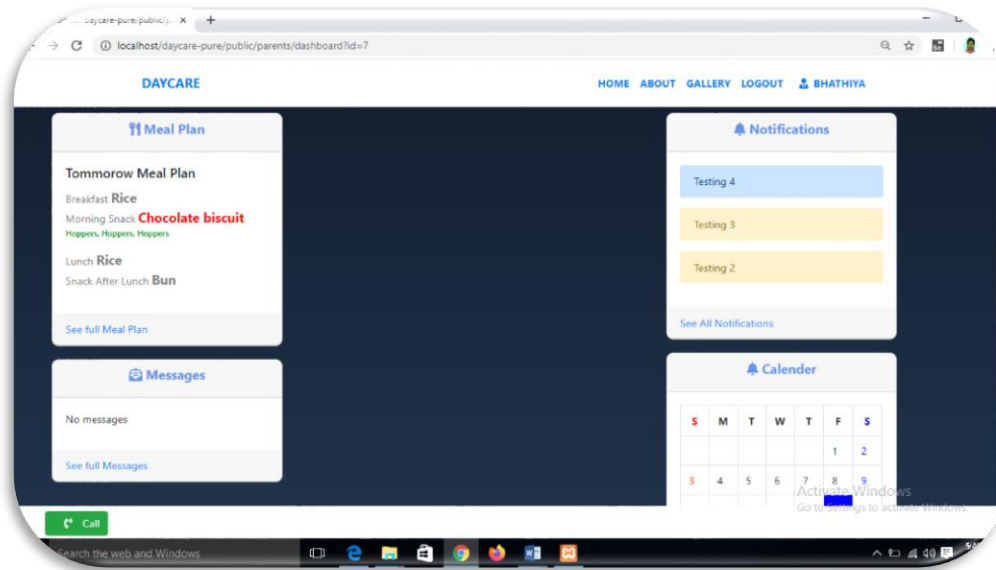
#	Page /Function	Test Description	Expected Result	Test Result	
				Phase I	**Phase II**
1.	Login	Login without entering username/email AND password	Prompt user to enter required fields.	Passed	Passed
2.		Login without entering username/email OR password	Prompt user to enter required field	Passed	Passed
3.		Login with invalid username/email AND password	Indicate error by notifying email or password is incorrect	Passed	Passed
4.		Login with invalid username/email OR password	Indicate error by notifying email or password is incorrect	Failed (Directed to blank page)	Passed
5.		Login with correct username/email and Password	Log in to the system	Passed	Passed
6.	Logout	Logout from the account	Logout from the user account and redirect to the home page	Passed	Passed
7.	Student Registration	Submitting student records without adding mandatory values	Student information submission should fail without mandatory values	Failed (Validations were not added when testing)	Passed
8.		Use invalid format on the fields and submit the information (E.g: enter DOB using string values)	Information submission should fail with invalid values.	Passed	Passed
9.		Enter all information correctly and submit	Student Information should submit and save on the database	Passed	Passed
10.		View each student's information using search bar	All saved students' information should be shown	Passed	Passed
11.	Parent Registration	Submitting Parent records without adding mandatory values	Parent Information submission should fail without mandatory values	Failed (Validation were not added when testing)	Passed

12.		Use invalid format on the fields and submit the parent information(E.g enter email as abbc.com)	Information submission should fail with invalid values	Passed	Passed
13.		Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"	Passed	Passed
14.		Enter all information correctly and submit	Parent Information should submit and save on the database	Passed	Passed
15.		Load parent name on the "parent name" field of the student registration page	All saved parents' name should be loaded to the student registration page.	Passed	Passed
16.		Submitting Teacher records without adding mandatory values	Teacher Information submission should fail without mandatory values	Failed (Validation were not added when testing)	Passed
17.	Teacher Registration	Use invalid format on the fields and submit the Teacher information(E.g enter email as abbc.com)	Information submission should fail with invalid values	Passed	Passed
18.		Enter different values in "password" and "Re-enter password" fields	Error massage should be indicated as "passwords do not match"	Passed	Passed
19.		Enter all information correctly and submit	Teacher Information should submit and save on the database	Passed	Passed

Table C. 1 Test Results - Admin Module

Test result related to meal plan management module. Refer Table C. 2 Test Results - Meal Plan.

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	**Phase II**
20.		Submit food information without adding any values	Information submission should fail without adding any values	Passed	Passed
21.		Submit information without adding food type	Information submission should fail without adding food type	Passed	Passed
22.	Create a new food	Submit exist food with food type	Validation massage should be shown as "this food is already exists"	Failed	Passed
23.		Submit food information giving valid food name and food type	Food information should submit and save on the database successfully	Passed	Passed
24.		Load food details to the relevant cages of meal plan page.	All saved food details should load on the relevant cage on the meal plan based on the food type.	Passed	Passed
25.	Delete food	Delete any food already saved and listed on the foods page.	Selected food should be deleted from the database	Passed	Passed
26.	Create Meal Plan	Submitting meal plan without filling all the fields (except holiday)	Meal plan should not create successfully	Passed	Passed
27.		Filling meal plan details for a holiday submit the meal plan details.	Indicate the message saying "date is marked as a holiday"	Failed	Passed

28.		Submitting a meal plan without entering a date.	Meal plan should not create successfully while showing error massage	Passed	Passed
29.		Submitting meal plan with correctly filled fields	New meal plan should be created successfully for a given week	Passed	Passed
30.		Submitting meal plan for same week	It should not be able to create a meal plan for same week again and again	Failed	
31.	View Current Meal Plan	Viewing currently available meal plan by navigating to the current meal plan page	Current meal plan page should be shown meal plan which is created for the current week	Passed	Passed
32.		Viewing food allergy details with respect to current meal plan by navigating to the current meal plan page	It should be shown food allergies of the students with respect to the currently available meal plan	Passed	Passed
33.	Tomorrow meal plan	Viewing Tomorrow meal plan via parent's login	It should be shown tomorrow meal plan to the parents.	Passed	Passed
34.		Highlighting food allergies of the student and showing substitutes for them	In parent login, it should be able to show food allergy details and respect substitutes	Passed	Passed

Table C. 2 Test Results - Meal Plan

Test results related to image sharing. Refer Table C. 3 Test Results - Image Sharing.

#	Page /Function	Test Description	Expected Result	Test Results Phase I	Phase II
35.	Upload Images	Submitting information without uploading image	Prompt error message	Passed	Passed
36.		Submitting image once it is uploaded	Image submission should be done successfully	Passed	Passed
37.	View gallery	Navigate to gallery page to view images via parent login	Uploaded images should be shown in gallery page	Passed	Passed
38.		Navigate to gallery page to view images via teacher login	Uploaded images should be shown in gallery page	Passed	Passed

Table C. 3 Test Results - Image Sharing

Test Results related to notifications. Table C. 4 Test Results - Notifications.

#	Page /Function	Test Description	Expected Result	Test Results Phase I	Phase II
39.	Send Manual notification	Submitting manual notification details without entering any data	Notification submission should fail	Passed	Passed
40.		Submitting manual notification entering the message correctly	Notification submission should be done successfully	Passed	Passed
41.	Generate automatic notifications	Generate sms/email notification regarding user registration	Notifications should be received to the user	Failed	Passed
42.		Generate sms/email notification regarding tomorrow meal plan	Notification should be received to the user	Passed	Passed
43.		Generate sms/email notification regarding image sharing	Notification should be received to the user	Failed	Passed

Table C. 4 Test Results - Notifications

#	Page /Function	Test Description	Expected Result	Test Results Phase I	Phase II
44.	Mark events	Submitting event details without entering any data	Event submission should fail	Passed	Passed
45.		Submitting event correctly filling all the things.	Event submission should be done successfully	Passed	Passed

#	Page /Function	Test Description	Expected Result	Test Results	
46.	View calendar	Log in to the parent profile to see calendar	Calendar should be shown with the marked events and holidays	Passed	Passed

Table C. 5 Test Results - Event Management

#	Page /Function	Test Description	Expected Result	Test Results	
				Phase I	Phase II
47.	Make a Call	Generate a call using call icon	Receiving call should be indicated in the mobile	Passed	Passed
48.	Decline the call	Decline the call by receiver	Once the call is declined by the receiver system should be notified it.	Passed	Passed

Table C. 6 Test Results - Generate Calls

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