University Of Ruhuna,

Matara, Sri Lanka

Printing Shop Management System

Project Report By

Group No. 07

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Acknowledgement

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Abstract

The report focuses on the development of a Printing Shop Management system which is designed to solve the currently faced problems by the students at the printing shops of the university, when getting their work done. The major problem was that the students have to wait for many hours to get their work done, which is a huge wastage of time. Therefore the development process involved a thorough analysis of the current workflow of the printing shops within the university premises and the specific problems faced by the customers using a survey. Through the survey, it was proven that this is a problem for many at the university and that the system should be included with some specific functionalities in order to solve those problems. The system includes functionalities such as selecting the preferred printing shop, selecting the vacant time slots, placing the orders, customize the pages as to how they should be printed, sending notifications to the customers where necessary and etc. Here, the objective was to design and implement a user-friendly and intuitive interface that incorporates simple technology in which anyone could handle with easily and with maximum customer satisfaction. Finally the resulting system was proven to be effective in improving productivity, reducing errors and increasing customer satisfaction ultimately resulting in solving the above said problem of wasting time at the printing shops, which was further justified at the stage of user acceptance testing.

Chapter 1. Introduction

1.1 Background

The printing centers at the university premises provide a range of services including paper printing, production of documents, book binding and selling stationary. They get a lot of customers daily and they have no proper way to manage them. We conducted a survey on this problem and it revealed that those printing centers are in need of a proper system to handle their tasks efficiently with customer satisfaction.

Starting from the taking of the order to the delivery of the print, everything happens manually and it takes a lot of time. Most of the time we see a congestion in those printing centers because of this inability to manage work accordingly when they get a lot of customers at once. Customers used to visit the printing centers to place the order, whether it is a hard copy or a soft copy. They have no way of communicating at a distant and sending the printing material to the printing centers which is a wastage of time. Most of the time the customers do not get their work done quickly and have to wait for hours.

Through the survey, we were able to confirm that most of the students face this problem of wasting their time at those printing shops at the university and that they are in need of a proper solution.

Therefore to overcome all those problems, students and the shop keepers of the printing centers are in need of a proper web based system. It should contain the functionalities to fulfill the above stated requirements in the most efficient way. Since the shop keepers are engaging in a range of work other than printing, the system should utilize each work helping them to provide their service with a higher customer satisfaction.

1.2Problem Definition

When considering the plight of the university students, it is quite clear that everyone of them is undergoing the pressure in conducting their academics in order to cover up their targets. Such that one of the most tiring times that they have to face at the university is the period of having end semester exams and also in submitting assignments, reports to the due date. Therefore in getting their notes, past papers and assignments printed, still they have no proper kind of solution at the printing centers within the university premises, to get it done quickly but have to wait for hours to get the work done. Those problems in which the students and the shop keepers have to face in their point of view can be listed as follows.

- **Students' point of view**
    - Have to wait in long queues for hours at the printing centers
    - No proper way of finding whether the shop is closed or not
    - No proper way of sending the printing material to the shop keeper other than visiting the shop
    - No proper way of getting to know whether the order that they placed is done or not
    - No proper way to know how long that it takes to get their work done
    - No way of finding which printing shop at the university is having less congestion, and where to visit to get the work done quickly
- **Shop keepers' point of view**
    - Having no proper way to update the customers about their order
    - No proper way of letting the customers know when the shop is busy or closed
    - No proper way of organizing the orders to deliver them, considering the order placed time and the time that the customer is requesting to get the work done
    - No proper way of rating the customer according to their interaction

1.3 Main Objectives

The main objective of this project is to develop a Web based Printing Shop Management System for the printing centers at the university, to remotely interact with their customers and to reduce the congestion within them by making the tasks done more efficiently and effectively. Such that the functionalities that the system provides can be listed as follows.

- The system registers each of the customers who place their order in the respective printing shop
- The system lets the customers to place their orders using the given time slots
- The system will let the customers know when their order is ready
- The system will update the customers as to which printing shop that they should place the order according to the congestion at the specific moment
- It will let the customers know if the shop is closed or not
- It will send notifications for the customers where possible and there is no wastage of time
- It will help the shop keepers to organize the orders according to the given time slots and to organize when to get them delivered

- It will help the shop keepers to rate the customers according to their constant interaction with the shop
- Through the ratings the shop keepers can get the report of each customer who have placed the order and can count on them in their next order

1.3 Scope

Here, in this project we are focusing on creating a Web Based Printing Shop Management System with the target of reducing the constant congestion at the printing shops of the university. So far, we have not found any solution for this issue, but still wait for hours in lengthy queues whether the task that is to get done is big or small. It is really pathetic when thinking on the plight of the final year students, because the truth is that they have no time to waste as such. What we target here is to make each customer and the shop keepers easier in managing the tasks and not to make anything complex. Hence, the functionalities included in the system are with simple logic and are of easy usage. It can be developed with complex algorithms and with several other functionalities in future development stages, but what we expect here is only to make the students comfortable in getting their work done without any wastage of time.

By successful completion of this web based system, students and the shop keepers will no longer have to face difficulties in getting their printouts and in getting done the other related activities such as book binding, laminating and so on. We have added functionalities to the system thinking on the plight of the customers as well as the shop keepers, and has made the process digitized in which we hope it will solve the above said problems with maximum user satisfaction.

Customer

- Ability to create and edit orders
- Ability to check the status of the order and whether the shop is open or closed
- Ability to set the time slot needed
- Ability to select the preferred printing shop
- Ability to select the vacant printing shop
- Ability to get ratings according to the interaction with the shop

Shop Keeper

- Ability to accept orders
- Ability to reject orders
- Ability to update the order status of the customers, through notifications
- Ability to check the customer interactions and rate them

Chapter 2. Analysis and System Specification

2.1 Requirement Analysis

As the first step in requirement gathering, we conducted a survey among the students to find the problems that they face at the printing shops. There by referring to the answers that they provided, we came to know the issues that they are facing and what solutions that we should bring upon through our system to solve those problems. Here, at the printing shops most of the things from the initial stage are performed manually and it is a wastage of time. Therefore in making the process digitalized through a web based system, we found that most of these problems will be solved and that this process will be more efficient and effective.

The images of the Google Form that we distributed among the students and the images of the graphs that we obtained for the relevant responses are attached in the appendix (Page 58).

2.1.1 Functional Requirements

There are three users in the system as Administrator, the Shop Keeper and the Customer.

Administrator is the main user of the system. Following functionalities can be done by the administrator.

- Login to the system
- Manage the profile of the Customer
- Manager the profile of the Shop keeper
- View order details
- Creating time slots
- Managing printing centers
- View print details
- Creating notifications

Shop keeper is the one who is managing the tasks at the shop and following are his/her functionalities.

- Sign up as a shop keeper
- Login to the system
- View customer details
- View available tasks
- Update the status of the tasks
- View completed tasks

- Send notifications
- Add sales records to the system
- Providing ratings for the customers

Customer is the one who receives services from the shop and his/her functionalities are as follows.

- Sign up as a customer
- Login as a customer
- Create order
- Edit order
- View available time slots
- Select the preferred printing shop
- View notifications
- View the status of the order

Out of Scope:

- Online payment handling

2.1.2 Non- Functional Requirements

Non-functional requirements (NFR) are a set of specifications that describe the system's operational capabilities rather than the specific behaviors. They are contrasted with functional requirements that define specific behavior or functions.

Availability

As the system is a web based system, it is available for 24 hours unless there is any internet disruption. If there is a system update or any kind of maintenance, the system may be down for few hours but it will be a temporary issue.

Reliability

Reliability is something that is needed to be sure of because securing the sensitive data of the customers like contact numbers and other personal details is very important. Those confidential details are only visible to the system administrator, shop keeper and the customer only and will be used only for official purposes.

Maintainability

Maintainability is very important because software should be written in such a way that it can evolve to meet the changing needs of the customers. This is a critical attribute because software change is an inevitable requirement of a changing business environment. Here, the code is easily maintainable as comments have included to support any developer who is going to use the code for future development. As comments aid code comprehension, maintenance is easier. Here, we have used PHP, Bootstrap, HTML and CSS basically and those technologies will also help with easy maintenance.

Security

Security is very important as the system contains sensitive data of the users. But here as each of the users have to use a username and a password to log into the system, there is no way of accessing those sensitive data by the outsiders. Passwords are encrypted in the database and it contains more security.

Usability

The customers can easily sign up to the system and a registered customer can easily log into the system. A customer who is logged into the system, could easily access through the interfaces which are easily adaptable. The system is user friendly that it focuses mainly on the maximum customer satisfaction. Easy and quickly manageable icons and navigations are used and the system transverses quickly between its states.

2.1.3 Data Flow

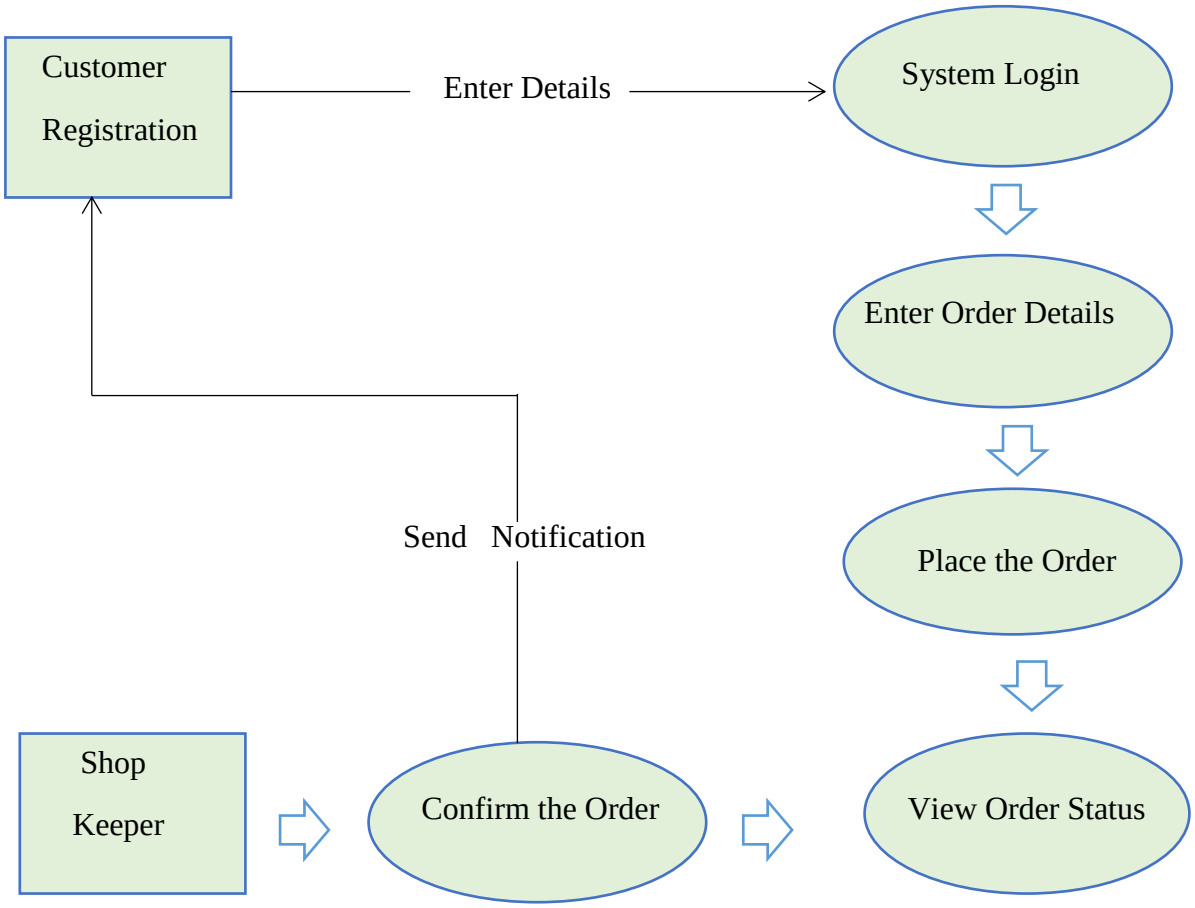


Figure 1: Data Flow Diagram for online ordering process

After the customer registration, the customer can place the order by selecting a vacant time slot of the selected printing shop. Then the shop keeper can view the customer details and the placed order details. According to the work that the shop keeper has already scheduled he/she can analyze whether the order is acceptable or not. Thereafter to mention the current status of the shop and to get the customer notified, the shop keeper can send a notification to the customer. This is simply the process which is depicted in the above flow diagram to show how the above explained ordering process is done.

2.2 Review on similar Systems and the Product Developed

When reviewing the system in which we developed, with that of the available other systems all over the world, there are a lot of such web based commercial systems to be compared. Some such popular systems are EFI Pace, Easy Cut Studio, Printvis, Capterra and etc. All of these are online portals which are created to have a better customer management. Those are driving more efficient workflows and they support the finance, sales and marketing operations as well as human resource management. What a printing shop expects through this kind of system can be managed using software operations management and financial management. Operations management includes managing the customer details, managing the customer orders, sending notifications where necessary and etc. Financial management includes handling the online payment portal, making invoices and so on.

In comparison to above stated systems and their functionalities, there are some differences in our system, in which we have focused mainly on the maximum support that we can provide for the users with easy maintenance and usage. Here, our target audience includes the university students and the shop keepers of the printing shops. What they expect is to get their work done without any wastage of time, so that instead of including more advanced functionalities when compared to the above stated systems, we have included functionalities in which one could handle easily. Making the process complex is not the fact but what it should do is providing all the considerable requirements for the users. Such that, our system is simple when compared to the systems that we find in the industry, but it can fulfill the needs of the users with their maximum satisfaction.

Further, the system can with held the Sri Lankan context and that it is of easy usage with a button press that anyone could easily handle, because many here in Sri Lanka have less knowledge in technology. Therefore, when compared to the global context and the system that we have created that it should mention that the functionalities and the way we created the system is unique to itself in providing the maximum user experience for all the users.

Chapter 3. Design

3.1 Introduction-Overall View of the Project

This project is centered around the basic problem of finding lengthy queues and spending so much of time in getting something done at the printings shops within the university. That it is very much common not only within the University of Ruhuna premises but also within the other universities too. In finding solutions for this problem, we thought of implementing this project where we expect that the problem might be solved even to some extent.

Through a survey including the basic problems that the students have to face, we wanted to clarify whether this is a problem for the whole bunch of students at the university and also to investigate the students' perspective with regarded to this problem. After analyzing the responses that we received through the survey, we found that everyone finds this as a problem and that all of them are in need of some kind of solution. Therefore, through the survey it was easier for us to find what requirements that the students are in need and then what functionalities we should include in our system.

The project focuses only to give solutions for the basic requirements of the students and the shop keepers regarded to the above problem, and that we wanted to provide them with an easily manageable process that we did not want to make it complex by adding advanced functionalities. Thus, when looking at the project at a distance that it gives the overview of a simple project, but what is hidden inside is that it is implemented targeting and fulfilling the needs of the clients with their maximum satisfaction.

In the future development stages that this project can be implemented adding more advanced functionalities and can also be used at a printing shop outside the university premises also. The speciality of this system is that, as it includes general functionalities that anyone with a small knowledge with the technology could handle it and that the maintenance of the system can be easily done so that it does not need to be considered a burden. Therefore we as the developers of the system, although we leave the university after the project, that this system does not need any kind of special focus as it functions with a simple kind of process. Such that when considering many of the projects that were implemented at the university over the years, that this web based system has some kind of speciality in a sense.

3.2 User Interfaces

3.2.1 Administrator

Administrator is the main user of the system. An administrator can view orders, view print details and also can create notifications.

3.2.2 Startup View

When the user opens the system for the first time they are provided with a welcome page. Then they have to create an account in order to login to the system.

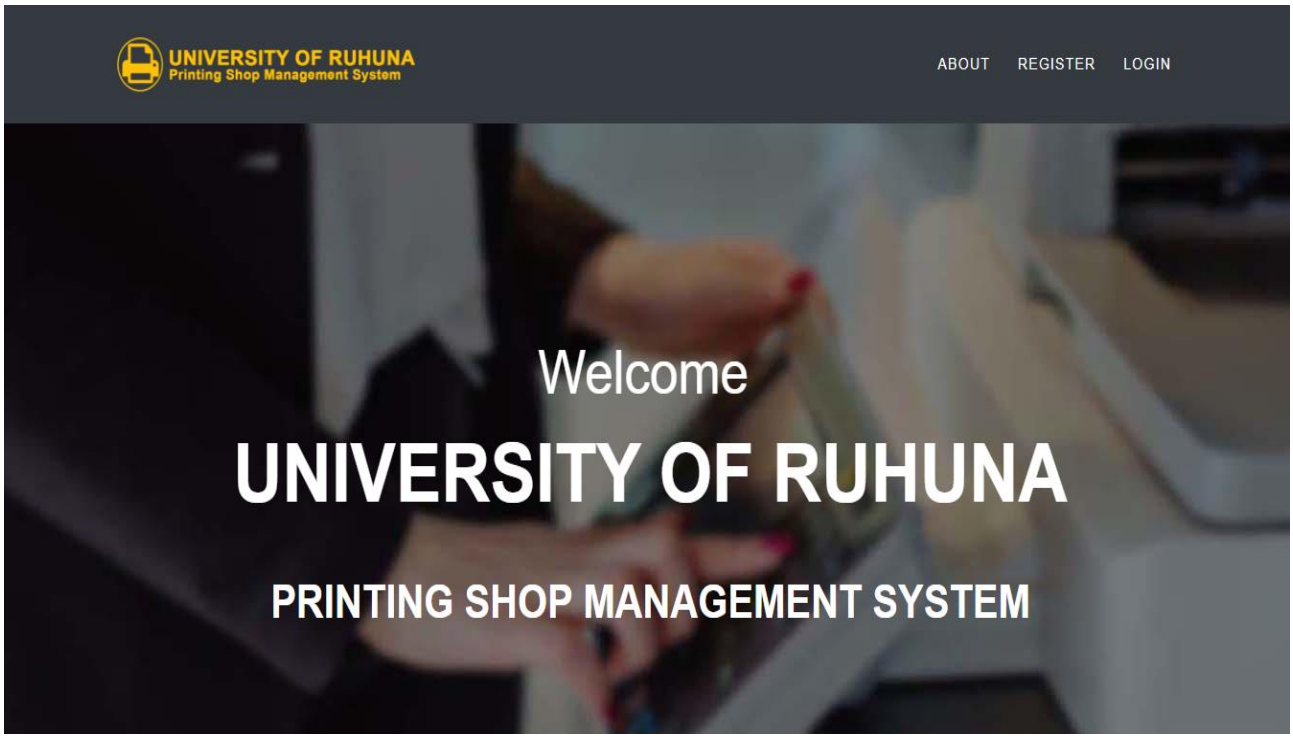


Figure 2: Welcome Page

3.2.3 User Registration and Login View

Users need to create an account if they are new to the system or else they can login into the system by entering the username and the password.

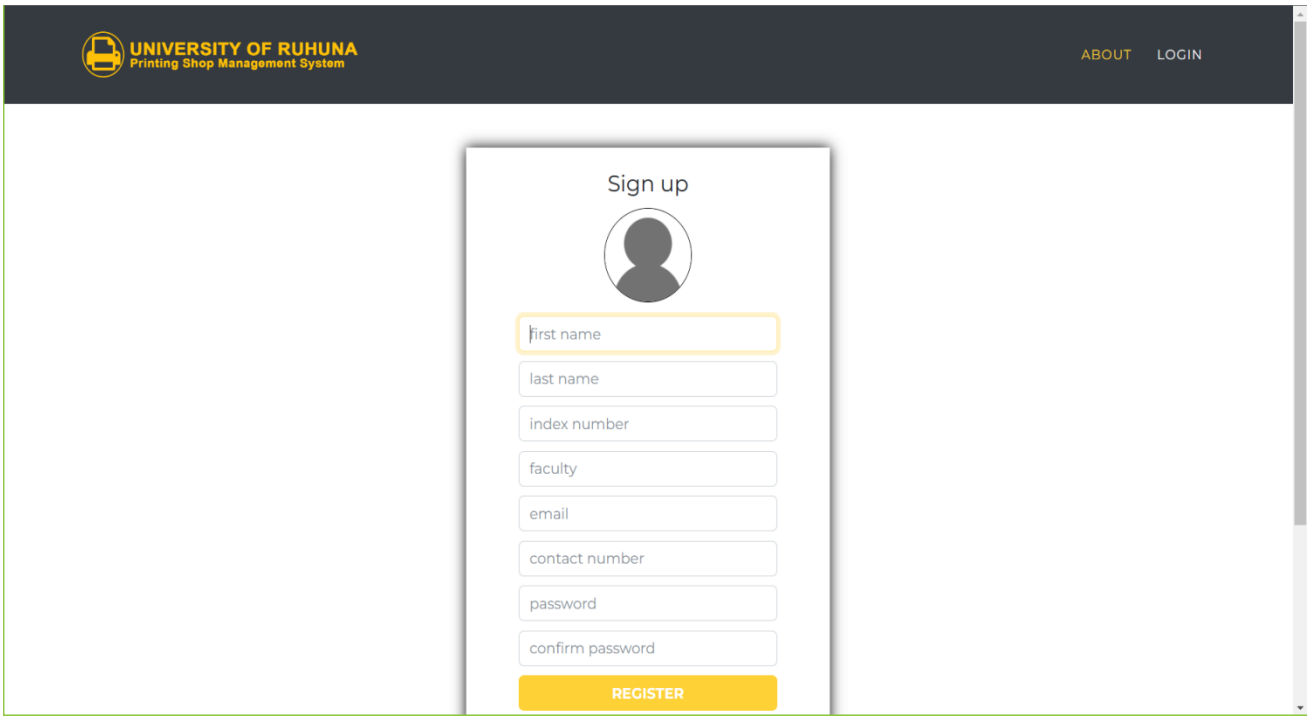


Figure 3: User Registration

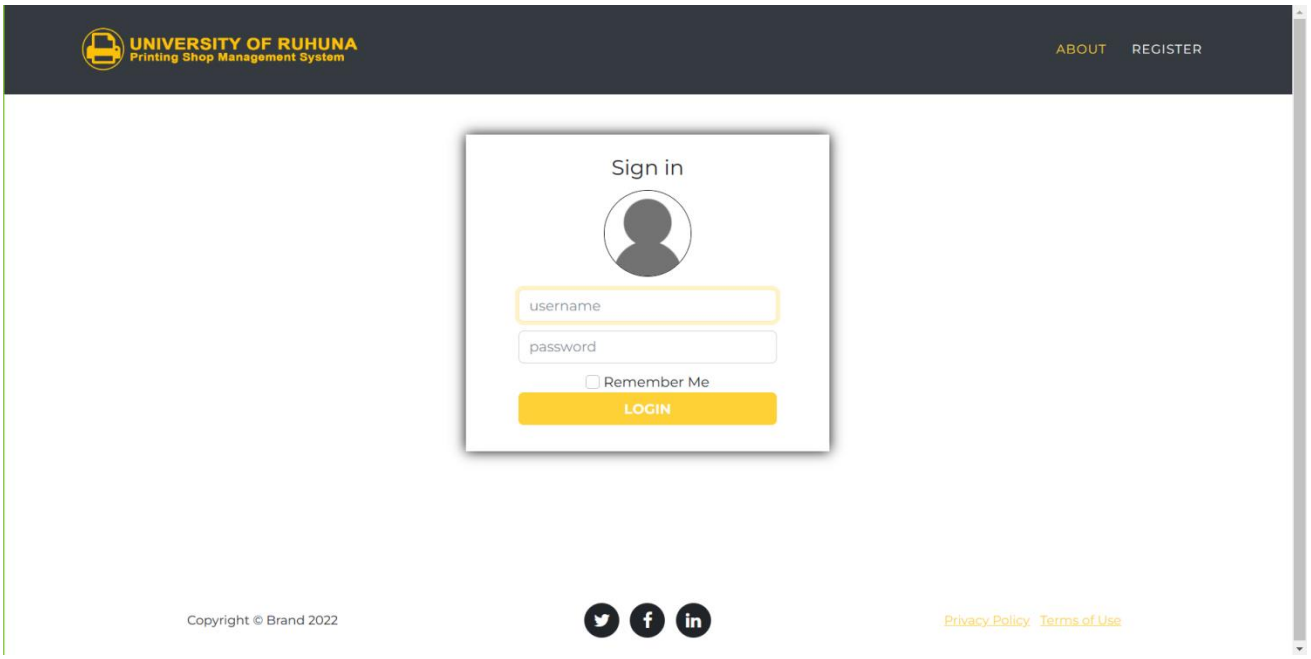


Figure 4: Login

3.2.4 Profile View

User can view his/her details from this view. If in any case the users need to edit their details they can use the **"Edit"** button and then they get the edit profile interface where they can change and save their details accordingly.

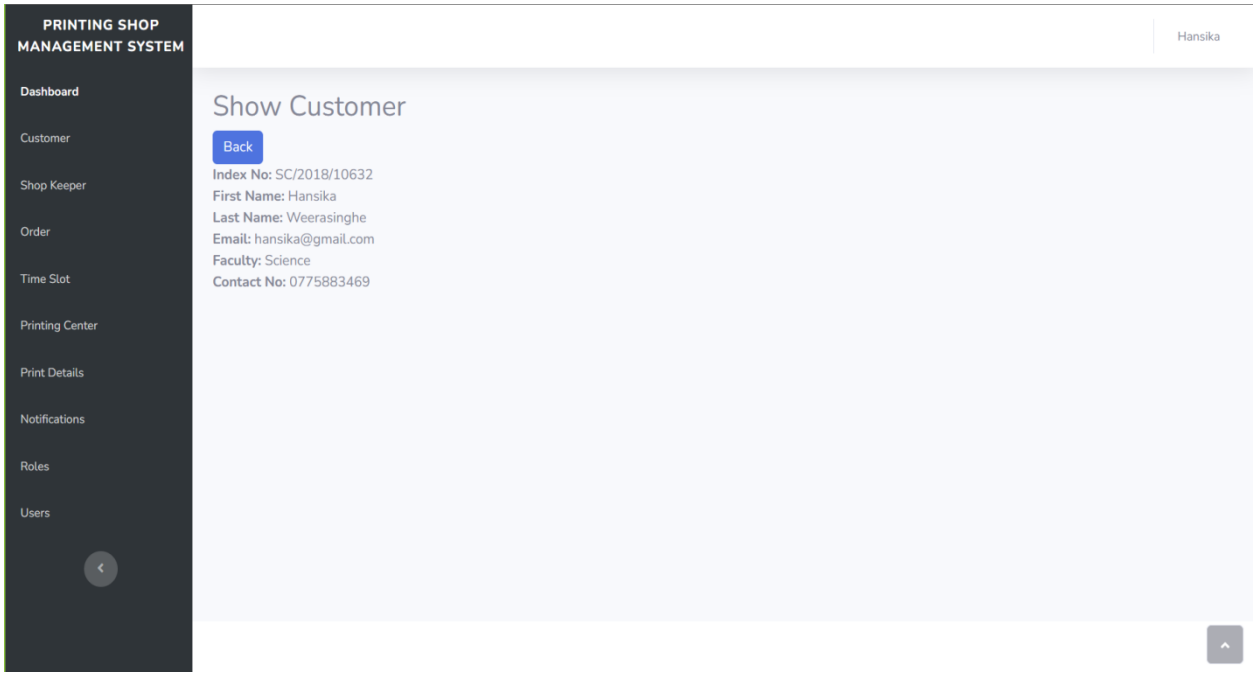


Figure 5: Customer Profile

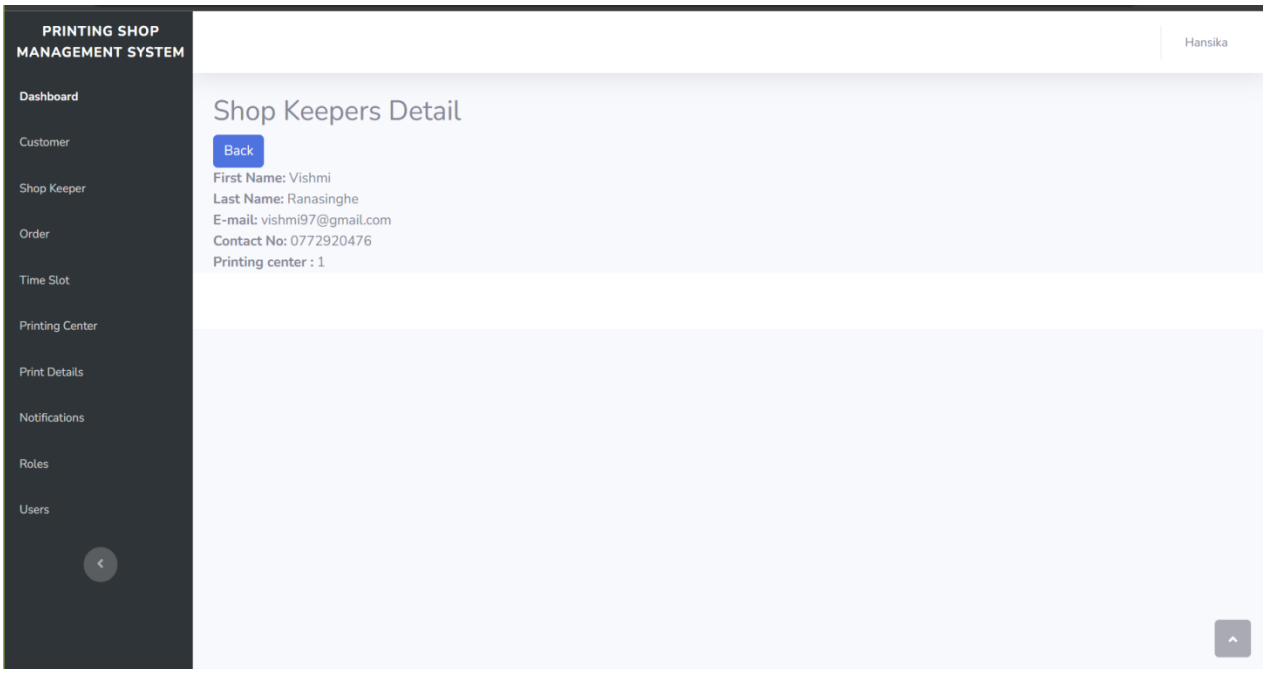


Figure 6 : Shop Keeper Profile

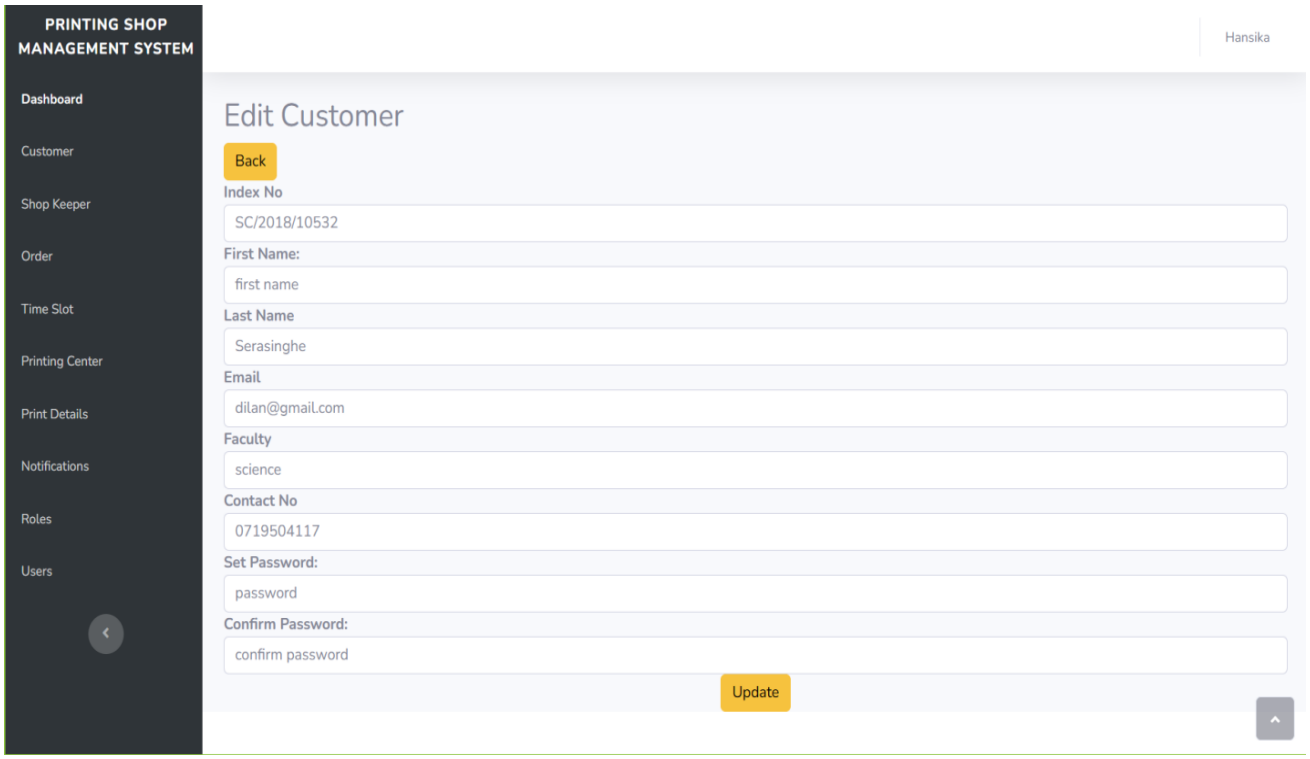


Figure 7: Edit Customer Profile

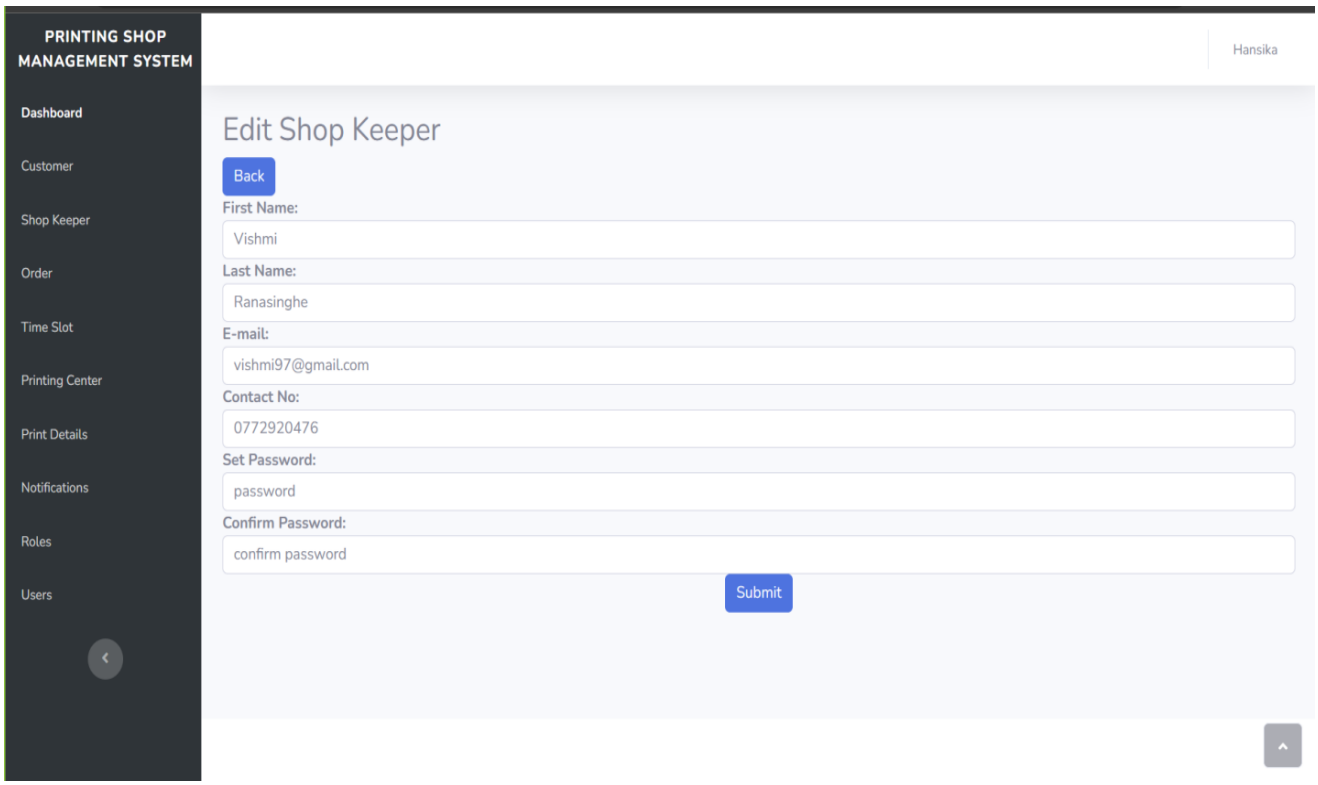


Figure 8 : Edit Shop Keeper Profile

3.2.5 Printing Shops View

Here, the user can select the preferred printing shop using this interface.

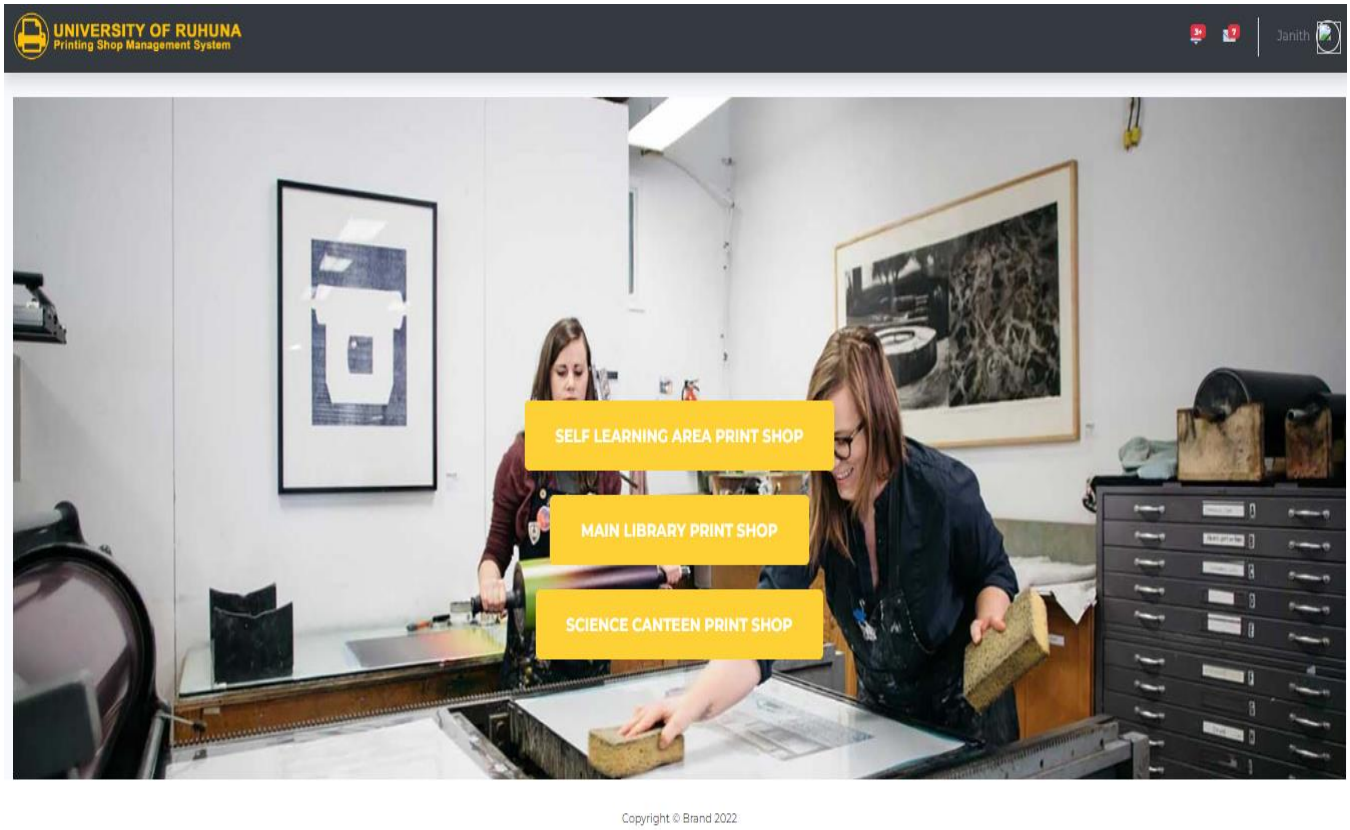


Figure 9: Printing Shops View

3.2.6 Time Slots View

Using this view, users can select the vacant time slot to place their orders.

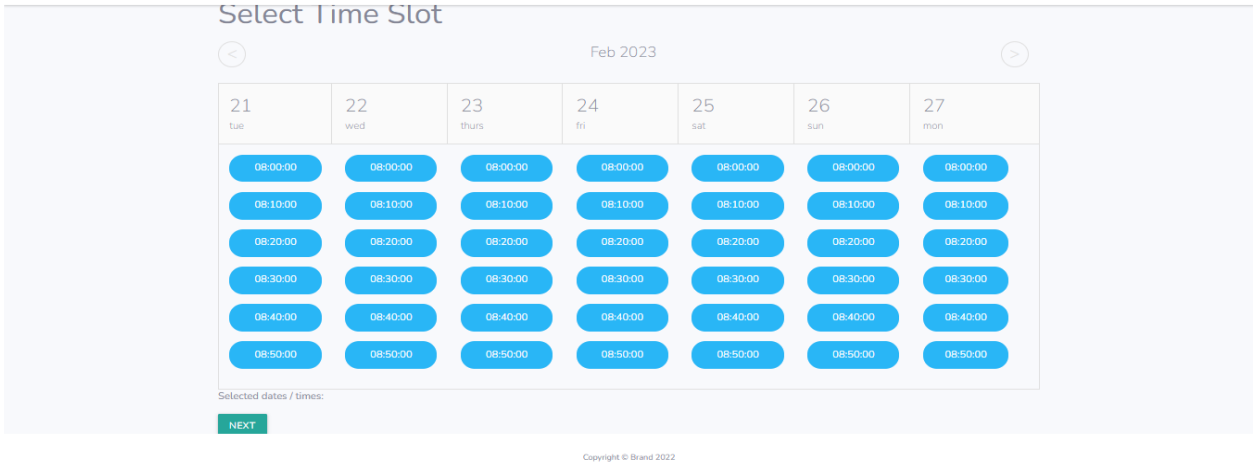


Figure 10: Time Slots View

3.2.7 Fill Print Details View

Using this interface, the users can customize the pages to be printed according to their preference.

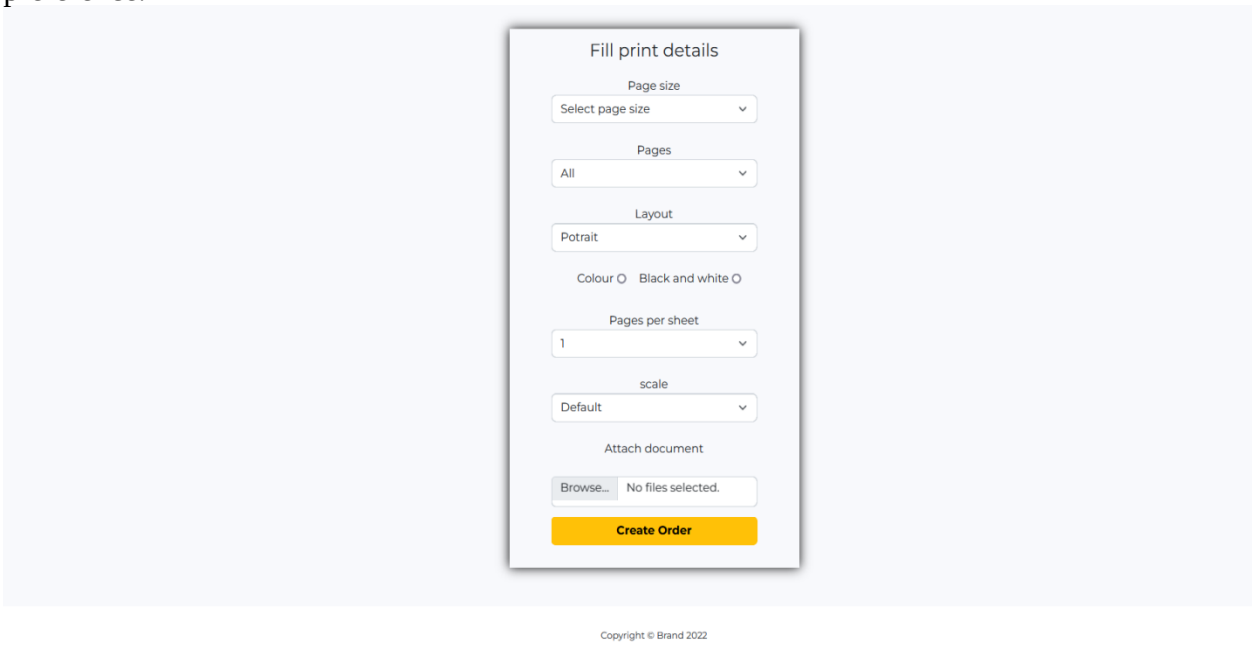


Figure 11: Fill Print Details View

3.2.8 Create and Edit Order View

Here, the users can place the orders as well as they can edit the placed orders.

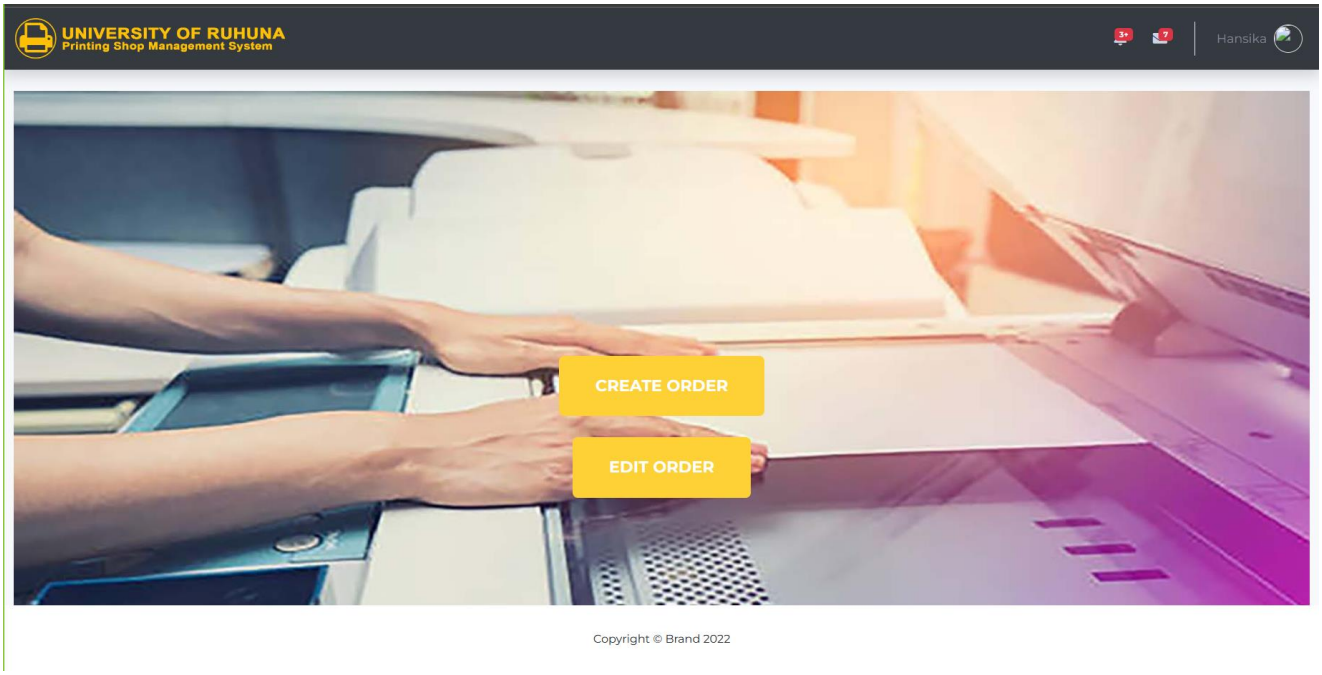


Figure 12: Create and Edit Order View

3.2.9 Customer's Order View

Using this interface, the customers can view the placed orders and the status notifications of the orders.

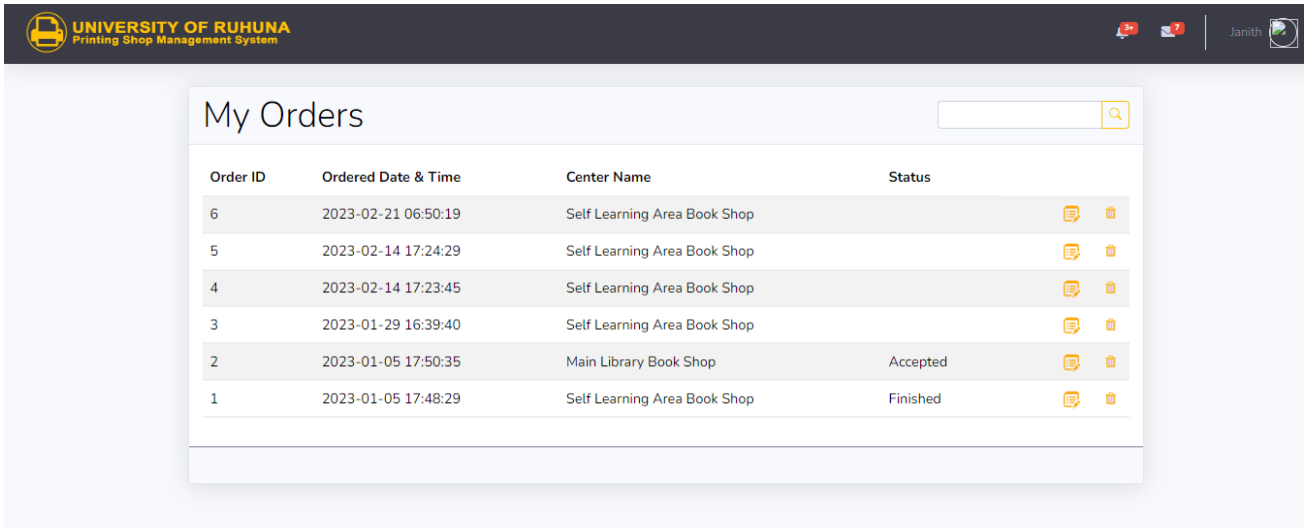


Figure 13 : Customer's Order View

3.2.10 Shop Keeper's Order View

Using this interface, shop keepers can view the received orders. Here, they can view the order details, can delete the completed orders and can update the order status using the dropdown given. When this order status update is sent it can be viewed by the customers.

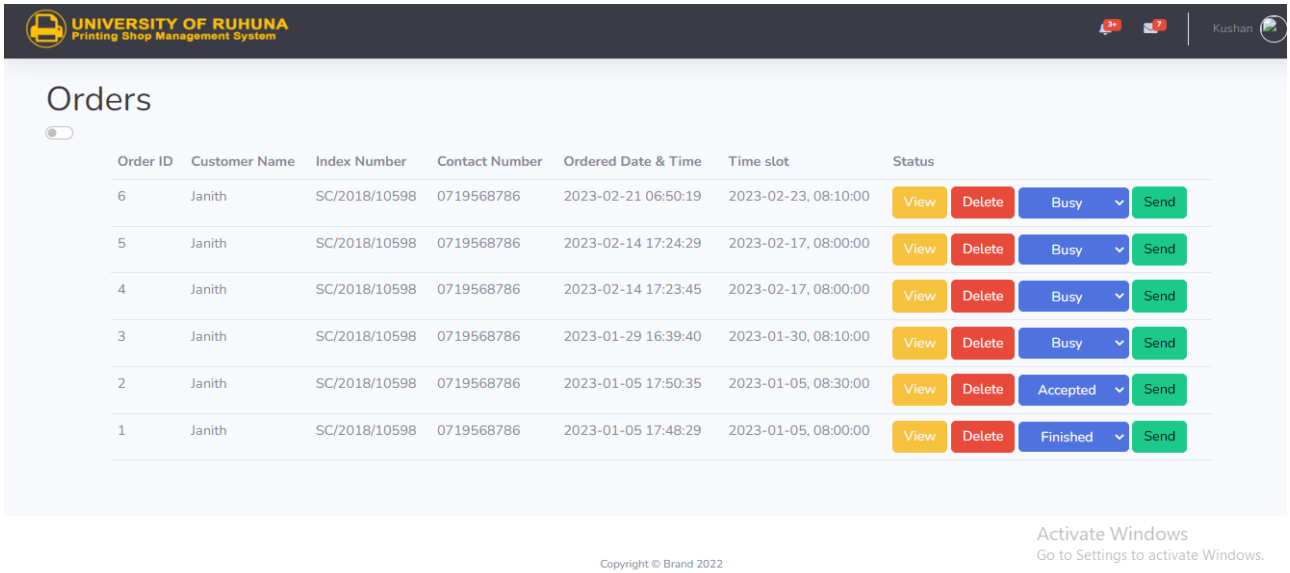


Figure 14 : Shop Keeper's Order View

3.2.11 Print Details View

Using this interface, the shop keepers can view the print details provided by the customer. Also they can accept or reject these order details accordingly using this view.

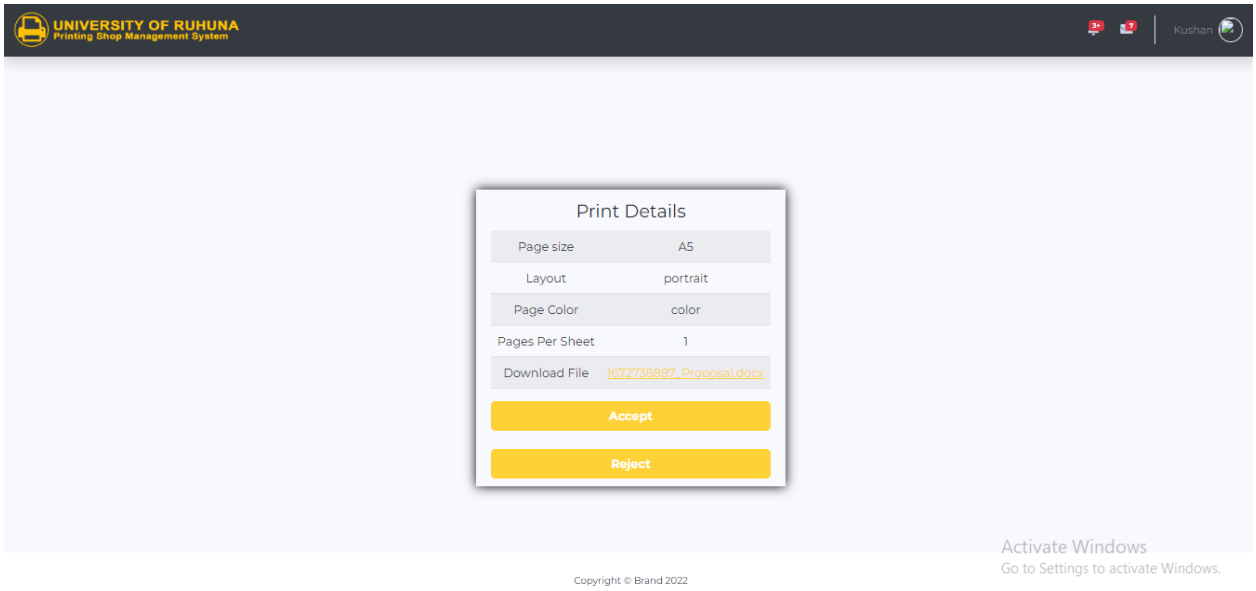


Figure 15 : Print Details View

3.3 Business Logic

A Printing Shop Management system typically involves several business processes that must be managed efficiently to ensure smooth operations and customer satisfaction. Here are some key aspects of the business logic of our system.

- Order Management: The system should be able to receive, track and manage printing orders from customers. It should include features for capturing order details such as print specifications, delivery dates, customer information
- Production Planning: The system should be able to schedule and manage the production process for each order
- Customer Service: The system should have the capability to manage the customer requests and should be able to track the customer order history and there by provide them with a personalized service and recommendations

The cost of print management software varies depending on the features and capabilities of the software, but it is generally quite affordable. The applicability of the software also varies depending on the needs of the university printing shops, but it can be used to manage a wide range of printing tasks. The reliability of the software is also important, as it needs to be able to handle large volumes of printing without crashing or slowing down. Overall, the system should be designed to streamline and automate key business processes while ensuring that the quality standards are maintained and customers are satisfied.

3.4 Database Structure/Design

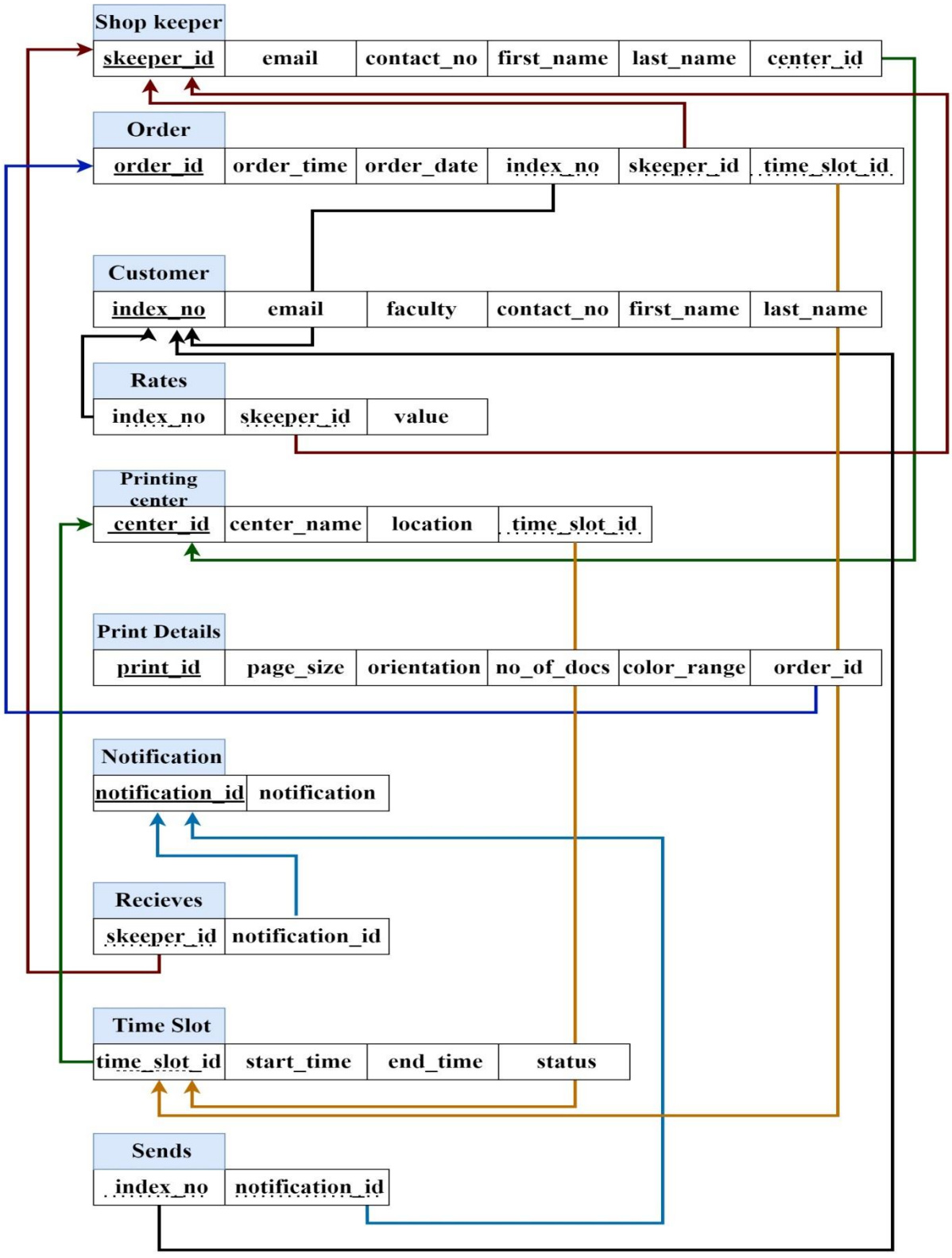


Figure 16: Database Schema

3.5 Use Case Diagrams

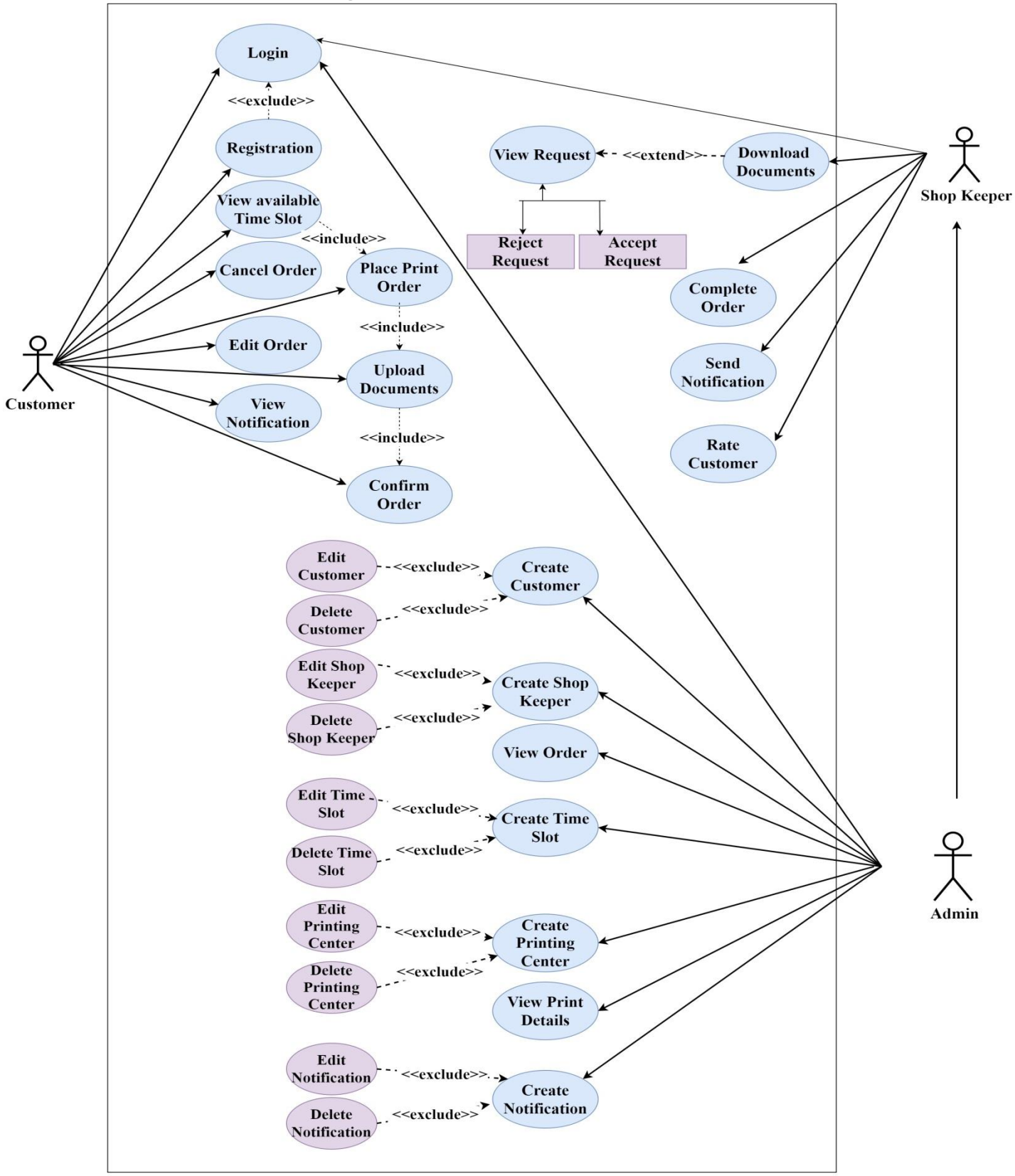


Figure 17: Use Case Diagram

3.5.1 Use Case Diagram of the Administrator

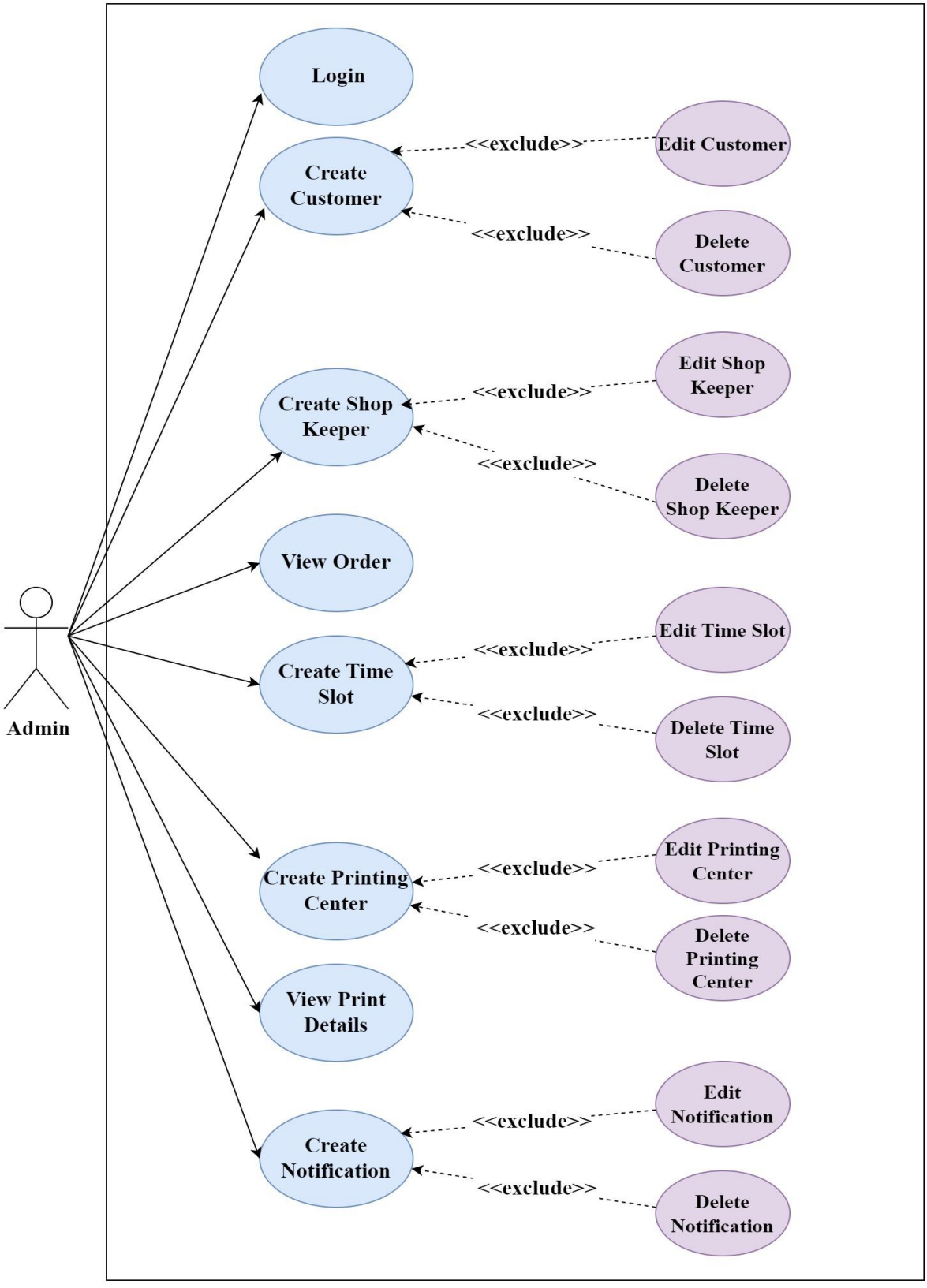


Figure 18: Use Case of Administrator

3.5.2 Use Case Diagram of the Shop Keeper

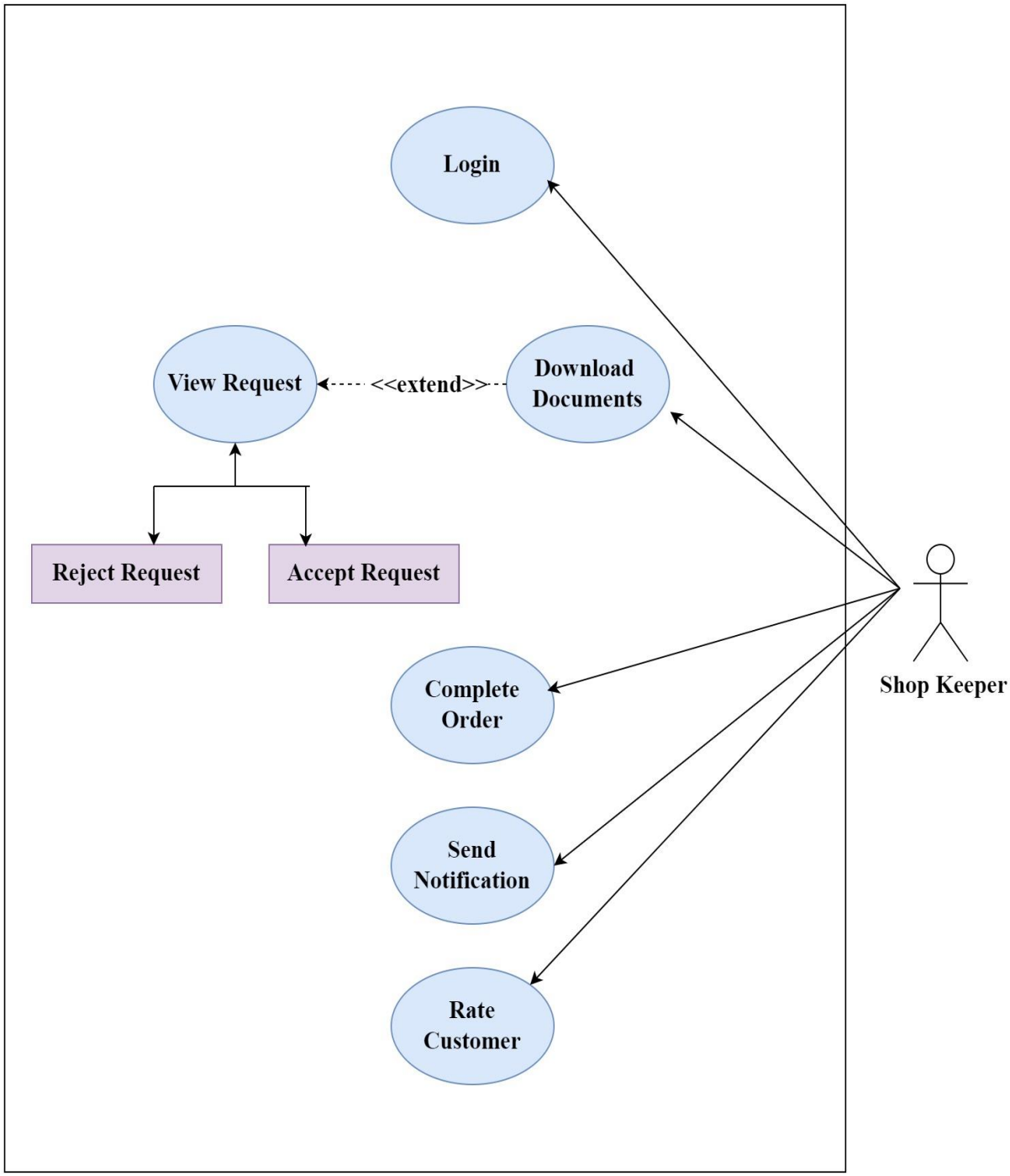


Figure 19: Use Case of the Shop Keeper

3.5.3 Use Case Diagram of the Customer

Figure 20: Use Case of the Customer

3.6 Entity Relationship Diagram

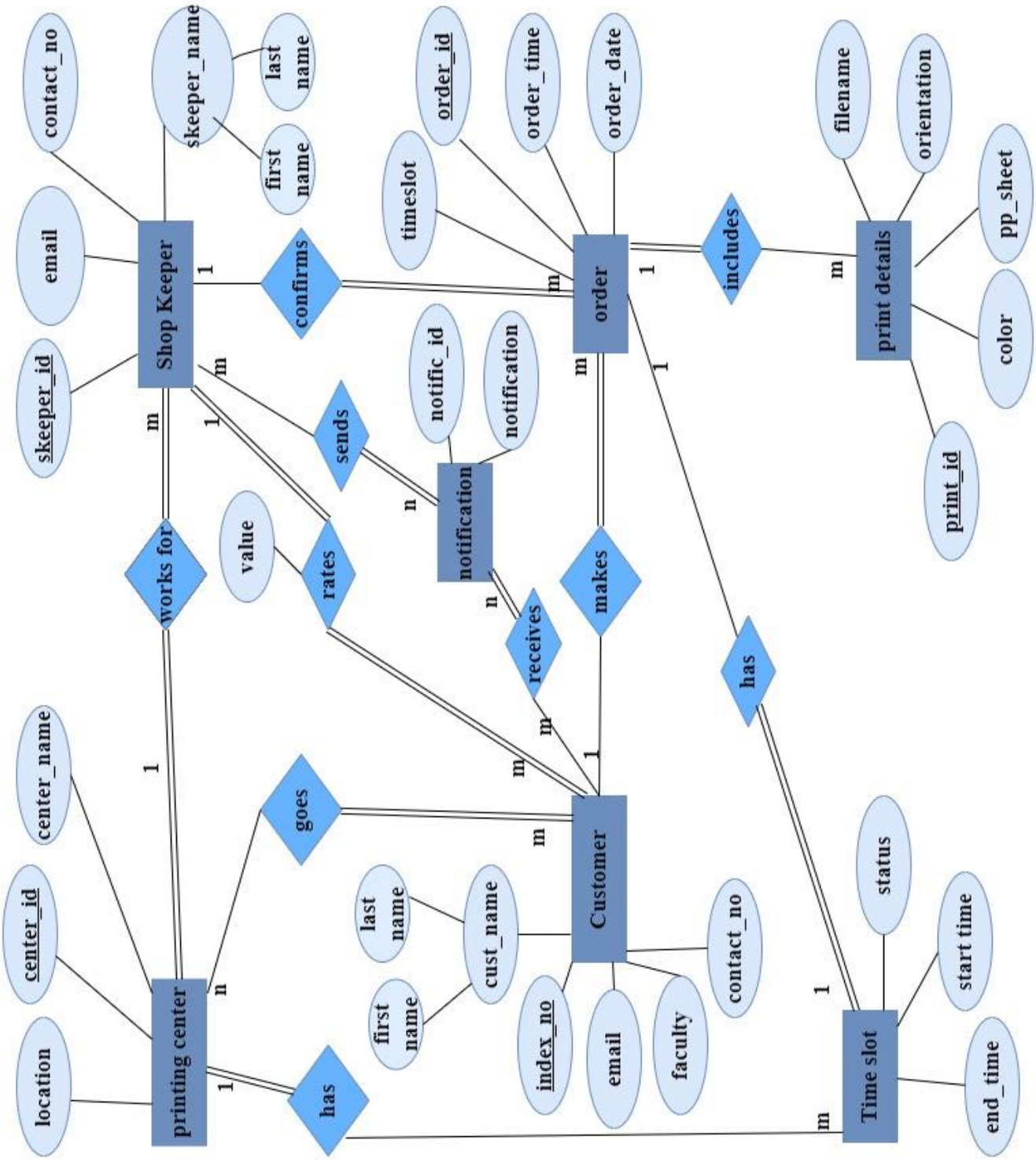


Figure 21: Entity Relationship Diagram

3.7 Normalization 3NF

shop Keeper	skeeper_id	pcenter_id	fname	lname	contactno	email
Printing Center	pcenter_id	cname	clocation			
order	order_id	pcenter_id	customer_id	otime	odate	notification_id	timeslot
customer	customer_id	fname	lname	email	contactno	faculty	Rvalue
Print Details	pdetails_id	order_id	color	orientation	pagesize	pp_sheet	filename
Customer Printing Center	customer_id	pcenter_id					
Notification	notification_id	notification					
Notification_Send	skeeper_id	notification_id					
Notification_receive	pcenter_id	notification_id					
Time_slot	pcenter_id	stime	etime	status			

Figure 22: Normalization 3NF

Chapter 4. Implementation

4.1 Software Development Life Cycle (SDLC)

Software Development life cycle (SDLC) is a structured process used in project management that defines the stages included in an information system development project, from an initial feasibility study to the maintenance of the completed application.

There are different software development life cycle models that specify and design, which are followed during the software development phase. These models are also called "**Software Development Process Models**". The types of software development models can be listed out as Waterfall model, Prototyping models, Rapid Application Development model, Incremental Development model, Spiral model, Formal development model, Unified process and Agile process.

So that how these models were used in the development phases of our project and which of them best suits the applications that we have used is important to be discussed.

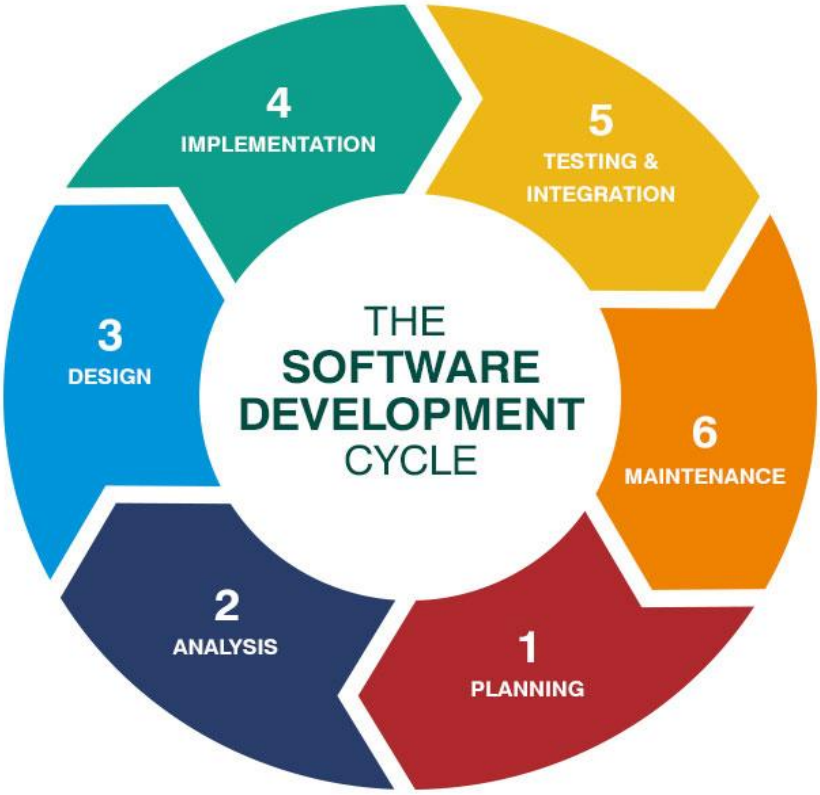


Figure 23: Software Development Life Cycle

4.2 Development Model

The development model that best fits this project is the **Iterative and Incremental model**. As this project has some sort of fixed well known requirements someone could suggest that the **Waterfall Model** best fits the project. But although the Waterfall Model includes phase by phase development, the output is delivered at the end of all the phases and it does not accept any changes at the middle phases, such as implementation, verification and maintenance. The testing and verification comes late in the process and it has some kind of risk in using the Waterfall Model in the project. Therefore to mitigate all those problems the Incremental Model is more suitable for the project when compared with the Waterfall Model.

Incremental development is more manageable than other development models as it follows normal software process standards. It avoids the problems of constant change which characterizes evolutionary prototyping. Here, the most important part of the system is first delivered and the other parts of the system are delivered according to their importance.

Advantages of Incremental Model

- Customers do not have to wait until the entire system is delivered and that they can gain the benefit at the early development stages
- Customers can use the early increments as prototypes and gain experience that informs their requirements for later system increments
- There is lower risk of overall project failure
- Most important system services receive the most testing

Disadvantages of Incremental Model

- Difficult to map the customers' requirements onto increments of the right size (lines of code)
- Hard to identify the common facilities that are needed by all increments
- System structure tends to degrade as new increments are added

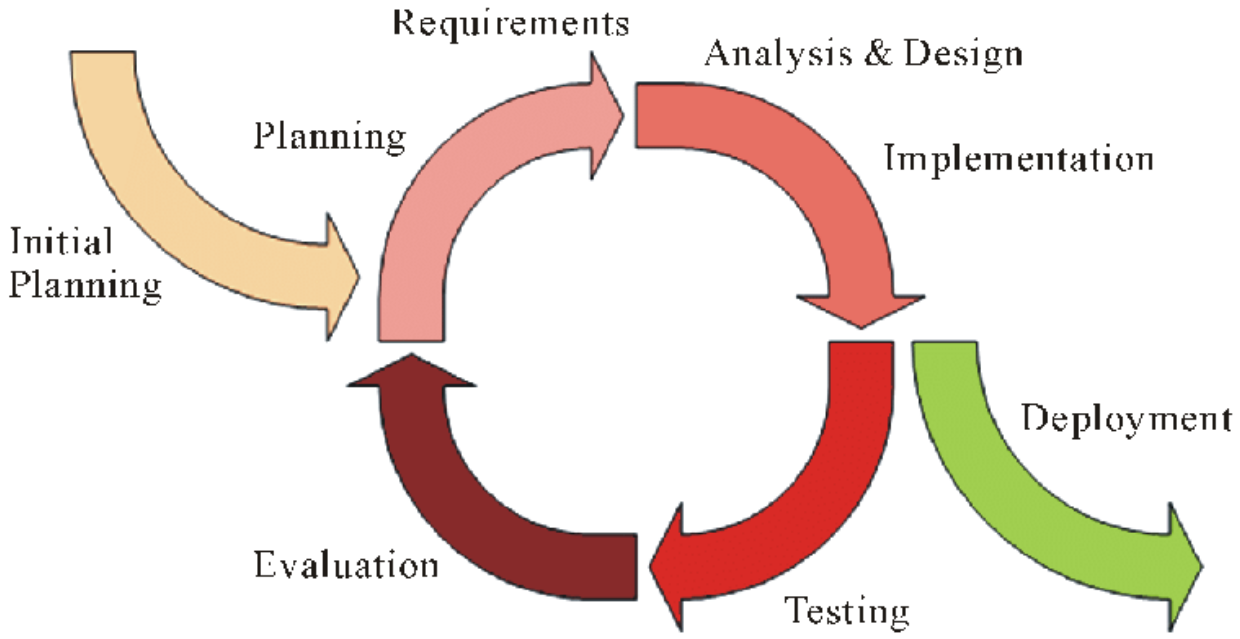


Figure 24: Iterative and Incremental Model

Nowadays in all most all the software projects in the software development industry use Agile System Development. Agile development follows principles such as higher customer involvement, incremental delivery, maintaining simplicity, embracing change and several other unique principles. Agile has early prediction on the cost of the project and a schedule of each process done. But here, in this project agile methodologies like scrum, XP or Kanban cannot be used because they are used by cross functional teams and that this project is a small kind of implementation when compared to huge software projects in the industry.

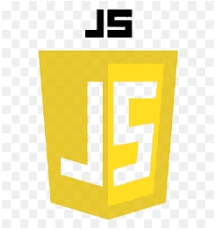
Therefore while focusing on some agile principles, here in our project we have used Iterative and Incremental model in implementing our Printing Shop Management System.

4.3 Implementation Environment

This is a web based system developed to provide solutions for the problems that we find at the printing shops within the university premises. Here, the system is basically developed using the Laravel framework in which we have used PHP in developing the backend of this system. Apart from that, we have used HTML, CSS and Bootstrap in developing the front end.

In handling the database, MySQL was used and XAMPP was used as the server. The technologies used in developing the system, with their versions are as follows.

- XAMPP v3.3.0
- PHP 8
- HTML 5
- Bootstrap 5



Further in designing the templates for the front end we used Bootstrap Studio and Figma. In designing the Use Case diagrams, Entity Relationship diagrams, Activity Diagrams and Class diagrams **draw.io** was used.

XAMPP v3.3.0

XAMPP stands for,

X - Cross Platform (Can work on platforms like Windows, Linux or macOS)

A - Apache

M - MySQL

P - PHP

P - Perl

XAMPP is one of the mostly used cross-platform web servers which helps developers to create and test their programs on a local web server. It comprises of Apache HTTP server, MariaDB and an interpreter for different programming languages like PHP and Perl.

XAMPP is an open source package of web solutions that includes Apache distribution for many servers and command-line executables. So that it was very much useful in handling our project on the Windows platform and also when working with PHP.

PHP – 8

PHP is an open source server side scripting language which is well suited for web development. PHP is faster than other scripting languages like ASP or JSP and can be embedded into HTML. PHP can develop dynamic web pages easily. Also it is very easy to install and setup PHP and that it is one of the best languages to learn.

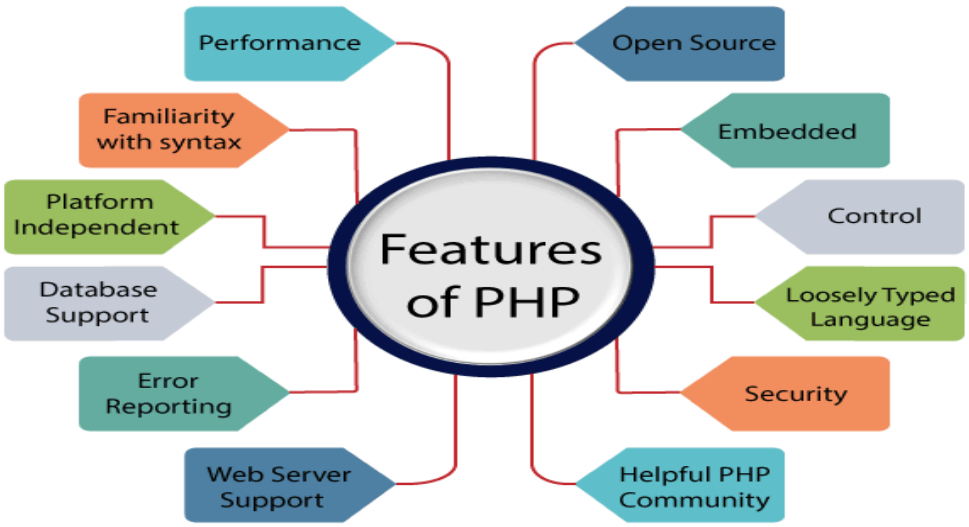


Figure 25: Features of PHP

In using PHP for our project, we used Laravel framework which is an open-source PHP framework. Laravel allows the developers to write less code leading to less possibility of bugs. Therefore Laravel is an innovative template engine which helped us in making our project a success.

4.4 Work Breakdown Structure

As mentioned earlier, the system is developed going with the process of an Iterative and Incremental model. Work breakdown structure is a tool that shows the step by step approach to complete our project to successfully produce a deliverable. Therefore the project is broken down into several modules as follows.

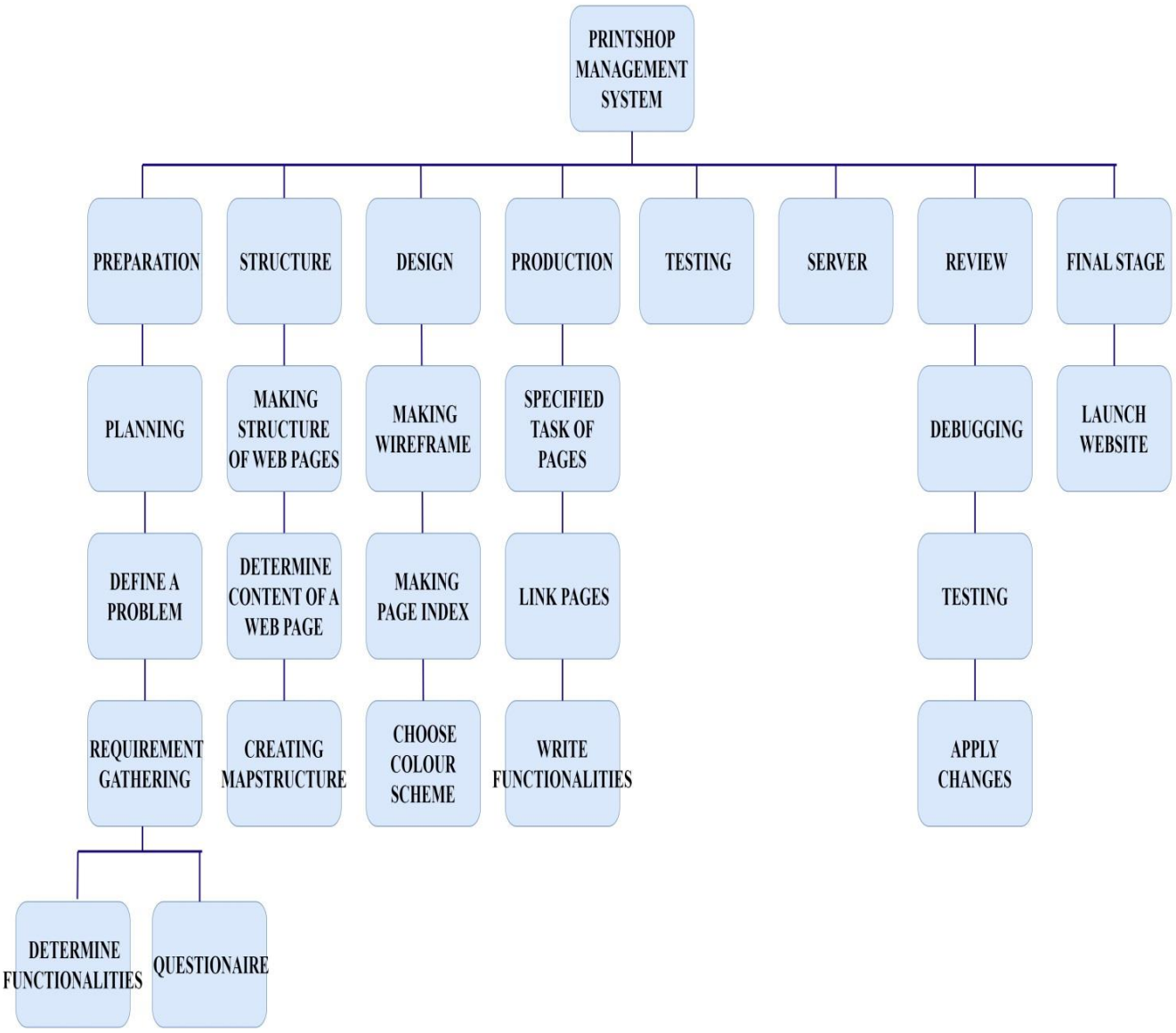


Figure 26: Work Breakdown Structure

4.5 Planning and Management

In planning and managing the tasks properly, a Gantt chart was used. It was referred often in order to ensure whether the tasks have met the deadlines. The Gantt chart was updated throughout the project with some of the changes that had to be done when compared to the original plan. Such that it was an efficient way of completing our tasks in the expected time frame.

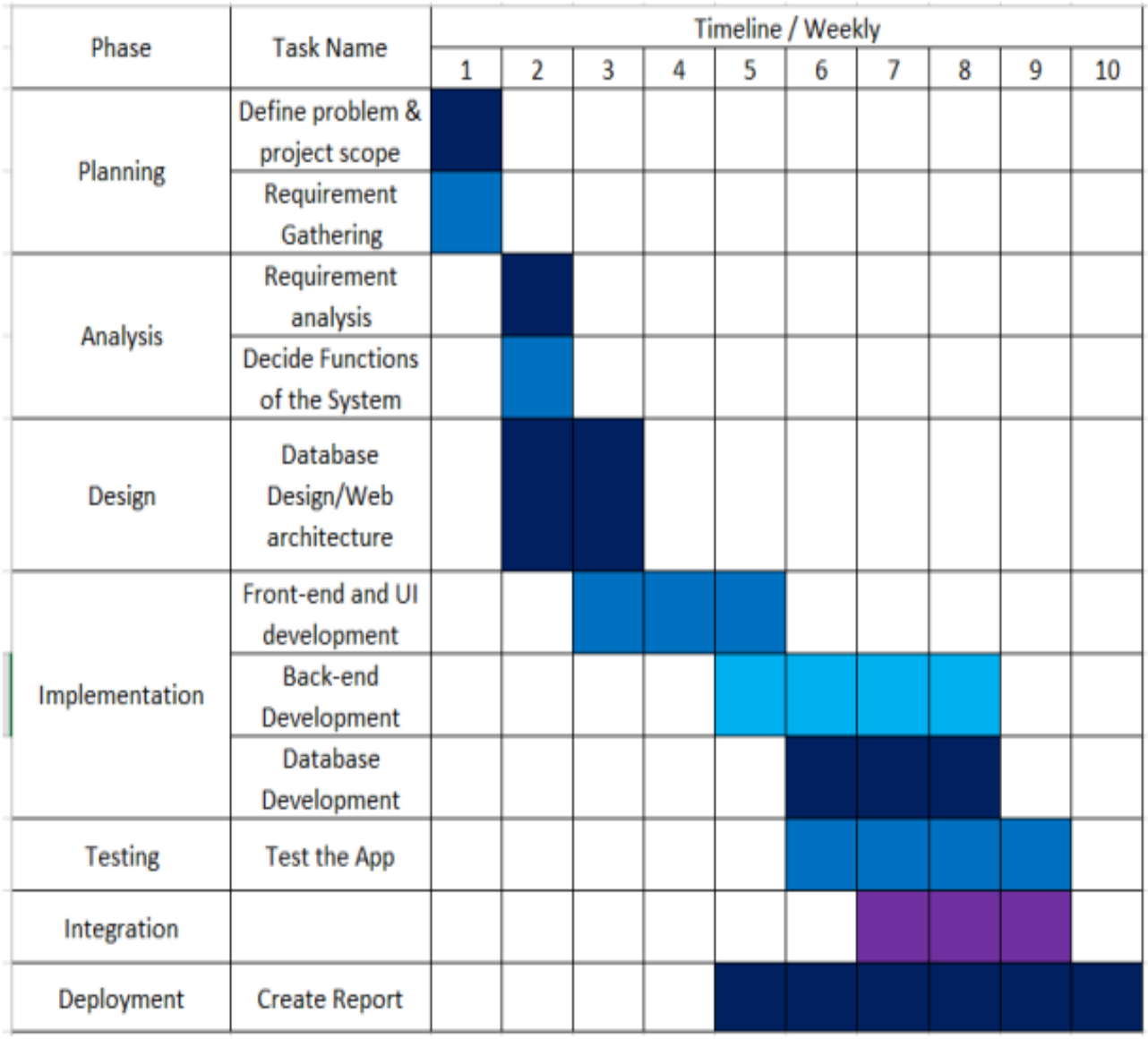


Figure 27: Gantt Chart

A folder structure is maintained in order to be in touch with the system easily for future development and in doing any alterations in the currently working system. So that the impact of data being lost is solved and also if it needs to refer to previous work for any clarifications that it is easier in maintaining such a folder for any backups.

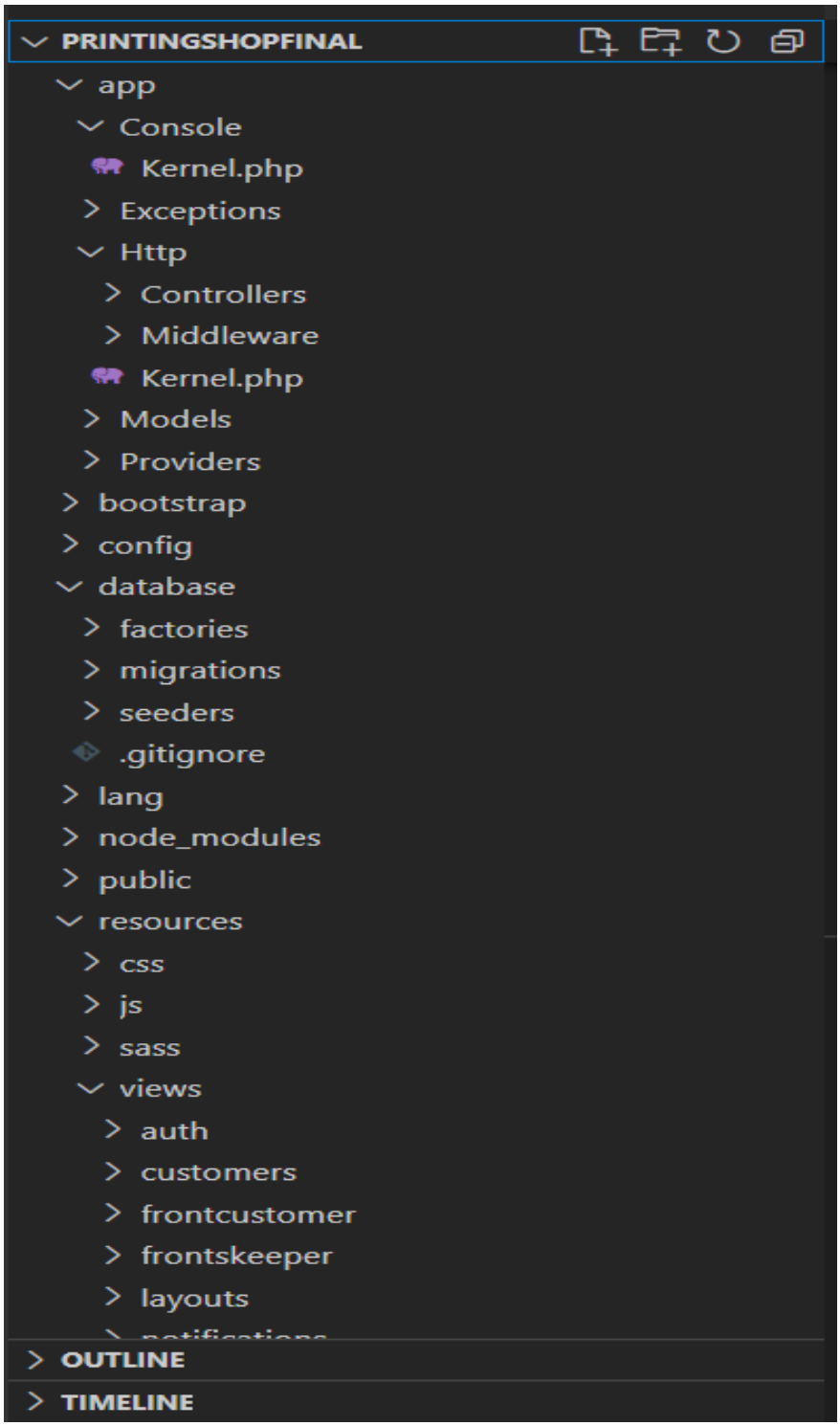


Figure 28: Folder Structure

Apart from the folder structure, all the coding conventions were done as a best practice throughout the project. Those best practices included indentation, comments, programming practices, programming principles, naming conventions and etc.

Through these coding conventions, it is easier to maintain the software and further it increases the readability of the code. Therefore in future development, it is easier for another developer to manage the code according to the new requirements when these coding conventions are followed.

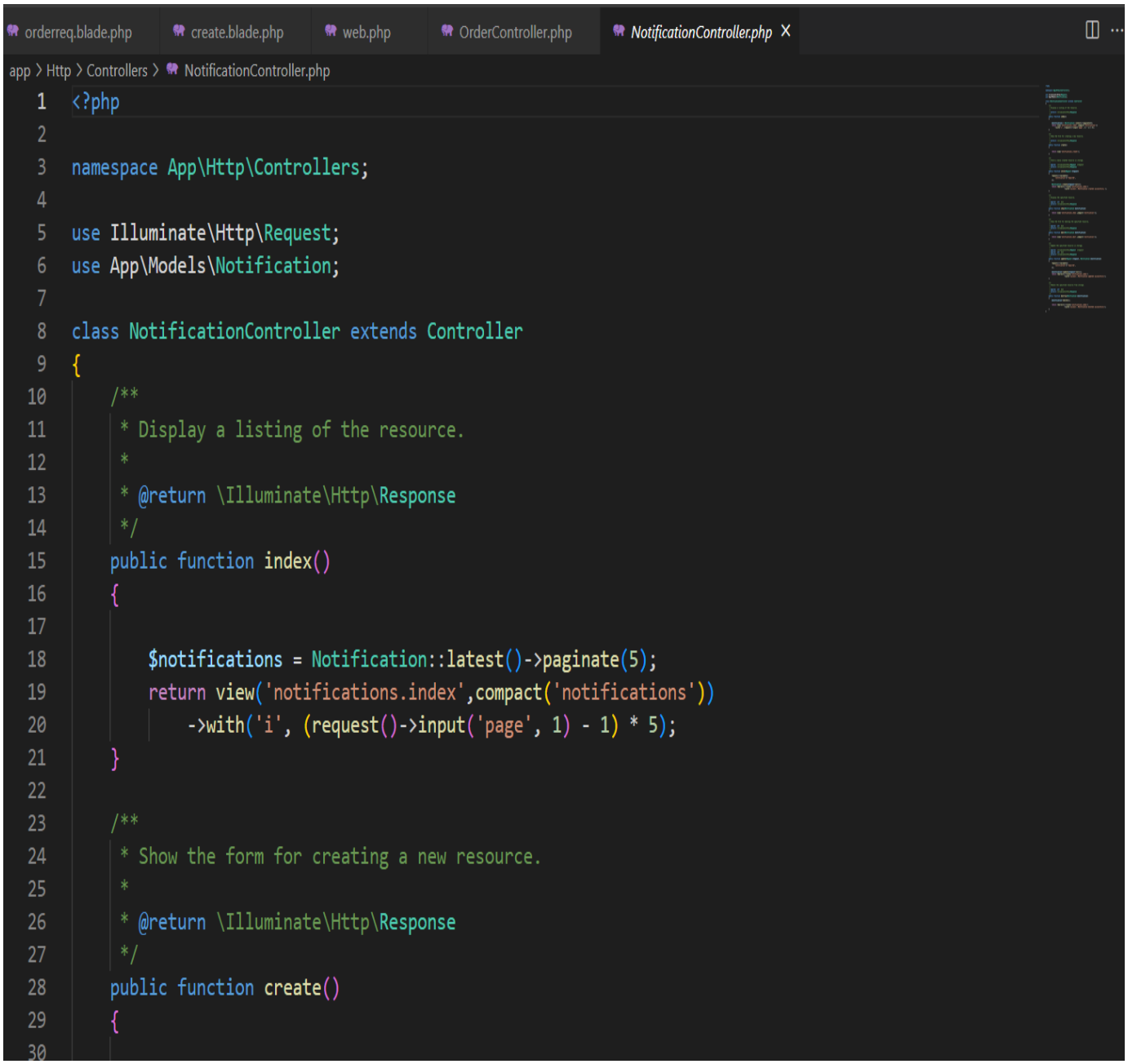


Figure 29: Coding Conventions

Chapter 5. System Testing

5.1 Test Methodology

Testing is done in order to ensure whether the system has met with the needed user requirements and the required system specifications. Software testing comprises of two parts as verification and validation.

5.1.1 Software Verification

Software Verification is the process of confirming whether the software is meeting the business requirements and it concentrates mainly on the design and system specifications. It is simply the question of ' **Are we building the product right ?** '. Here, the verification alerts are used to restrict the mistakes happened by the user.

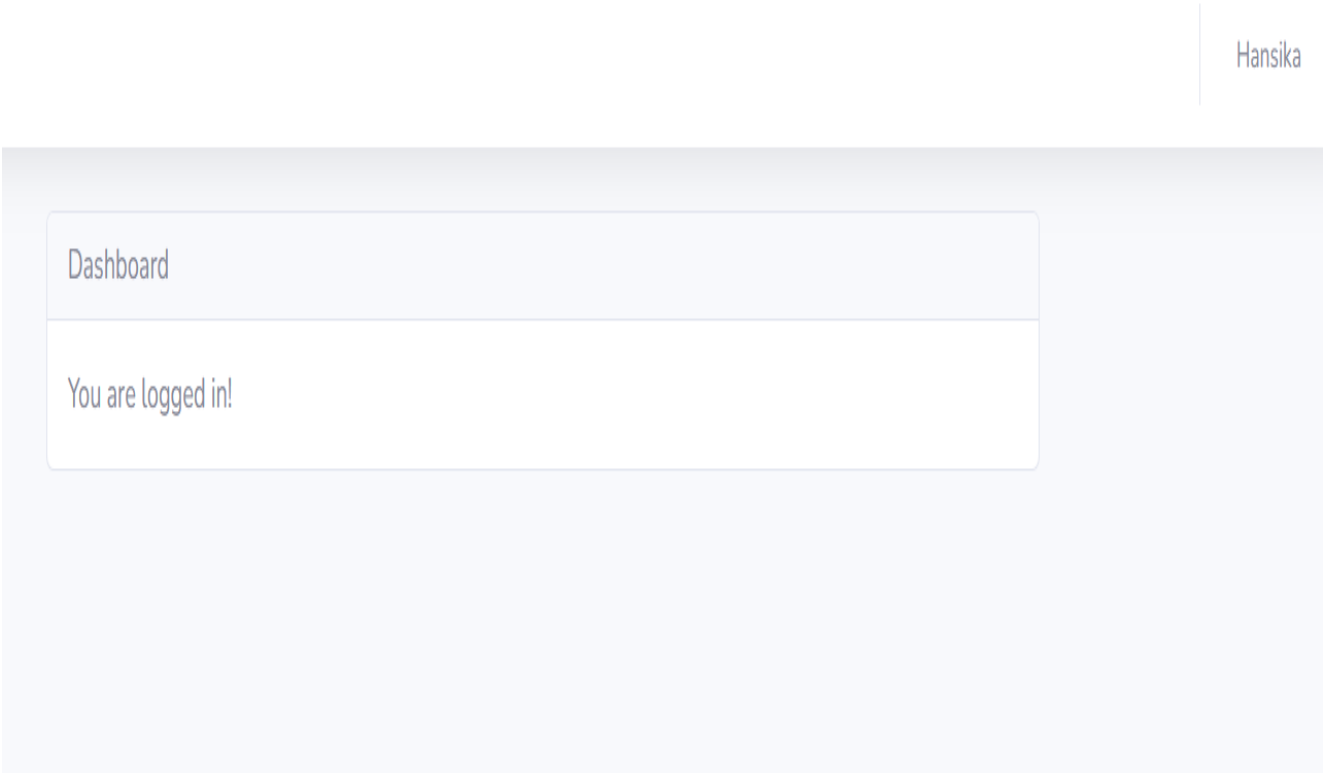


Figure 30: Verification Message

5.1.2 Software Validation

Software Validation is ensuring whether the product meets the user requirements. It is simply the question of ' **Are we building the right product ?** '. It is carried out at the end of the Software Development Life Cycle (SDLC). Therefore if the software meets the requirements for which it was made, it is validated.

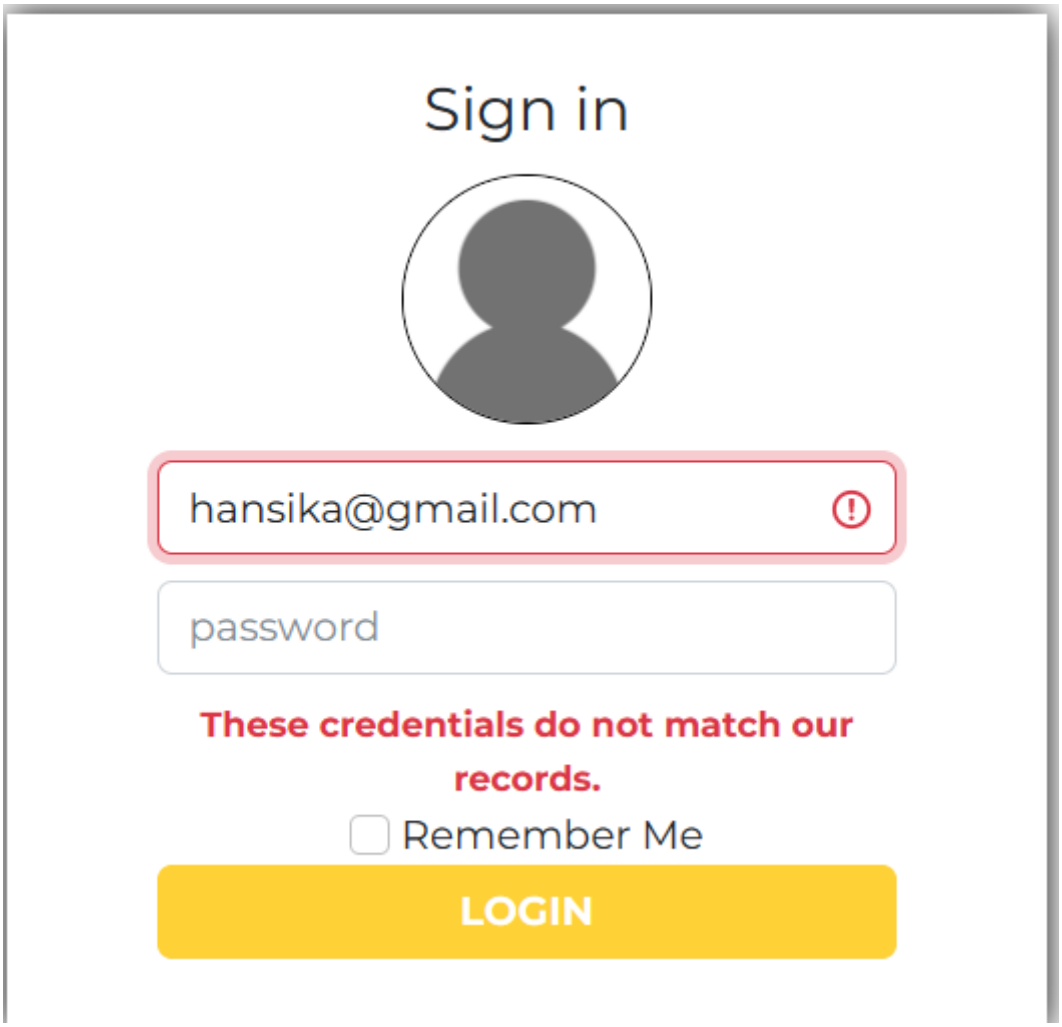


Figure 31: Validations

5.1.3 Errors, Faults and Failures

Errors are where you get a difference in between the desired output and the output received. A fault occurs when an error exists and it is also called a bug. Failure is simply the inability to perform the desired task and it occurs when the faults exist in the system.

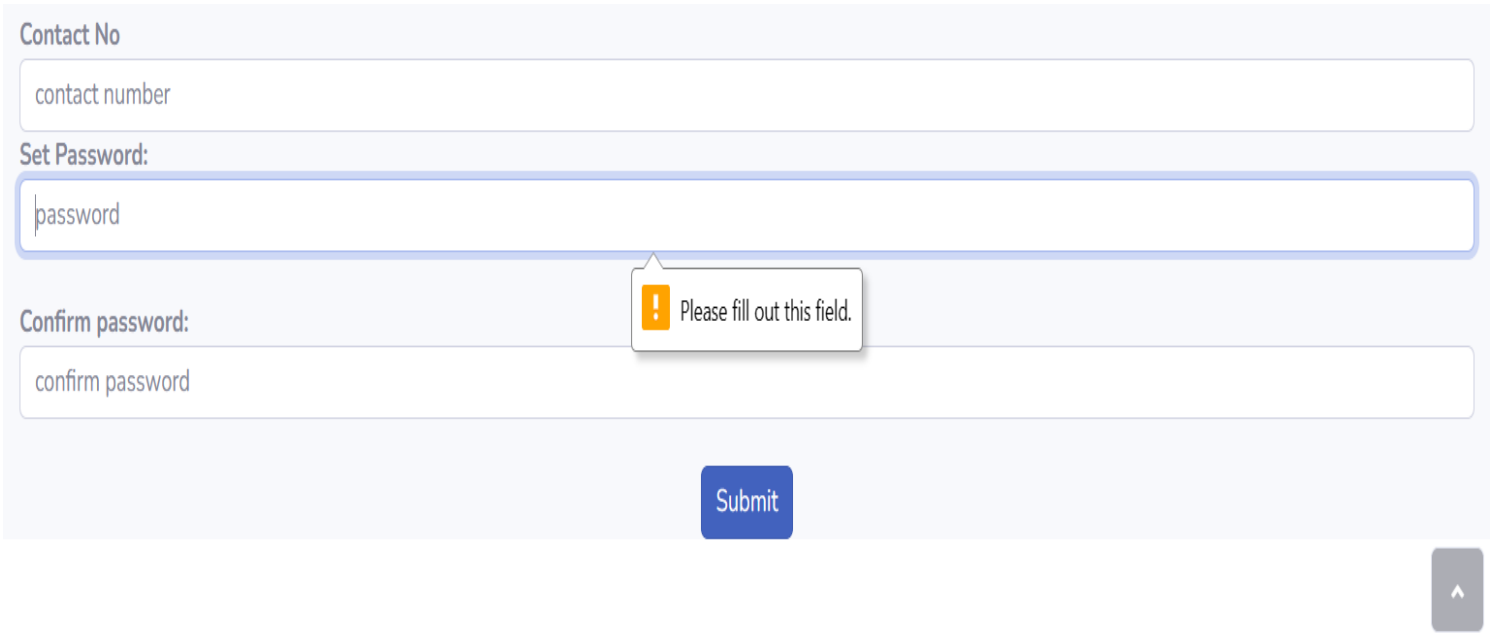


Figure 32: Error Messages

5.1.4 Unit Testing

Here what we basically used in testing our system is Unit testing. Unit testing is performed by the developer on one unit of the program, and check whether it is error free. This comes under White-Box testing approach. Unit testing is having several advantages and they can be listed as follows.

- Unit testing helps to fix bugs early in the development cycle and save costs.
- It helps the developers to understand the testing code base and enables them to make changes quickly
- Good unit tests serve as project documentation
- Unit tests help with code re-use. Here, you have to migrate both your code and your tests to your new project then tweak the code until the tests run again.

5.2 Test Cases

Test case id	Test scenario	Test steps	Expected System Response	Actual results	Pass/Fail
01	Check "Register button"	1. Click on "Register" button	User is directed to the "Sign up" page	As expected	Pass
02	Check "Sign up" with valid data	1. Enter Register interface 2. Enter user details correctly and completely 3. Click on "Register" button	User is directed to the Home page	As expected	Pass
03	Check "Sing up" with incorrect password field	1. Enter Register interface 2. Keep the password field incorrect or less than 6 digits 3. Click "Register" button	Display an error message "The password confirmation does not match" or "The password must be at least 6 characters	As expected	Pass
04	Check Login with valid data	1. Enter login interface of the relevant user 2. Enter username 3. Enter Password 4. Click "Login" button	User should login into the user homepage(Create order or edit order)	As expected	Pass

05	Check Login with error password	1. Enter login interface of the relevant user 2. Enter username 3. Enter the password incorrectly 4. Click "Login" button	Display an error message "These credentials do not match our records"	As expected	Pass
06	Check create order	1. Click on "Create Order"	User is directed to the page which is used to choose the printing shop	As expected	Pass
07	Check create order with valid data	1. Enter the relevant printing shop 2. Select the time slot and enter "Next" button 3. Enter the print details correctly and completely 4. Click on "Create Order" button	Display a message "Order created successfully"	As expected	Pass
08	Check create order without file	1. Enter the print details 2. Keep the empty filename field 3. Click "Create order" button	Display an error message "The filename field is required."	As expected	Pass
09	Check create order without print color	1. Enter the print details 2. Keep the empty color field **3.** Click "Create Order" button	Display an error message "The color field is required"	As expected	Pass

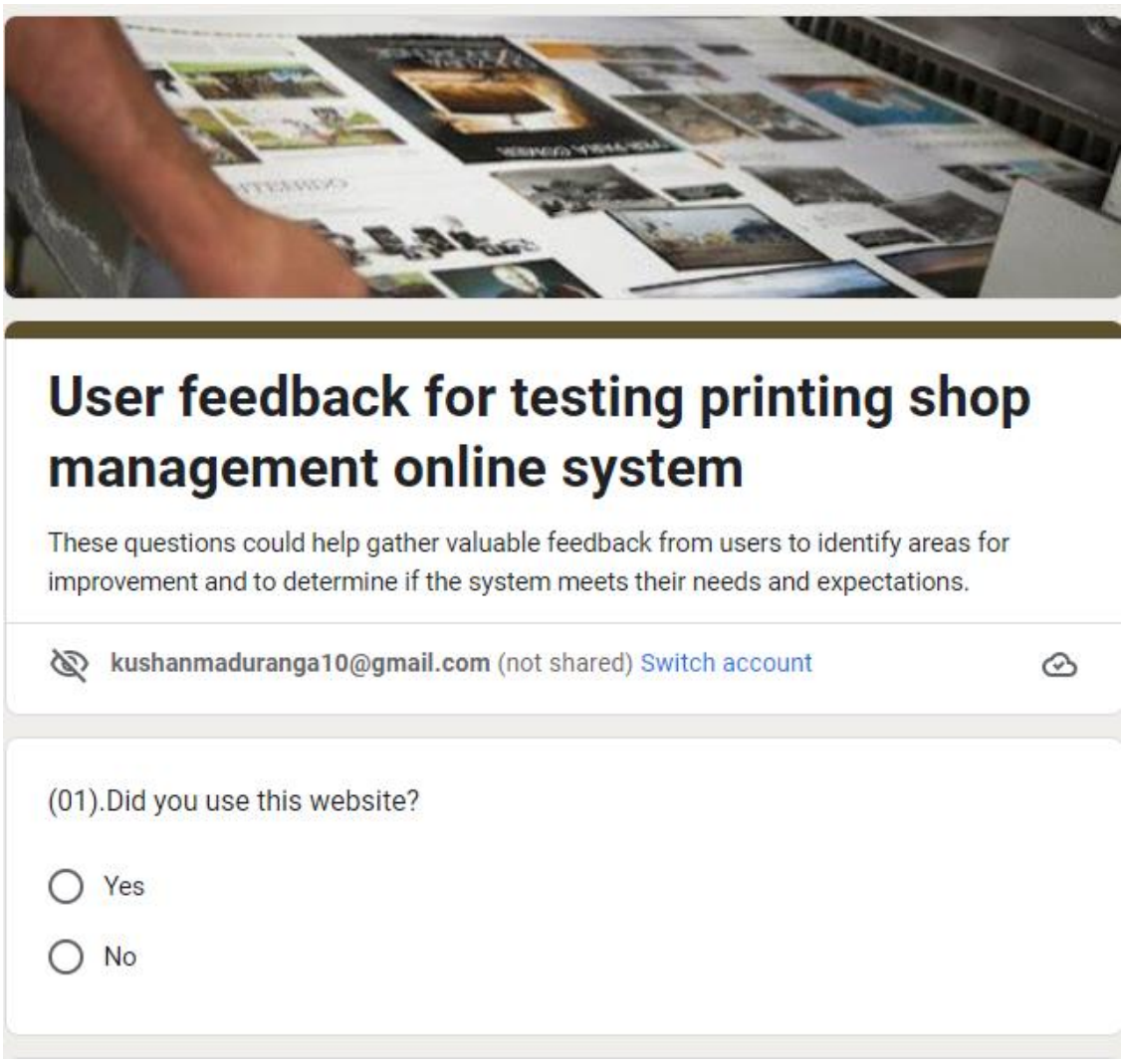
10	Check user can edit order	1. Click "Edit Order" 2. Enter the new print details correctly 3. Click "Update" button	Display a message "Print details updated successfully"	As expected	Pass
11	Check whether the Admin can view orders	1. Login as Admin 2. Click "View" button 3. Click "Accept" or "Reject"	Admin is directed to the page in which the orders and the print details can be viewed individually	As expected	Pass
12	Check whether the Admin can send notifications to the user	1. Login as Admin 2. Click the dropdown and select the message 3. Click the "Send" button	The relevant message goes to the users	As expected	Pass
13	Check whether the customer can delete the order	1. Login as customer 2. Click on "Delete" button	The relevant order is deleted from the My Orders page	As expected	Pass
14	Check whether the customers can be rated	1. Login as shop keeper 2. Select a rate for the customer	Customer can see the relevant rates	As expected	Pass

5.3 User Acceptance Testing (UAT)

User Acceptance Testing (UAT) is performed by the end user or client in order to ensure whether the software system can be accepted or not. This is also called **Beta Testing** or **End-user Testing** which is the final testing performed once the functional, system and regression testing are completed. This testing is very much important because this is where it justifies whether the product meets the business requirements before it is released for market use.

In performing User Acceptance Testing in our project, we as a team conducted a small survey with the use of a Google form in order to get the feedback from the clients and to verify whether they are happy with our system. The images of the Google Form and the feedback reports are as follows.

- **Images of the Google Form**



(02).Does this project have too many steps?

- ○ Totally agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Totally Disagree

(03). Is this user friendly and easy to identify?

- ○ Totally Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Totally Disagree

(04). What are the areas that you find to be improved further?

- ☐ Customer registration
- ☐ Shop keeper registration
- ☐ Order placing
- ☐ Order editing

(05). Did you get any problems when navigating through the pages of the system?

- ○ Yes
- ○ No

(06). If yes, mention them.

Your answer

(07). Are there any features that you suggest to add in our system?

- ◯ Yes
- ◯ No

(08). If yes, mention them?

Your answer

(09). Did you experience any technical issues or glitches while using the system?

- ◯ Yes
- ◯ No

(10). If Yes, mention them.

Your answer

(11). Which of the following do you think is the most efficient?

- ◯ Taking printout by online printing system.
- ◯ Taking printout by staying in printing shop.

(12). Are you satisfied with the overall experience of using the system?

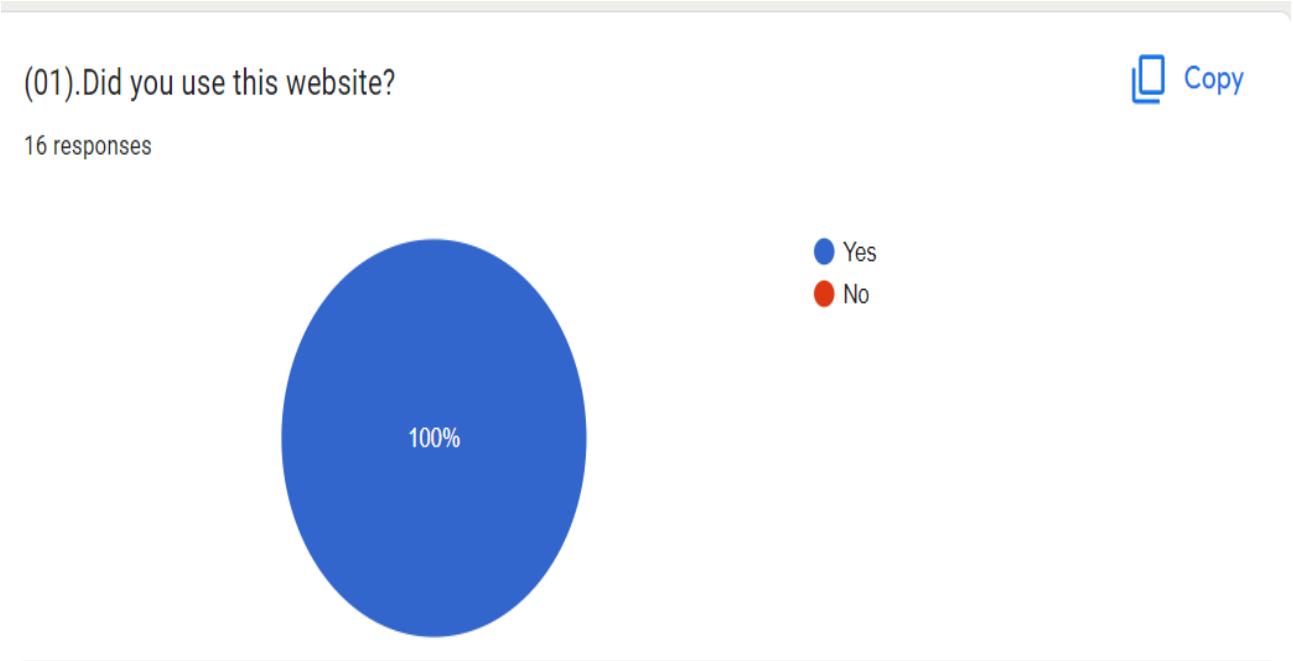
- ◯ Yes
- ◯ No

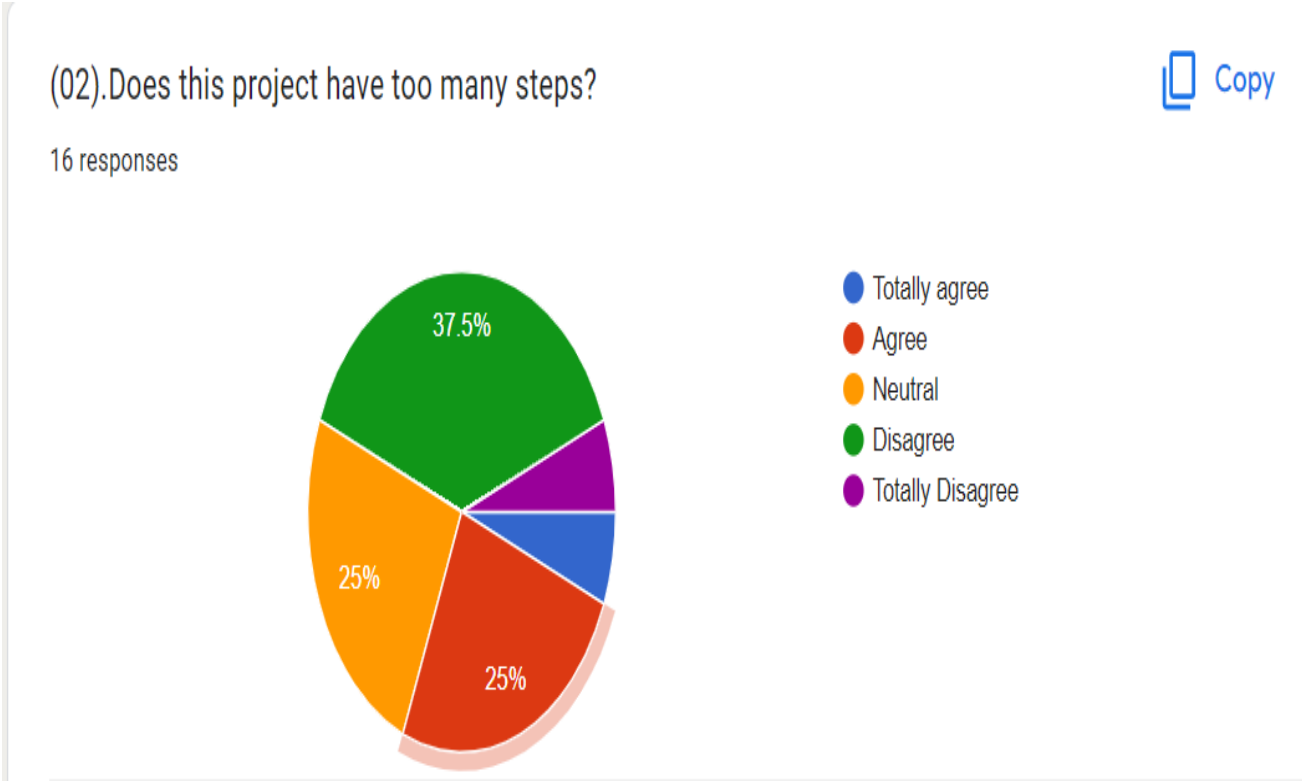
(13). Do you recommend this system to others who need a printing shop management system?

- ◯ Yes
- ◯ No

Submit Clear form

❖ Images of the graphs obtained for the responses gained through the Google Form

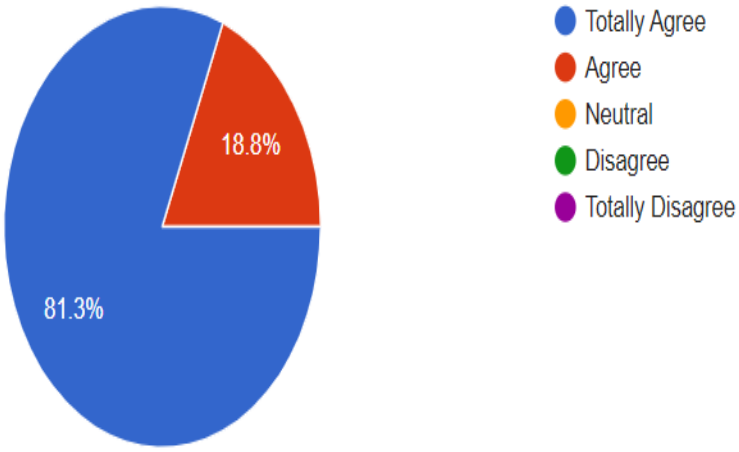




(03). Is this user friendly and easy to identify?

Copy

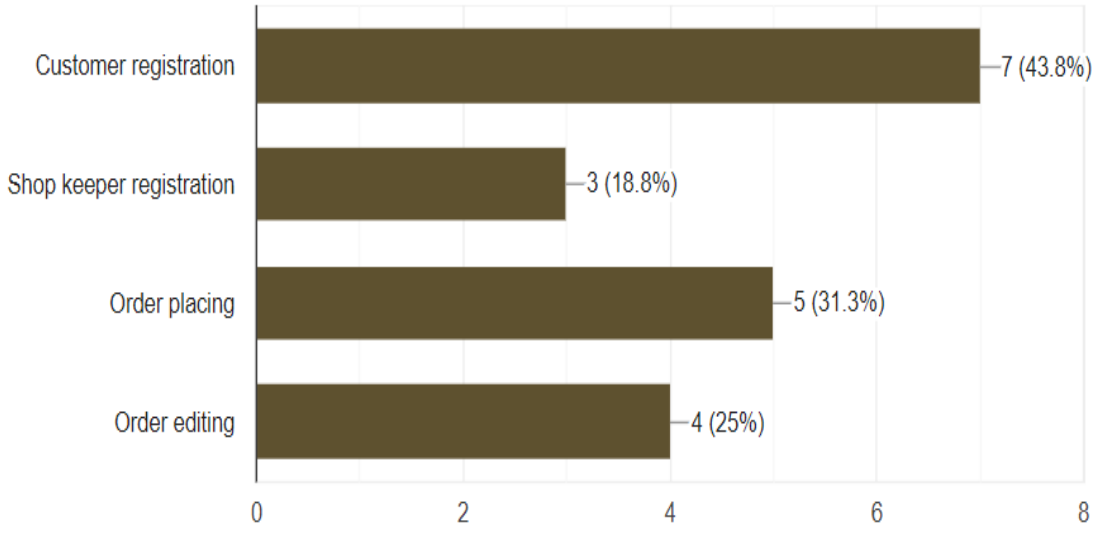
16 responses



(04). What are the areas that you find to be improved further?

Copy

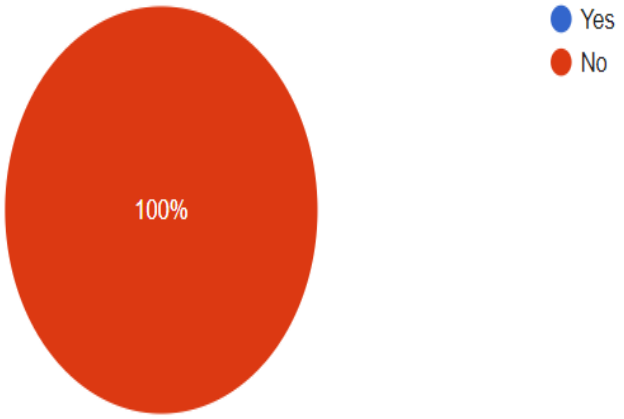
16 responses



(05). Did you get any problems when navigating through the pages of the system?

Copy

16 responses



(06). If yes, mention them.

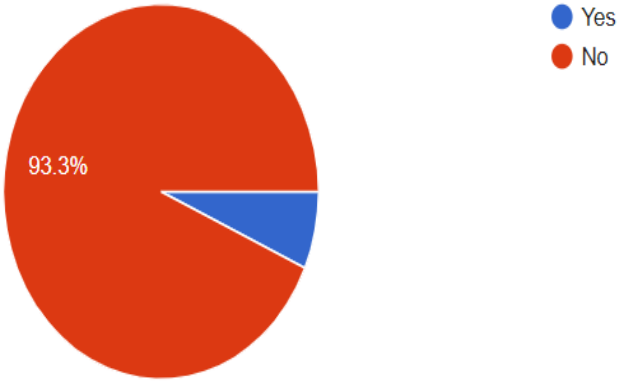
0 responses

No responses yet for this question.

(07). Are there any features that you suggest to add in our system?

Copy

15 responses



(08). If yes, mention them?

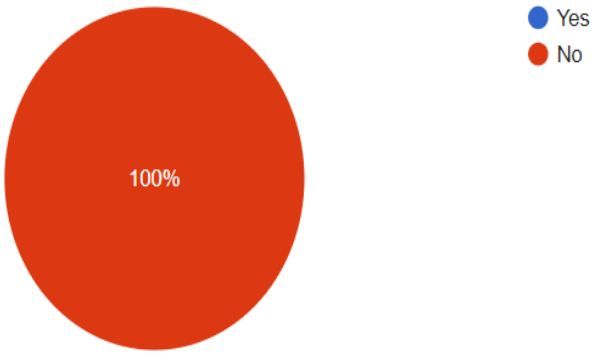
1 response

Online payment

(09). Did you experience any technical issues or glitches while using the system?

Copy

15 responses



(10). If Yes, mention them.

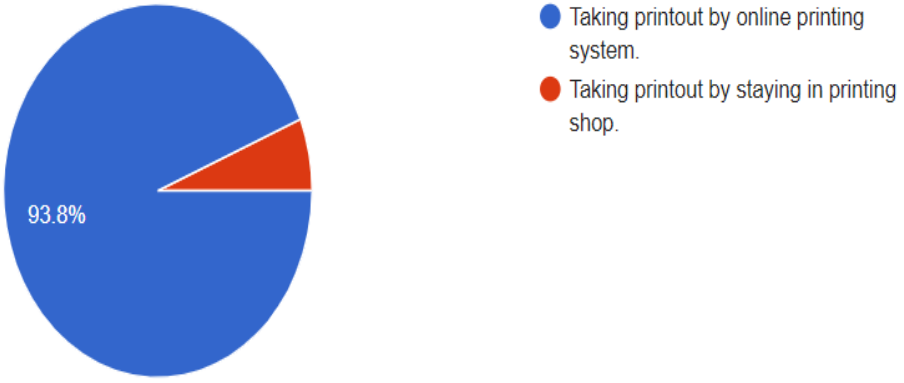
0 responses

No responses yet for this question.

(11). Which of the following do you think is the most efficient?

Copy

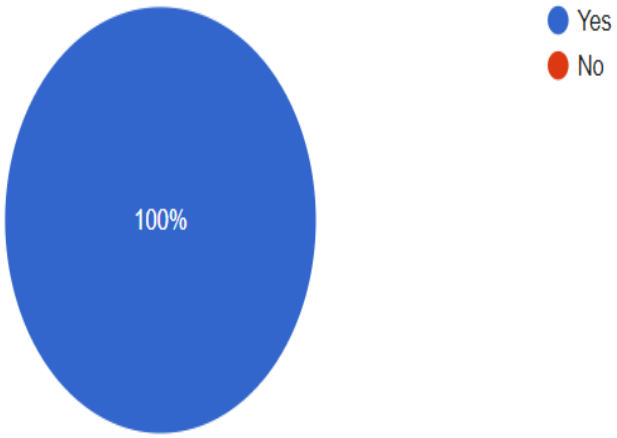
16 responses



(12). Are you satisfied with the overall experience of using the system?

Copy

16 responses



(13). Do you recommend this system to others who need a printing shop management system?

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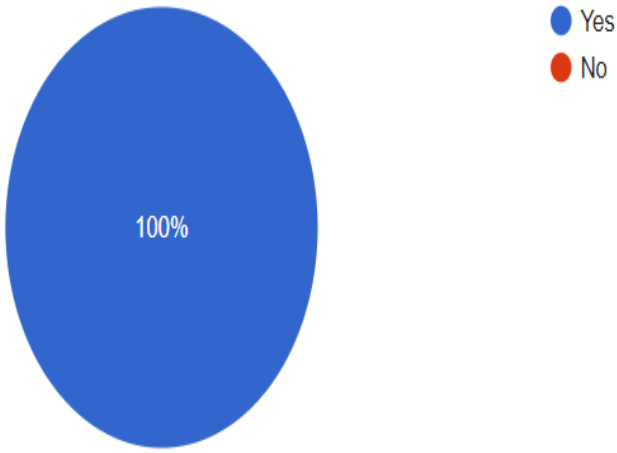
16 responses



Chapter 6. Conclusion and Future Development

6.1 Conclusion

In conclusion to the proposed requirement analysis, design, implementation and testing phases that we have undergone throughout the project and when analyzing the user feedback, our system is in a state of being used in a positive level of customer satisfaction. Here what we wanted was nothing else but to solve the problem of the students waiting to get their work done at the printing shops within the university premises. We being the undergraduates for nearly four years were continuously facing this problem but still found no proposed solution. Such that, we as a team thought of doing something useful for the university as in return we cannot afford for what we have gained from here at the University of Ruhuna as undergraduates. With the limited time, we managed to complete the tasks with the most essential functionalities included in our system and did not try to make it more complex.

In the phase of testing the product, we managed to get user feedback through a Google form and were able to find out our faults and areas to be developed further and as a whole we received a positive feedback. What we found from this in concluding those feedbacks is that the product can be introduced to any printing shop with the similar functionalities not only within the university premises, but also to the market outside. It will need more functionalities to be added and some other alterations, but in a sense it is in a state of being developed and changed according to the changing user requirements.

Such that the experience that we gained through this project will be really useful for us to engage in the software industry and that we learned how to tackle with such a web based system from the initial stage of requirement analysis phase and up to the stage of product being delivered into the market. Therefore in concluding all those facts, the path we took to complete our task up to this level is in a state of being happier as a team.

6.2 Future Development

This system was developed with the intension of being satisfying the requirements of the students at the university premises and this can be developed further by adding many more functionalities.

One way of enhancing this system is adding an online payment portal for the customers. As it is costly to buy a payment gateway we were unable to add it into our system, but at the future development stages that it is something which is so much useful to be added into the system.

Apart from that, automation of certain processes like job scheduling, order tracking and quality control can reduce manual work and can increase the productivity of the system.

Artificial intelligence and machine learning can also be used in the system in the future. It can help to optimize the print settings for various print jobs, automatically identify and correct errors and improve the accuracy and speed of order processing.

Another most important thing to be done at the future development stages is developing a mobile app. It can provide the users the capability to access order information, production status updates and also to communicate with the printing shop easily.

Implementing a business intelligence system is another trendy way of making the system sophisticated. Such a system can provide real-time insights into business performance, can help the printing shop make data-driven decisions and can identify areas for improvement.

Overall, the future development stages of this printing shop management system should focus on leveraging technology to improve efficiency, accuracy and customer satisfaction.

Bibliography

- **Articles**
  - https://www.guru99.com/unit-testing-guide.html, Guru99, Unit Testing Tutorial: What is, Types, Tools, EXAMPLES, ,.
  - https://www.tutorialspoint.com/sdlc/sdlc_overview.htm., ,Tutorialspoint, SDLC Overview, ,.

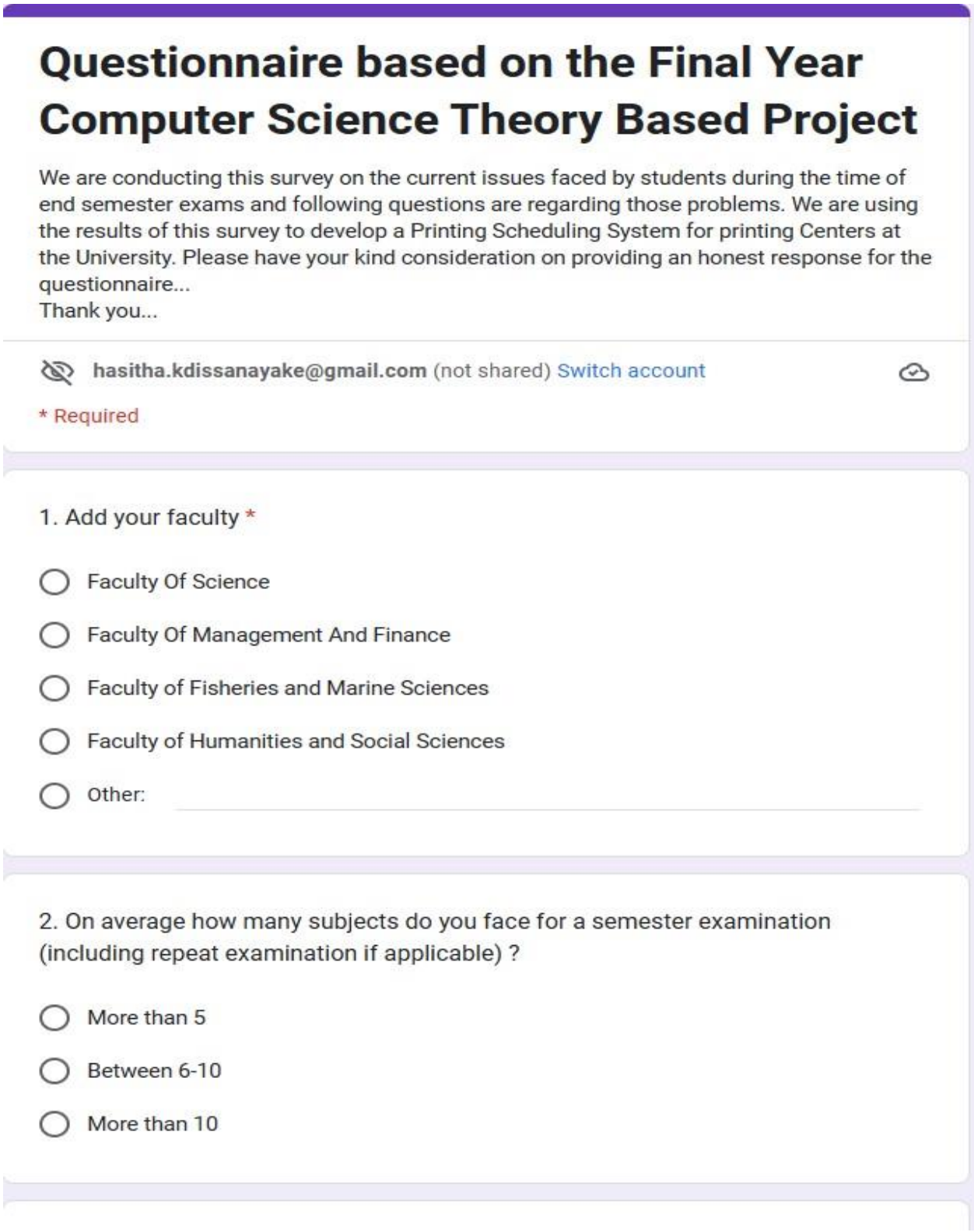
- **Online Sources**
  - Printing United Alliance
    - https://www.printing.org/, , Printing Industries of America, .
  - Automation in Digital Printing
    - https://campaign.colorgate.com/discover-productionserver?utm_term=print%20automation&utm_campaign=V22.10+International&utm_source=adwords&utm_medium=ppc&hsa_acc=2566194776&hsa_cam=18882507960&hsa_grp=143632872859&hsa_ad=634321863085&hsa_src=g&hsa_tgt=kwd-298453918705&hsa_kw=print%20automation&hsa_mt=b&hsa_net=adwords&hsa_ver=3&gclid=Cj0KCQiAutyfBhCMARIsAMgcRJSfTvTWxWPOWQMMugC0ruFg8zYGC-oURWyRgDh_A9fpaoMb_0IWqMYaAn9CEALw_wcB
  - YoPrint: Simple screen printing management software
    - https://www.yoprint.com/

- https://www.itsolutionstuff.com/post/laravel-9-user-roles-and-permissions tutorialexample.html ,Hardik savani, Laravel 9 user roles and permissions tutorial, ,
- https://www.altexsoft.com/blog/non-functional requirements/https://www.synopsys.com/glossary/what-is-sdlc.html ,Yemelyanenko D, Non-Functional Requirements: What They Are and How to Identify Them. Altexsoft., (2020, September 23).
- .https://dl.ucsc.cmb.ac.lk/jspui/bitstream/123456789/4519/1/2017%20MIT%20075.pdfhttps://www.javatpoint.com/xampp, Senarathna, N, A Study on the Impact of Social Media on Youth. University of Colombo School of Computing, (2017).
- https://www.javatpoint.com/laravel#:~:text=Laravel%20is%20an%20open%2Dsource,languages%20like%20Ruby%20on%20Rails.https://geekflare.com/best-print-management-software/, Laravel - Introduction," javatpoint.com, [Online], ,.

- https://www.tutorialspoint.com/software_engineering/software_testing_overview.htm#:~:text=Software%20Testing%20is%20evaluation%20of,comprises%20of%20Validation%20and%20Verification.https://www.guru99.com/unit-testing-guide.html , Software Testing Overview," Tutorialspoint.com, [Online], ,.
- https://www.softwaretestinghelp.com/what-is-user-acceptance-testing-uat/ , Saha, P, What is User Acceptance Testing (UAT)? [Blog post]. SoftwareTestingHelp.com, (2019, January 3).
- https://study.com/academy/lesson/formal-methods-model-definition-application.htmlhttps://www.geeksforgeeks.org/rup-and-its-phases, Gardner, D. (n.d.), Formal Methods Model: Definition & Application. Study.com, .
- https://www.javatpoint.com/software-engineering-sdlc-models, , Javatpoint. "Software Engineering - SDLC Models, .

Appendix

❖ Images of the Google Form



Questionnaire based on the Final Year Computer Science Theory Based Project

We are conducting this survey on the current issues faced by students during the time of end semester exams and following questions are regarding those problems. We are using the results of this survey to develop a Printing Scheduling System for printing Centers at the University. Please have your kind consideration on providing an honest response for the questionnaire...
Thank you...

hasitha.kdissanayake@gmail.com (not shared) Switch account

* Required

1. Add your faculty *

- Faculty Of Science
- Faculty Of Management And Finance
- Faculty of Fisheries and Marine Sciences
- Faculty of Humanities and Social Sciences
- Other:

2. On average how many subjects do you face for a semester examination (including repeat examination if applicable) ?

- More than 5
- Between 6-10
- More than 10

3. What is the printing center you prefer to take printouts? *

- ◯ Library
- ◯ Canteen
- ◯ Self-learning area
- ◯ Other: _____

4. How was the congestion (traffic) at printing centers?

- ◯ Little
- ◯ Mild
- ◯ Too much

5.On average how long did you wait to get your printouts? *

- ◯ Less than 0.5 hours
- ◯ Between 0.5-1 hours
- ◯ More than 1 hour

6. Do you like to have a system to get your printouts at the university premises without any waste of time ? *

- ◯ Yes
- ◯ No

7. How do you find your lecture notes ?

- ◯ From LMS
- ◯ From friends
- ◯ From the emails that the lecturer sent
- ◯ From your batch Google Group

8. When are you printing your lecture notes?

- ◯ Before the study leave
- ◯ Before the particular examination paper
- ◯ I use handwritten notes

9.If you want to print your notes, how do you prefer to carry your lecture notes to print?

- ◯ Pen drive
- ◯ Email the notes
- ◯ WhatsApp the notes

10. What difficulties did you face while carrying lecture notes from the above mentioned option ? *

- ◯ Forgot to take the pen drive back
- ◯ Hard to find a pen drive to carry notes
- ◯ Printing center complains that no email received
- ◯ Printing center complains that no WhatsApp message received
- ◯ I have no laptop/smartphone or other means to send Emails,WhatsApp
- ◯ Other: _____

11. How do you obtain past papers ?

- ◯ From LMS
- ◯ From Library
- ◯ From Lecturer
- ◯ Other: _____

12. If you take downloaded past papers to print, how do you carry them ?

- ◯ Pen drive
- ◯ Email the notes
- ◯ WhatsApp the notes

13. When are you printing your past papers ?

- ◯ Before the semester
- ◯ Before the study leave
- ◯ Before the particular examination paper

14. Do you prefer if you can upload your lecture notes that need to be printed to this upcoming system ?

- ◯ Yes
- ◯ No

15. Do you prefer to have an option that can select your wanted past papers from the new system?

- ◯ Yes
- ◯ No

16.Do you like to schedule an online printing order to your selected printing center ?

- ◯ Yes
- ◯ No

17. Do you prefer to allocate a time slot preferable to you to collect your printing order from your selected printing center ?

- ◯ Yes
- ◯ No

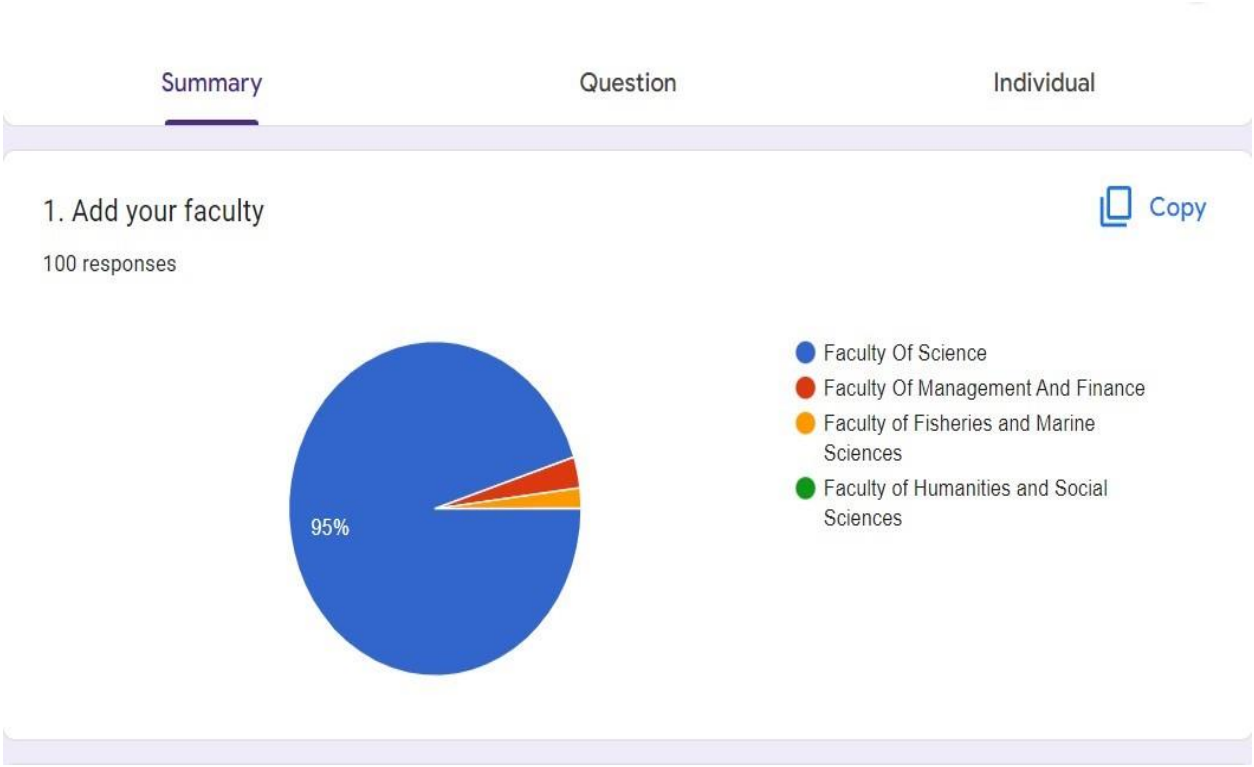
18. Do you prefer to know when printing centers are busy ?

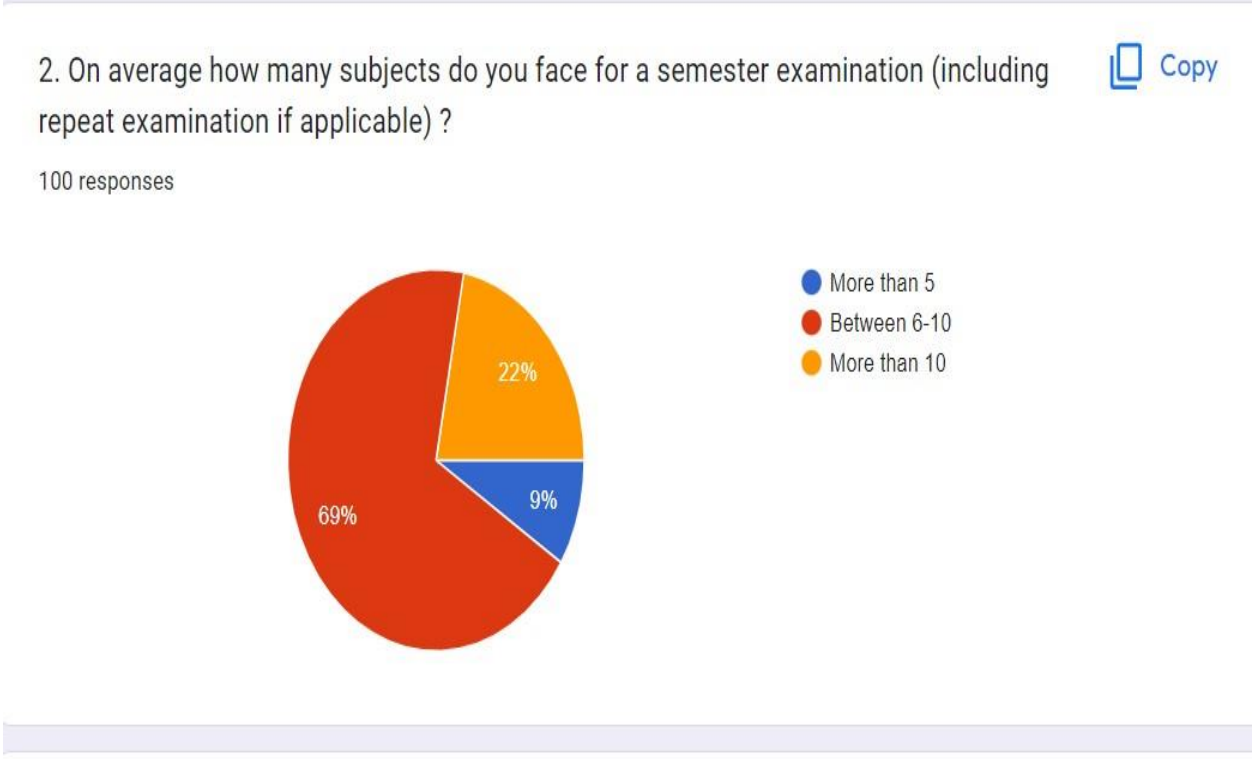
- ◯ Yes
- ◯ No

Submit Clear form

Never submit passwords through Google Forms.

❖ Images of the graphs obtained for the responses gained through the Google Form





3. What is the printing center you prefer to take printouts?

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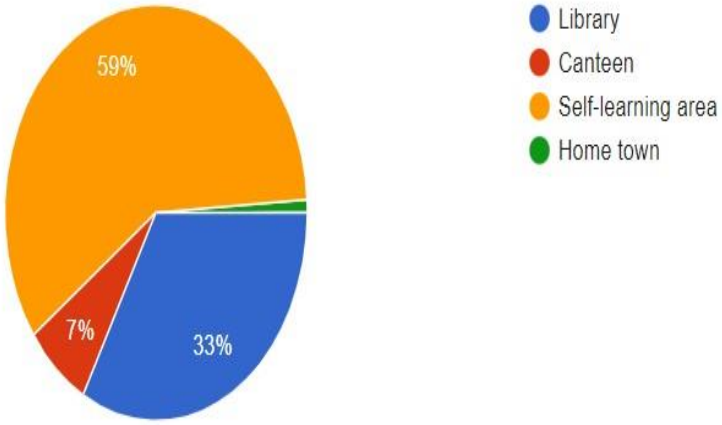
100 responses



4. How was the congestion (traffic) at printing centers?

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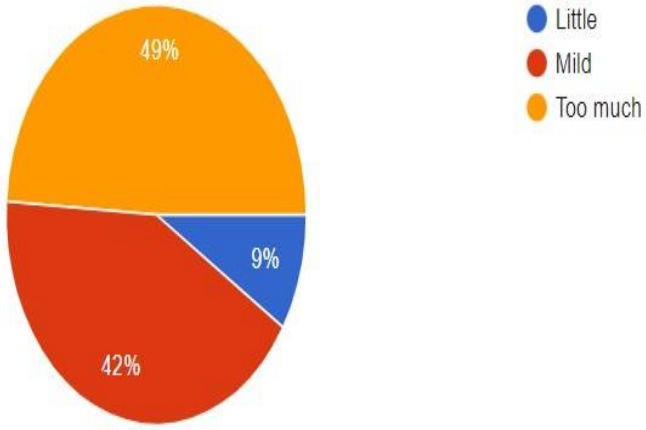
100 responses



5.On average how long did you wait to get your printouts?

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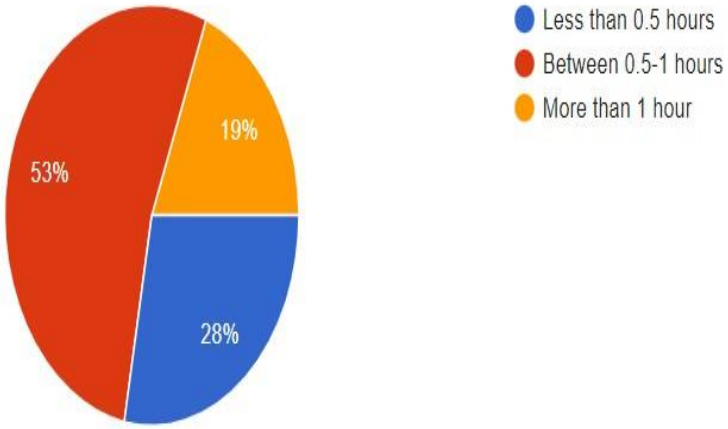
100 responses



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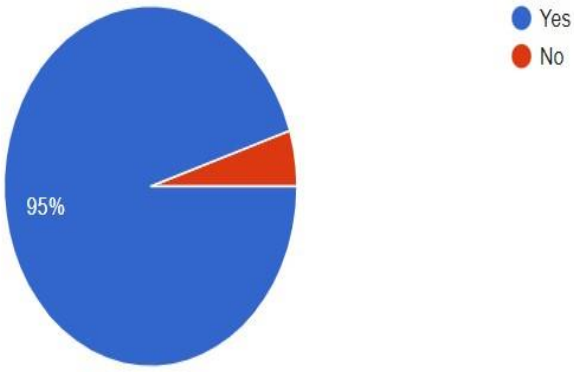
6. Do you like to have a system to get your printouts at the university premises without any waste of time ?

100 responses



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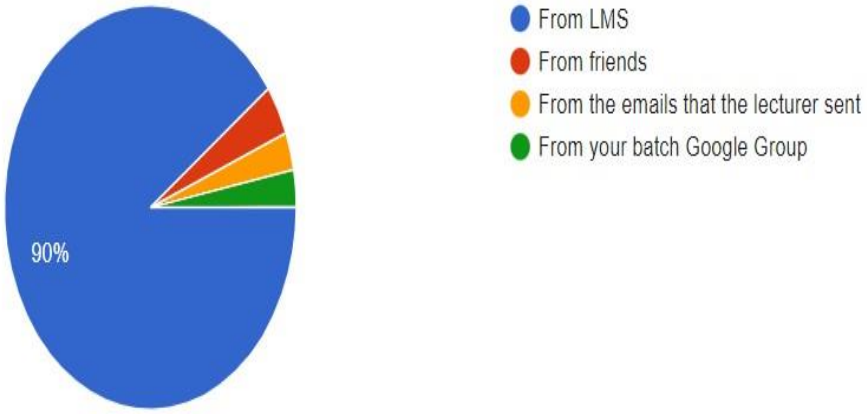
7. How do you find your lecture notes ?

100 responses



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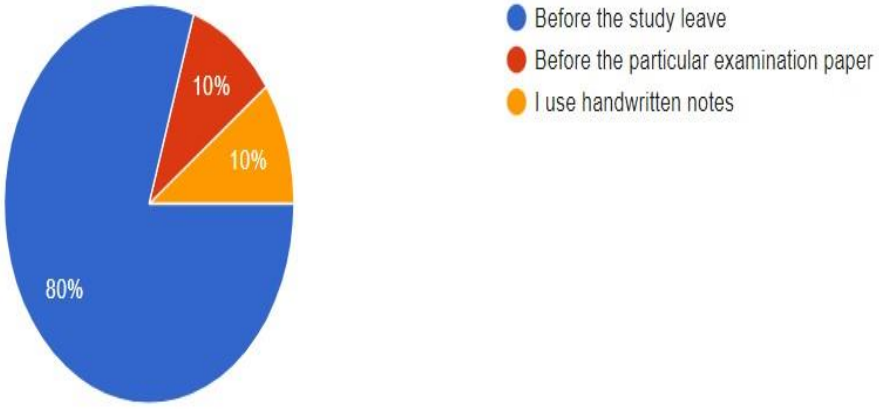
8. When are you printing your lecture notes?

100 responses



9.If you want to print your notes, how do you prefer to carry your lecture notes to print?

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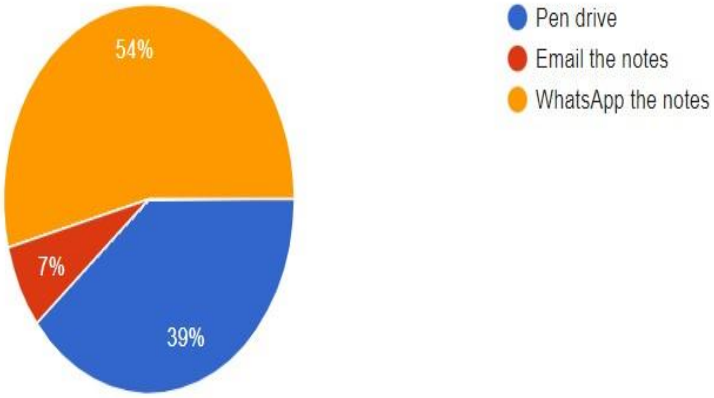
100 responses



10. What difficulties did you face while carrying lecture notes from the above mentioned option ?

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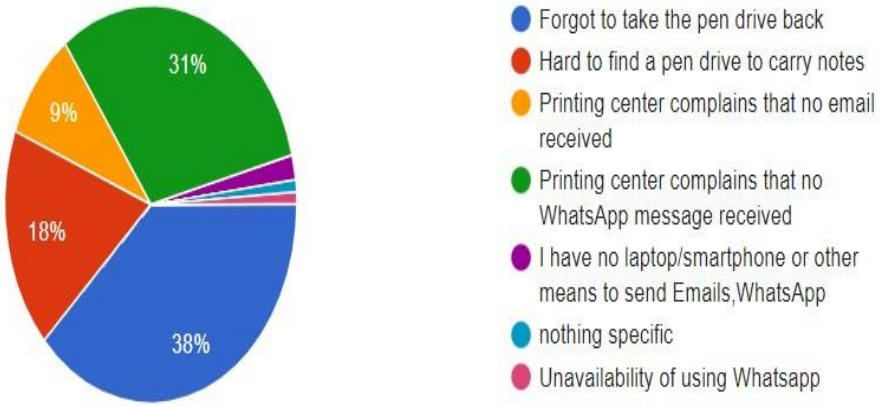
100 responses



11. How do you obtain past papers ?

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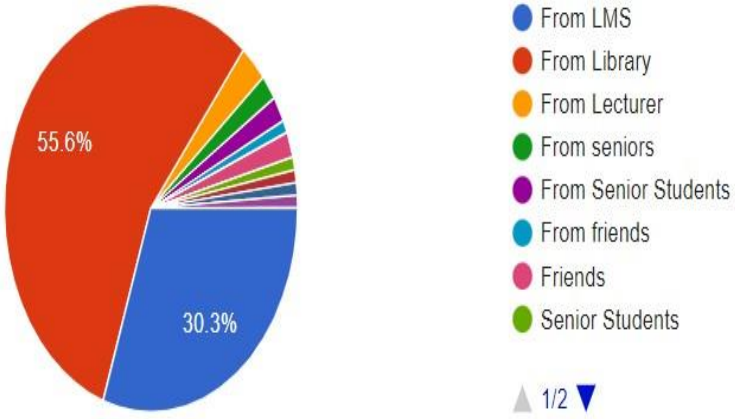
99 responses



12. If you take downloaded past papers to print, how do you carry them ?

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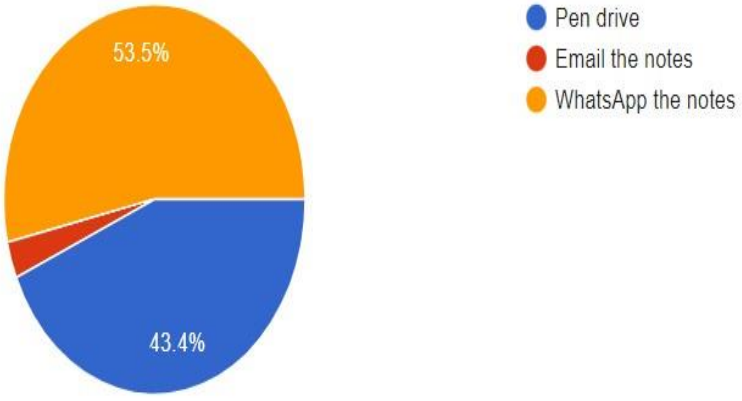
99 responses



13. When are you printing your past papers ?

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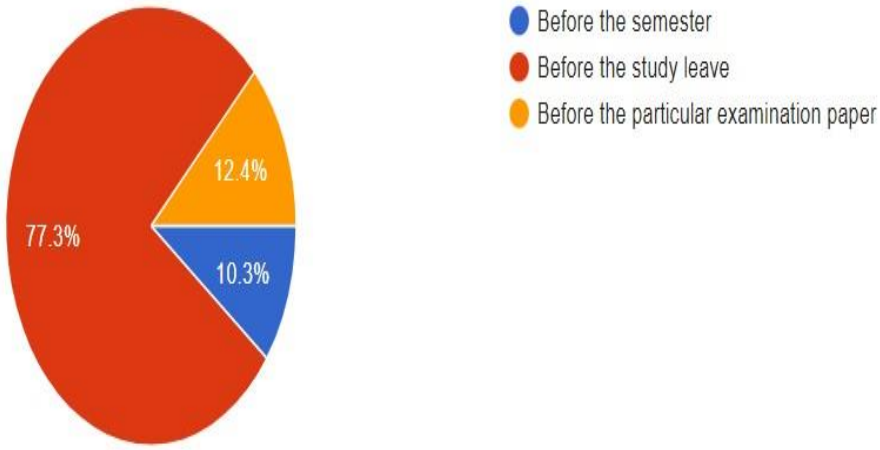
97 responses



14. Do you prefer if you can upload your lecture notes that need to be printed to this upcoming system ?

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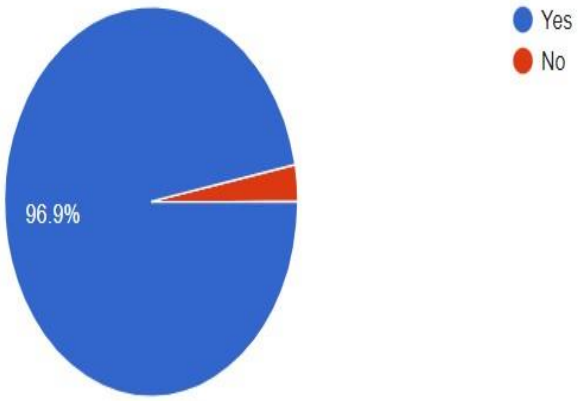
98 responses



15. Do you prefer to have an option that can select your wanted past papers from the new system?

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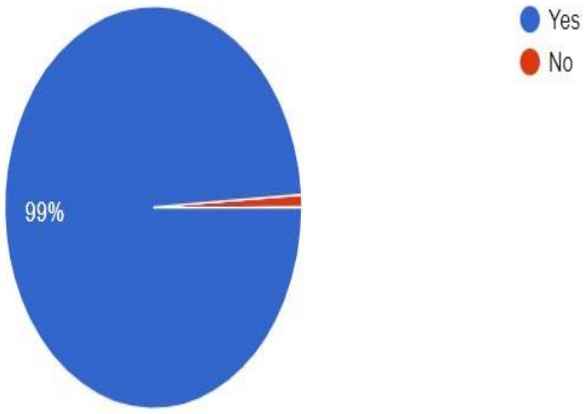
98 responses



16.Do you like to schedule an online printing order to your selected printing center ?

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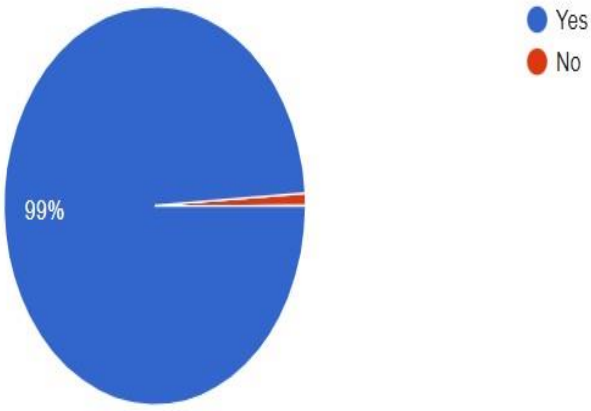
99 responses



17. Do you prefer to allocate a time slot preferable to you to collect your printing order from your selected printing center ?

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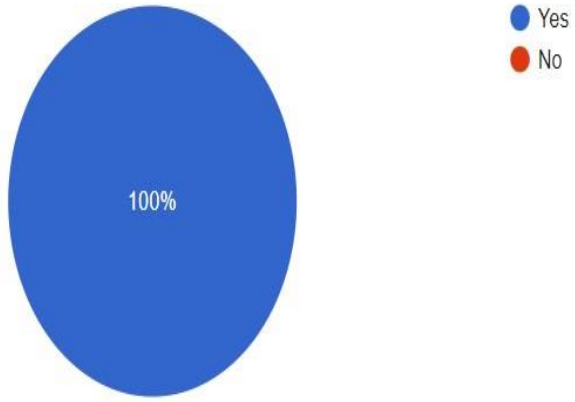
99 responses



18. Do you prefer to know when printing centers are busy ?

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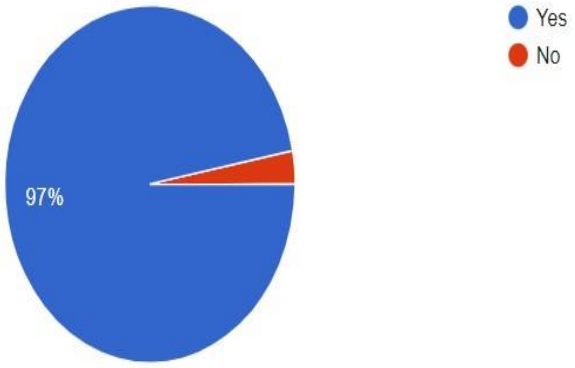
99 responses



Individual Contribution

1. **Name : S.M.D.K Serasinghe**

   Reg.No : SC/2018/10532

Initially, we gathered ideas from our peers through a questionnaire to obtain the necessary requirements. Subsequently, we created several diagrams, including ER diagrams, Database schema, and the Use case diagrams. We then transformed the database into 1NF, 2NF and 3NF. Using the Laravel framework, I designed the database and models, and inserted test data into the database. Following this, I implemented a login and user registration system using Laravel's built-in package. I then created controllers and an admin panel using Laravel's packages. Moreover, I created separate interfaces for both customers and shop keepers. Finally, I used Bootstrap and JavaScript to design the landing page, user login interface, and user registration interface.

2. **Name : M.P.J.M Pathmasiri**

   Reg.No : SC/2018/10505

At the initial stage, we discussed about the project idea and we pulled those ideas together and started working on the project. Each of us studied about ER diagrams, Use case diagrams, normalization and drew those diagrams and discussed about it. Then we divided the work among us and I designed ordering view of shop keeper using Bootstrap. Then the function disabling edit button when shopkeeper presses printing button, was done by using jQuery. In the project report I contributed in describing development models, creating the work breakdown structure, planning and management process in the “Implementation” chapter.

3. **Name : H.K.Dissnayake**

   Reg.No : SC/2018/10628

As a team member, I gave my contribution in making the survey and the project proposal at the initial stage of the project. Then in developing the front end, I contributed in making the "View Order Details" interface using Bootstrap. In the back-end, I created the functionality of viewing the due order status at the customer side, when the shop keeper selects the relevant message from the drop down and press on the "Send" button. In developing the above functionality in the back-end, Laravel was used and I had to work with the blade PHPs, controllers and the database in creating the API. Finally, I was given the responsibility in finalizing the project report by editing all the needful.

4. **Name : M.G.K.N Gunathilaka**

   Reg.No: SC/2018/10548

First, I created the entity relationship diagram. Additionally, I provided support in creating the use case diagram also. Moving on to the frontend, I was responsible in designing the fill print details view using Bootstrap. In the back-end, I created the functionality of timeslot availability using Laravel, when the customer goes to create order. To ensure the quality of the system, I gave my contribution in the testing phase and added the results to the final report. In the testing part, I created the Google form in getting feedback from the end users to identify the areas that need further improvement and determined their expectations. In the presentation, I created a system overview that detailed the functions completed. I also highlighted any difficulties that arose during the development process within the final presentation.

5. **Name : S.J.M.N Thathsara**

   Reg.No : SC/2018/10643

I created the start , stop, re-available buttons and countdown timer in the Shop keeper panel. If the shop keeper needs to be re-available the time slot, the shop keeper can re-available the time slot by clicking the button. I contributed in creating the welcome page in the front end. Apart from that, I contributed in providing information under the topics used technologies, user interfaces and

6. **Name : D.M.S.S Dasanayaka**

   Reg.No: SC/2018/10525

When we looked carefully around the university, we saw some problematic conditions in printing shops. Mainly, the students spend unnecessary time in the shops. We decided to create a system to streamline this process. First, the necessary data was collected using a questionnaire. Then we created several diagrams, including ER diagrams, database schema and Use case diagrams. When moving into the front-end, I created the shop owner's interface using Bootstrap. There, I designed the view order and confirm order pages. Using Laravel, I created the shopkeeper controllers. I supported to make necessary arrangements with the members in other tasks also.