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# A Secure Booking Appointment System with Graphical Password Authentication for Diva Hair Salon

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**Abstract:** Online booking appointments system describes the process of scheduling appointments with a business via the internet in a convenient and secure manner. Many hair salons have implemented an online booking appointment system to improve the customer's convenience. However, since Diva hair salon still uses the manual method to book the customer's appointment thus a secure online booking appointment with graphical password authentication system is proposed. It is a system that customers can book their appointment with the hair salon anytime and anywhere. The goal of this project is to create a secure online booking application with graphical password authentication for Diva hair salon's three target users: admin, staff, and customers. Customers can use this system to check the availability of the salon's stylists, choose a time and date for their appointment, and book it directly through the salon's website. This project employs agile methodology. HTML, CSS, PHP, and JavaScript are the programming languages used in this system. The project's outcome is that it will make online booking easier for Diva hair salon customers, and the response from Diva hair salon's administrator is that the system is well-functional.

**Keywords:** Online Booking Appointment System, Graphical Password Authentication, Web Based System

## 1. Introduction

Divia hair salon still uses three manual methods to book appointments for services: the customer must walk in to book their appointment, call the hair salon, and finally, direct message the hair salon on WhatsApp or social media to book the appointment. This complicates and prolongs the appointment booking process, causing the customer to choose another hair salon. Aside from that, Diva hair salon is also not systematic in which it is disorganized and inefficient in its operations and lastly, there is a lack of security in handling the customer's information because there is no security element implied in the existing process of the customer booking appointment in the hair salon.

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Thus, there are three main objectives which are to design, develop and test the functionality of a secure booking appointment system with graphical-image authentication for Diva hair salon which will use a web-based approach. The security elements that will be implemented in the system are graphical password authentication, hashing and salting user's password, hashing of user's graphical password, role-based access control, QR code verification and forgot password.

## 2. Literature Review

This section explains about the online booking appointment system, graphical password authentication and some similar system that will be compared with the proposed system.

### 2.1 Online Booking Appointment System

Online booking appointment has been implemented in every scheduling system nowadays, as seen in the government clinic appointment system, which is an initiative of the Malaysian Ministry of Health. One of the benefits of implementing an online booking appointment system in this project is that customers can book their appointment at any time and from any location [1]. This allows the potential customer to book at any time, regardless of whether it is during business hours or not. The customer also does not need to call the store to find out when the store is available for the appointment because the proposed system will state and set when the store is available to provide their service.

### 2.2 Graphical Password Authentication

Graphical password authentication is a dynamic password in which the display graphical password changes with each use, providing a high level of security against internal and external threats. There are three types of graphical password scheme which are recognition-based graphical password, pure recall-based graphical password and cued recall based graphical password.

1. Recognition-based graphical password: This type of graphical password authentication is also known as search metric system and is based on the user's ability to recognize a specific image or set of images [2]
2. Recall-based graphical password: Recall-based graphical passwords or also known as draw metric system and are passwords that are based on the user's ability to recall a specific image or set of images. The user is presented with a pool of images and is asked to select the specific images that they previously selected as their password, but the images are not shown to the user. Users need to draw their password either on a blank canvas or on a grid[3].
3. Cued recall-based graphical password: A password in Cued Recall-Based graphical password is made up of many (x, y) coordinates in an image or a login window. In the first graphical password method, the password comprises of numerous predetermined locations in a picture [2]. Cued recall-based schemes are authentication systems that rely on cues or clues to help users remember their passwords or passphrases.

### 2.3 Role-Based Access Control

The RBAC is the access control that assigned users to the roles and the security policies grant rights to roles rather than to users. RBAC allows for the creation of permissions hierarchies and inheritance since the users are assigned to roles [4].The grant of access is based on the employee's responsibility and authority in the organization, so access to delete, create, or update information in the system is restricted. There will be an assigned user as the administrator, stylist user, or end-user and permissions will be assigned only as needed for employees to do their jobs.

### 2.4 Hashing

Hashing is a one-way process that converts the entire password into a fixed-length string of characters. It is also known as compression function. Instead of the original password, the hash of the password is

stored in a secure location, such as a database or file. When a user tries to log in, their password is hashed, and the resulting hash is compared to the stored hash to ensure that they entered the correct passwords. This helps to protect the password and keeps it from being compromised if an unauthorized party gains access to the database or file containing the hashed passwords.

## 2.5 Quick Response code

Quick response (QR) codes are unique in that they can convey a wide range of digital content and services [5]. Attendance can be tracked by outfitting event organizers or employees with QR code scanning devices such as cellphones or specialist scanners. Attendees provide their QR codes, which are scanned upon entry or arrival to the allocated location.

## 2.6 Comparison of Existing Booking Appointment System

This section will explain the current system for booking hair salon appointments on the internet. Following that, a comparison of the current existing system with the proposed system will be discussed.

### 2.6.1 Diva Manual System

Customers will direct message the hair salon via social media platforms such as Facebook, Instagram, and WhatsApp. If the customer clicks on the hair salon's Instagram account, the user must click on the link provided on the Instagram biography, and the link will bring the user to the hair salon's owner's WhatsApp account. When the customer contacts the hair salon via WhatsApp, there will be an automatic message which include the services the hair salon provided, the discount, the date and time the hair salon opened, the hair salon's location and the username of the Instagram account of the owner for the hair salon like shown in Figure 1. The customer must enter their name, mobile phone number, date, and services desired through WhatsApp.

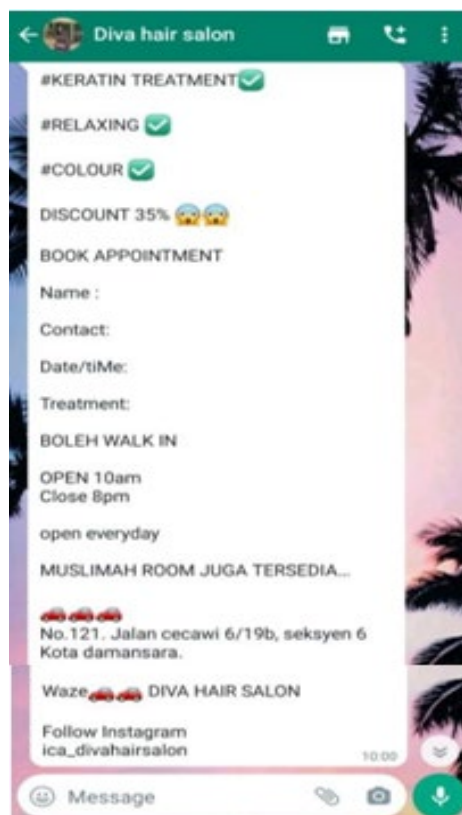


Figure 1: Automatic message in WhatsApp to book appointment with Diva hair salon

## 2.6.2 Fresha.com

Fresha.com is an open-source website where users can create an account for free. For the first time user, the user needs to sign up for their account. Users need to provide an email address, or they can sign up using their Facebook account or Apple. After clicking 'Continue,' the user must enter their first name, last name, mobile number, country, and password. Users need to click add and new appointment to book for the walk-in customer to the hair salon. In Figure 2, the user must select the date of the booking, as well as the time and duration required for the services. The user must also select the service that the customer desires as well as the team member who will be assigned to the customer.

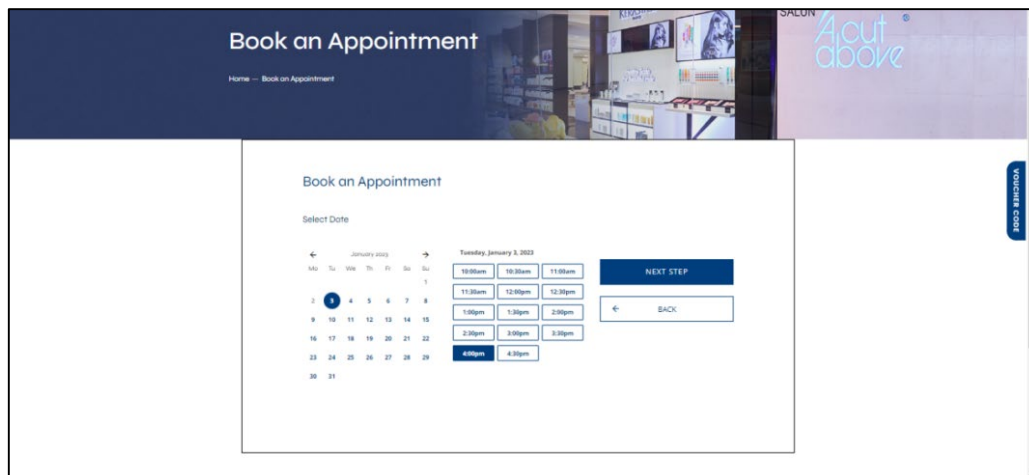


Figure 2: Booking appointment page

## 2.6.3 A Cut Above

This website provided an online appointment booking system for clients who wanted to book hair services from A Cut Above. To make an online booking appointment with the store, the user does not need to log in. User can click as many hair services user wants to purchase. The user then selects the outlet location by clicking the next step button. Following that, the user must select a date for their appointment from the available slot time and date that a cut above provided, as shown in Figure 3. The user then needs to enter their information to proceed with the booking appointment process in which the user needs to choose their hairstylist which wither senior stylist or stylist. Users also need to enter their name, email address and phone number and click the next step button.

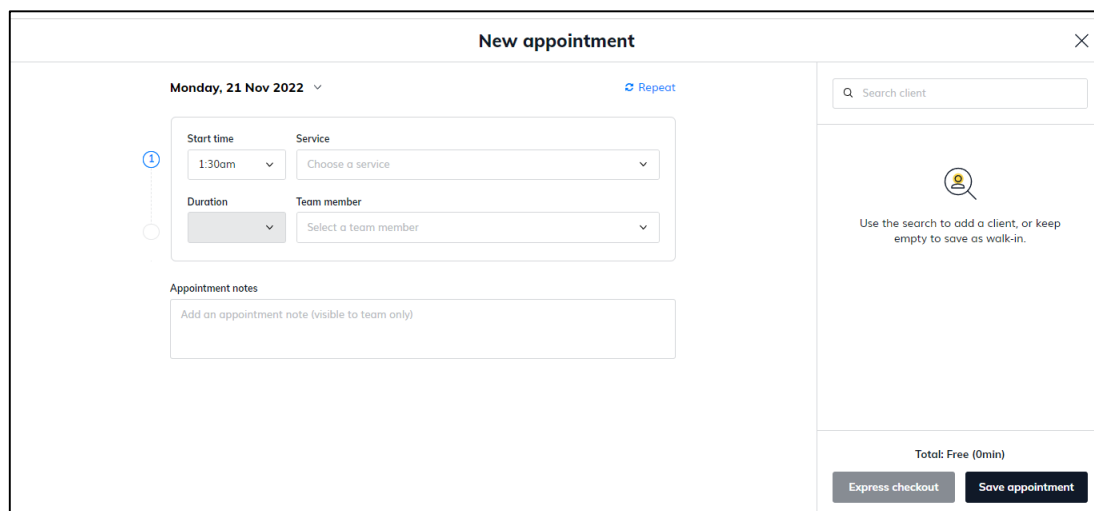


Figure 3: Choosing an available appointment slot on the booking appointment page

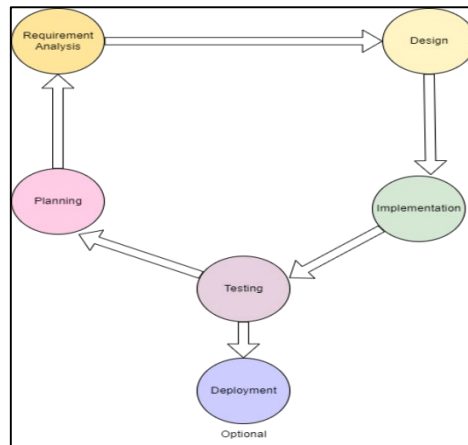
**Table 1: Comparison Existing Application with the proposed Application**

Features	Diva Manual System	Fresha.com	A Cut Above	Propose System
Type of system	Manual System	Online System	Online System	Online System
Authentication	No	Yes (Password and OTP via phone number)	No	Yes (Password and Graphical Password Authentication)
Register Module	No	Yes	No	Yes
Login Module	No	Yes	No	Yes
Booking Module	No	Yes	Yes	Yes
Generate Report Module	No	Yes	Not available	Yes
Hashing and Salting Password	No	Not available	Not available	Yes
Role-Based Access Control	No	Not available	Not available	Yes
Payment Module	No	No	No	Yes
QR Code Verification	No	No	No	Yes
Forgot Password	No	No	Yes	Yes
First Time Login	No	Not available	Not available	Yes

The similarities and differences between Diva's hair salon manual system, Fresha.com, A Cut Above and propose system are shown in Table 1. The hair salon manual system in Diva is a manual system, whereas the other system is an online system. Aside from that, both manual system and A Cut Above do not have authentication, though Fresha.com has password and One Time Password via mobile phone meanwhile the proposed system has password and graphical password authentication. Next, the proposed system and Fresha.com also have a login module, a registration module, and a report generation module, whereas A Cut Above's information not available and Diva's hair salon manual systems do not. Fresha.com, A Cut Above, and the proposed system all have booking modules, whereas Diva's manual system does not. Hashing and salting passwords only will be implemented in the proposed system, meanwhile Fresha.com and A Cut Above are not available to know the information. The proposed system will also include a payment module that will allow customers to upload receipts, will receive the QR code after the booking is approved and has forgotten password module in the proposed system. The role-based access control will be used in the proposed system meanwhile Fresha.com and A cut Above do not have.

### 3. Methodology

Agile model is the combination of the incremental and iterative model. This is because the agile model is an approach that was introduced to overcome the limitations of conventional development methods and to reduce costs while ensuring flexibility to implement changes in requirements at any phase [6]. As shown in Figure 4, each iteration will include planning, requirement analysis, designing, implementation, and testing.



**Figure 4: Phases in Agile Methodology**

### 3.1 Planning

During this phase, the scope of the project, project goals, and objectives will be defined in order to achieve the project's goals. The project will collect all information, including the problem statement about the hair salon in Diva from the owner, Encik Mohd Bakri bin Awang. This is to ensure that the system can resolve the problem that has arisen in the hair salon. This phase will also plan and define the project's budget and equipment.

### 3.2 Requirement Analysis

All the requirements are gathered by interviewing the owner of the Diva's hair salon during this phase. Interviews provide valuable insights because by interacting directly with users, the project member can gain valuable insights into how the system will be used, the challenges that users may face, and the potential impact of the system on the organization.

### 3.3 Design

During this phase, the application, network, databases, user interfaces, and system interfaces will be designed. The system specification is also being defined as details as possible to ensure that the system's development followed the user requirement. The functional and non-functional requirements are being identified during the requirement analysis phase into a detailed design for the system. The system's architecture and the specific components in the system will be determined.

### 3.4 Implementation

In the implementation phase, there are three major components: software, hardware, and programming language. The hardware that will be used is an AMD A6-9225 RADEON R4 Processor, Microsoft Windows 10 and RAM of 8GB. Next, VScode studio, phpMyAdmin database, XAMPP, Draw.io and Figma will be used to develop the booking appointment system for Diva hair salon.

### 3.5 Testing

Functional testing is performed to ensure that the system will function properly, such as the booking process for the Diva booking appointment. Following the completion of functional testing, user testing will prevail. The administrator, staff, and customers of the Diva hair salon will conduct the user testing.

### 3.6 Deployment

The goal of the deployment phase in agile methodology is to ensure that the software is ready for production use and that it can be deployed in a way that is reliable and efficient to end users. Maintaining

the software application after it has been deployed to production is essential to ensuring the system's smooth operation.

#### 4. System Analysis and Design

Functional requirements define the function or services that will be implemented in the system to achieve user's needs meanwhile non-functional requirements define system behavior rather than what the system should do. Table 2 and Table 3 are a list of functional requirements and list of non-functional requirements of a secure booking appointment system with graphical password authentication for Diva hair salon.

**Table 2: List of Functional Requirement for A Secure Booking Appointment System with Graphical Password Authentication for Diva hair salon**

Modules	Functionality
Login	<ul style="list-style-type: none"> <li>The system should permit the administrator and staff to login using username and password for first layer authentication.</li> <li>The system should allow the access login user to enter a valid phone number as well as graphical password</li> <li>The system should redirect the user to the appropriate homepage after a successful login.</li> <li>The system should allow error when there is empty field.</li> </ul>
Register	<ul style="list-style-type: none"> <li>The system should allow registration for new users (customer).</li> <li>The system should allow errors when there is an empty field.</li> <li>The system should allow the administrator to register account for stylist or workers.</li> </ul>
Hair Salon's Services Details Management	The system should allow the administrator to add, edit, delete and view information of the services provided by the hair salon.
User's Profile Management	The system should allow user to edit their personal information.
Appointment Schedule Management	The system should allow the administrator and staff to schedule the slot for the booking appointment and record the appointment details.
Generate report	The system should generate reports that the administrator can use for review
Payment	The system should allow customer to do upload payment for their booking.
QR code verification	The system should generate QR code to the customer.
Notification	The system should allow system to send notification to customer, staff and admin.

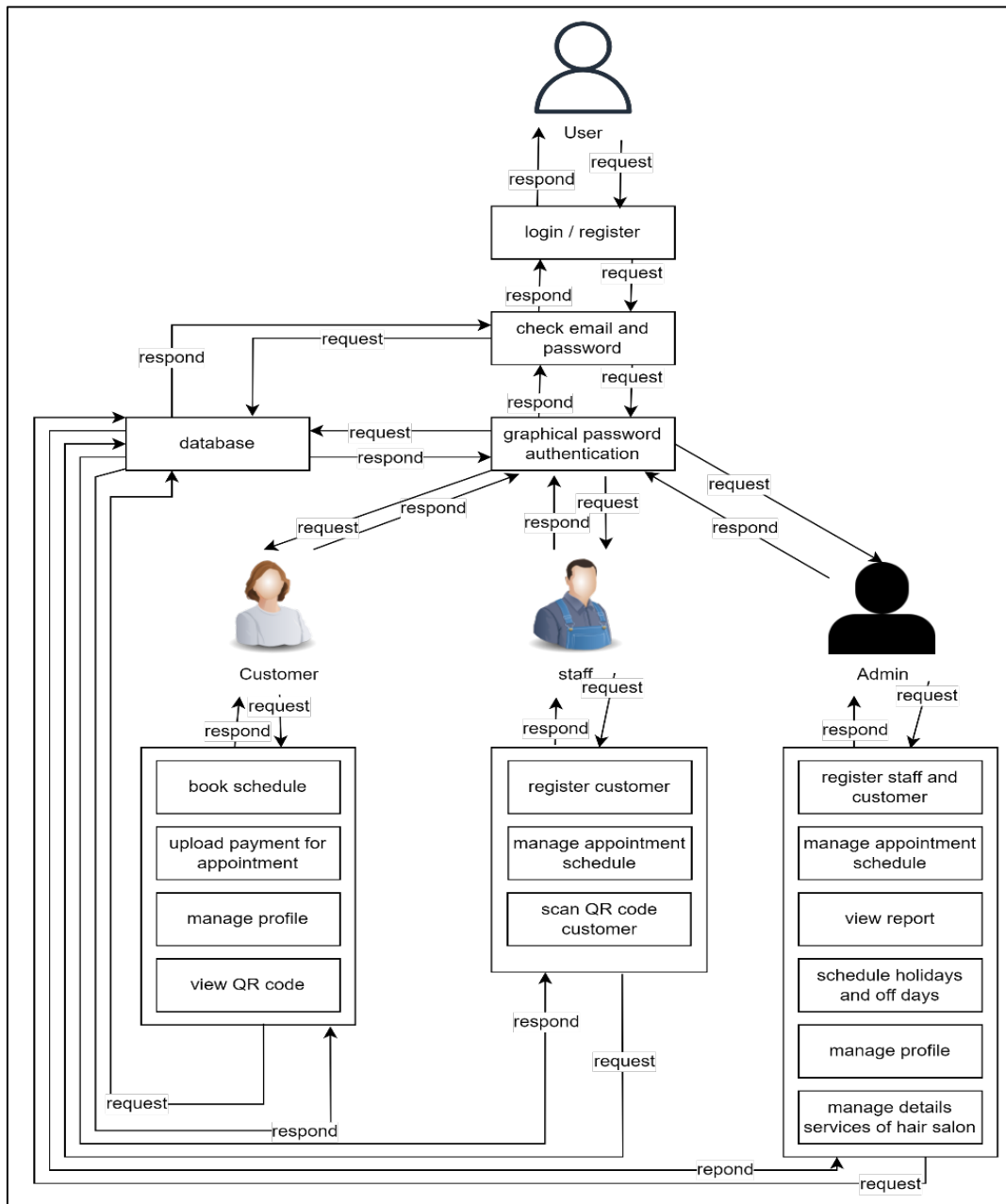
**Table 3: List of Non-Functional Requirement for A Secure Booking Appointment System with Graphical Password Authentication for Diva hair salon**

Modules	Functionality
Operational	The system can be accessed when there is internet connection.
Performance	All users should be able to access the correct assigned pages. The system can allocate the user to the correct session.
Usability	The system interface is user-friendly and easy to navigate.
Security	The user may access the system with username, password and graphical password authentication. The hashing and salting of user's password will be implemented as well as role-based access control. Users can also change their password via the forgot password module.

##### 4.1 System Architecture

Figure 5 shows the system architecture for online booking appointment system in which user will log in and the system will use a username and password. Then, the system will authenticate via the graphical password authentication. Users will go through their own dashboard based on role. Admin can register staff and customers, manage appointment schedules, view report, schedule holidays and off days, manage profile and manage details services of hair salon. Next, staff can register customers, manage

appointment schedule and scan QR code customers as verification of attendance to the booked slot. The customer can book a schedule, upload payment for appointments, manage profile and view QR code.



**Figure 5: General system architecture for a secure online booking appointment with graphical password authentication for Diva hair salon**

## 4.2 Context Diagram

The context diagram will depict the data flow for the administrator, customer, and staff users. The context diagram depicts how external entities interact or exchange data with the system. Figure 6 shows the context diagram in which the administrator can login, register, manage appointment and edit information of hair salon meanwhile the staff can also register customer, login and view appointment slot. Next, the customer can also login, book an appointment in the system and pay for the booked services via the system.

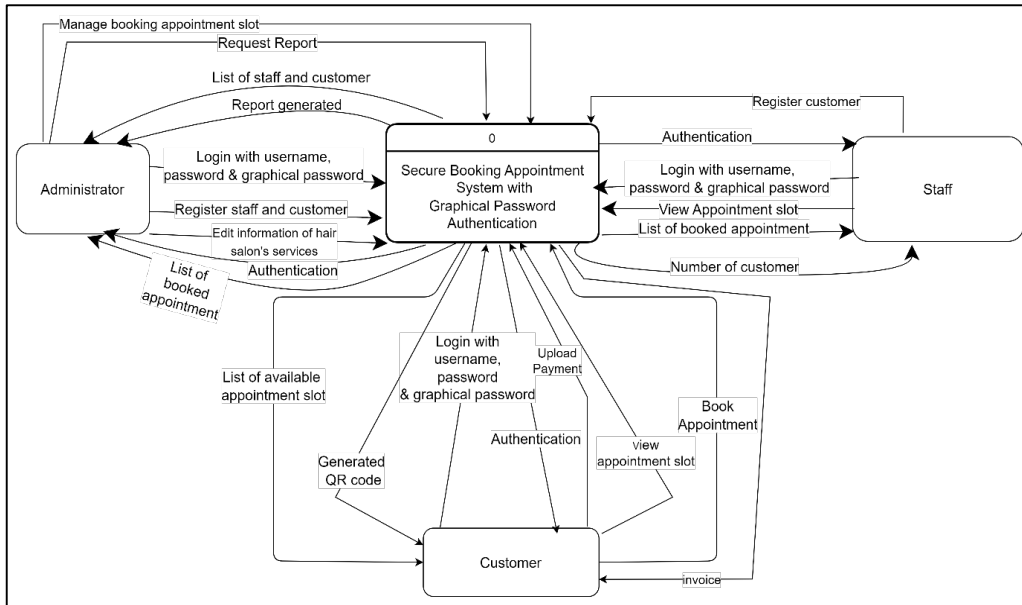
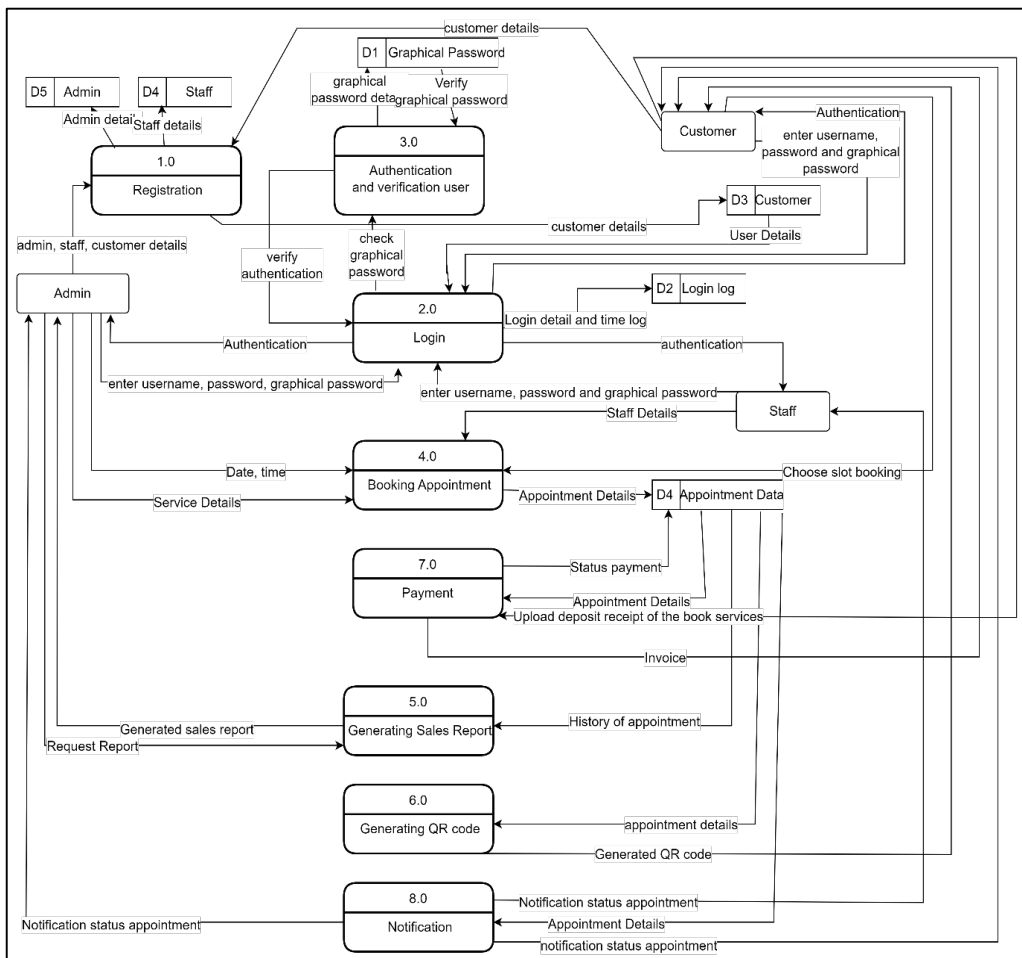


Figure 6: Context Diagram

### 4.3 Data Flow Diagram

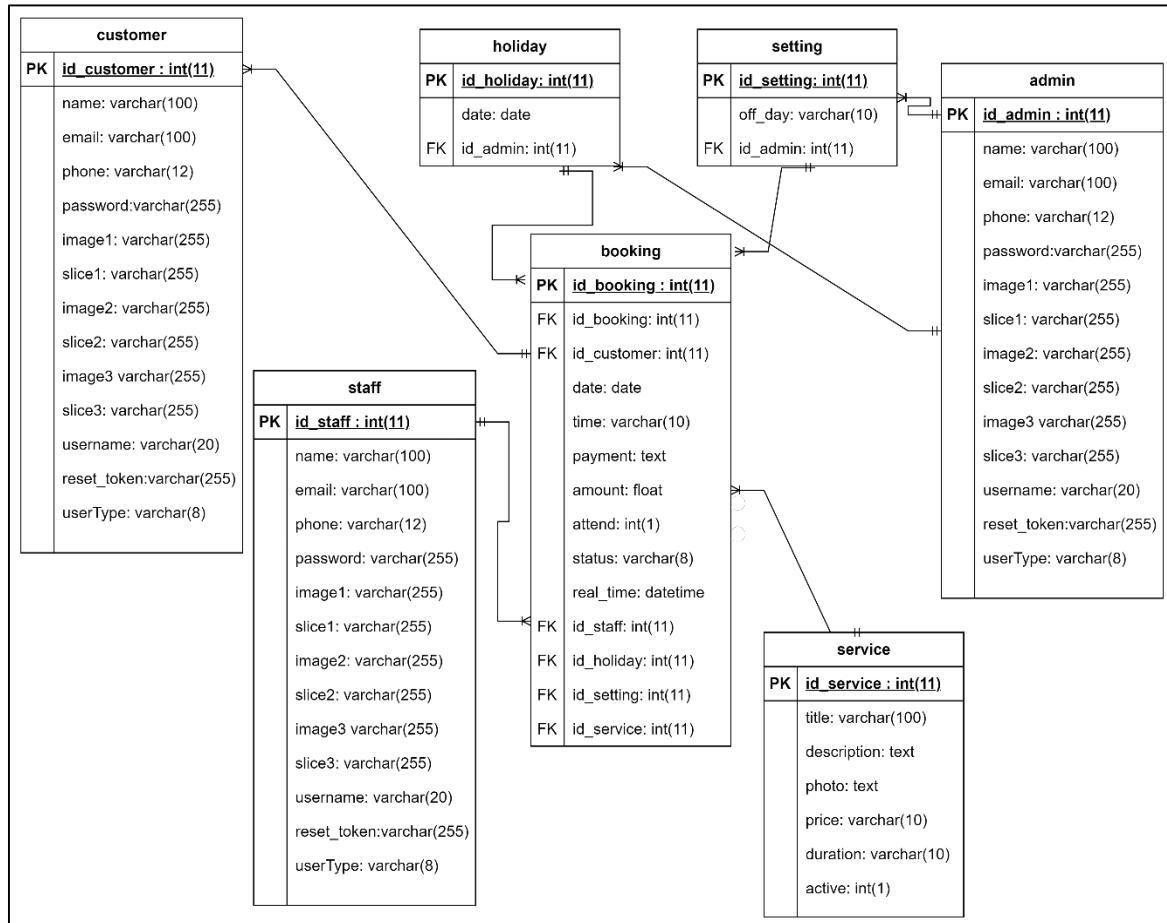
Figure 7 shows Data Flow Diagram that will illustrate the connections between the users such as admin customer and staff with the system.



**Figure 7: Data Flow Diagram**

#### 4.4 Entity Relation Diagram (ERD)

An entity relationship diagram (ERD) is a type of structural diagram that displays the relationship of entities in the system and reflects the data requirements of users in a database system [7]. Figure 8 displays the connection between entities in a secure booking appointment system with graphical image authentication for Diva hair salon.

**Figure 8: Entity Relationship Diagram**

## 5. Implementation and Testing

Implementation is the process of developing and building the software system from the design whereas testing is the process of determining whether the system is reliable and accurate.

### 5.1 Implementation

The following section will cover the modules that were utilized in this system. The modules for registration, login, booking, payment, and QR code verification will be covered. The several sections will each contain a description of the program's partial code for a particular module.

#### 5.1.1 Registration and Login

Figure 13(a) displays the registration page and Figure 13(b) shows the customers firstly will be prompt to login form and if they do not have any account, they need to register an account if they want to book an appointment with Diva hair salon. Customers need to enter their name, username, phone number,

email and password in the register form. Users need to enter the correct email address format in the text field, or they cannot register their account.

**Figure 13(a): Registration page**

**Figure 13(b): Login page**

Figure 14 depicts code to validate email input. The code uses a regular expression, "emailRegex", to define the pattern for a valid email address. The regex pattern  `/^[^\\s@]+@[^\\s@]+\\. [^\\s@]+$/`  ensures that the email address has the correct format with a non-empty local part, followed by the "@" symbol, followed by a non-empty domain part, and finally, a non-empty top-level domain.

```

<script>
  //validation email
function validateEmail() {
  const emailInput = document.getElementById('email');
  const email = emailInput.value;

  // Email validation regex
  const emailRegex = /^[^\\s@]+@[^\\s@]+\\. [^\\s@]+$/;

  // Perform the validation
  if (!emailRegex.test(email)) {
    emailInput.setCustomValidity('Please enter a valid email address.');
```

**Figure 14: Partial code to validate email input**

Figure 15 displays snippet code to validate password input which minimum length of password input should at least be 10, one upper case letter, one lower case letter and special character.

```

<script>
function validatePassword() {
const passwordInput = document.getElementById('password');
const password = passwordInput.value;

// Password validation rules
const minLength = 10; // Minimum length of the password
const uppercaseRegex = /[A-Z]/; // At least one uppercase letter
const lowercaseRegex = /[a-z]/; // At least one lowercase letter
const digitRegex = /[0-9]/; // At least one digit
const specialCharRegex = /[!@#$%^&*()_+\-=\[\]{};':"\\|,.</>?]/; // At least one special character

// Perform the validation
if (password.length < minLength) {
    passwordInput.setCustomValidity('Password must be at least ${minLength} characters long.');
```

Figure 15: Partial code to validate password input

Figure 16 shows validation of email address to check whether it already exists in database in registration form. All three tables will be checked, which are staff, customer and admin. If the result has more than zero rows (`mysqli_num_rows() > 0`), it means that the email is already registered in at least one of the tables.

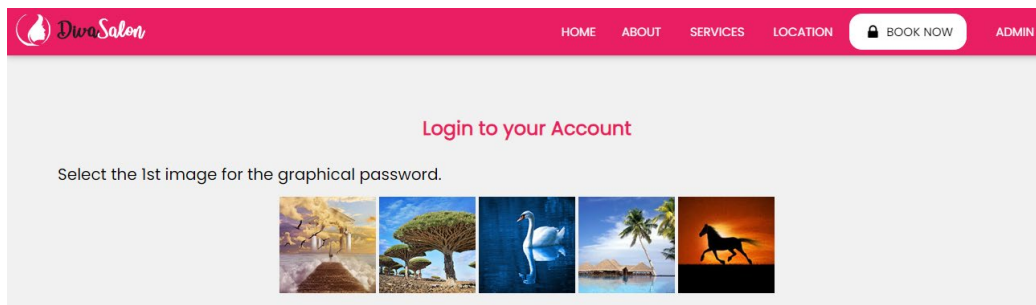
```

// Check if the email is already registered
$emailExistsQuery = "SELECT email FROM staff WHERE email = '$email'
                    UNION ALL
                    SELECT email FROM customer WHERE email = '$email'
                    UNION ALL
                    SELECT email FROM admin WHERE email = '$email'";
$emailExistsResult = mysqli_query($con, $emailExistsQuery);

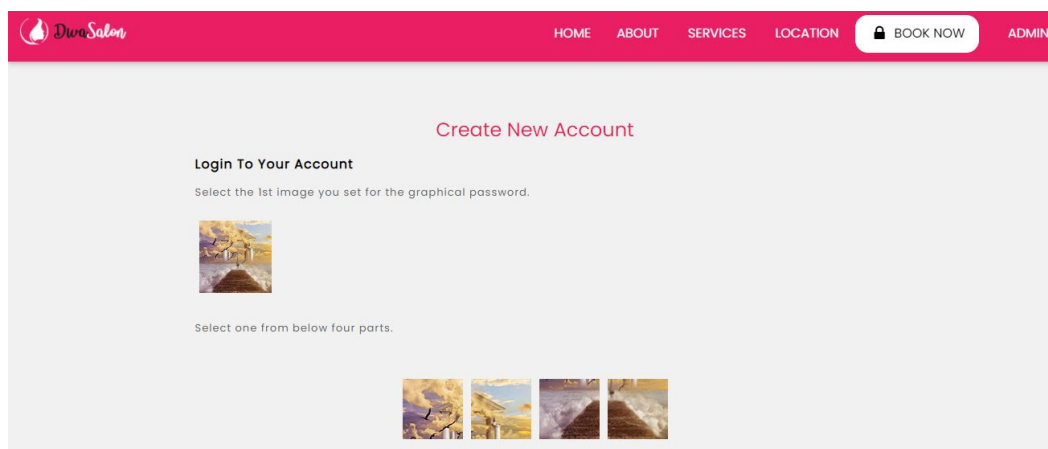
if (mysqli_num_rows($emailExistsResult) > 0) {
    // Email is already registered, show error message
    echo "
        <script type='text/javascript'>
            alert('Email is already registered!');
        </script>";
    exit; // Stop further execution
}
```

**Figure 16: Partial code to check if email is already registered in database**

Figure 17 and 18 displays graphical password that user need to select for registration account. Figure 19 depicts snippet code which will hash graphical password in database using sha-256 algorithm. Next, Figure 20 shows code to hash plain text password using hash function in PHP.



**Figure 17: User need to choose graphical password for registration**



**Figure 18: User need to choose graphical password for registration**

```

$var = $_GET['var'];
$_SESSION['a'][10] = $_GET['var'];

$userType = $_SESSION['user_type'];

$name = $_SESSION['names'];
$password = $_SESSION['passwords'];
$username = $_SESSION['usernames'];
$email = $_SESSION['emails'];
$phone = $_SESSION['phones'];
$image1 = $_SESSION['a'][5];
$slice1 = $_SESSION['a'][6];
$image2 = $_SESSION['a'][7];
$slice2 = $_SESSION['a'][8];
$image3 = $_SESSION['a'][9];
$slice3 = $_SESSION['a'][10];

// Hash the image paths using SHA-256
$image1Hash = hash('sha256', $image1);
$slice1Hash = hash('sha256', $slice1);
$image2Hash = hash('sha256', $image2);
$slice2Hash = hash('sha256', $slice2);
$image3Hash = hash('sha256', $image3);
$slice3Hash = hash('sha256', $slice3);
    
```

**Figure 19: Partial code to hash graphical password**

```

// Hash the password
$hashedPassword = password_hash($password, PASSWORD_DEFAULT);
    
```

**Figure 20: Partial code to hash plain text password**

### 5.1.2 Pre-booking Module

Figure 21 displays pre-booking page which customer can choose preferred stylist, services provided by hair salon, available date and slot time in booking page after successfully login to their account.

**Figure 21: Interface of booking page**

### 5.1.3 Payment Module

Figure 22 shows the interface of the customer's payment page. If a consumer does not upload the payment receipt within 2 hours of pre-booking, the slot appointment will automatically cancel and become available to another customer.

**Figure 22: Interface of payment page**

### 5.1.4 QR code Module

The interface of QR code page is shown in Figure 23. Figure 24 displays code scanning QR code in the staff panel which if the staff scan the QR code, it will update attend column into 1 and status of the booking will change into complete.

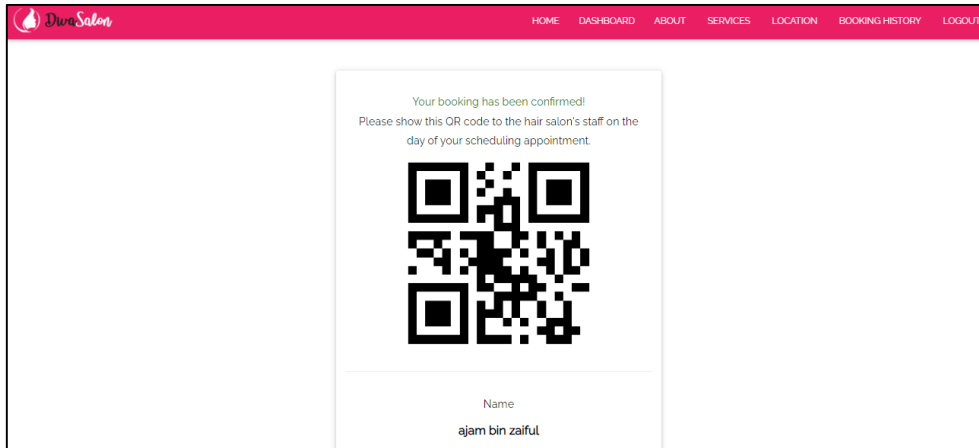


Figure 23: Interface of QR code page

```

if($act == "scan")
{
    $status = "Complete";

    $SQL_update = "
    UPDATE
    `booking`
    SET
    `attend` = 1,
    `status` = '$status'
    WHERE
    id_booking = $id_booking
    ";

    $result = mysqli_query($con, $SQL_update);

    $success = "Successfully Updated";

    //print "<script>self.location='a-main.php';</script>";
}
    
```

Figure 24: Partial code scanning QR code in the staff panel

### 5.1.5 First Time Login Module

Figure 25 shows the warning message "change password and choose graphical password" that will appear if the user is a first-time login and the user's password is a phone number that the administrator has set as a default password. Figure 26 depicts the change password page, where the user must input a password that meets the password requirements.

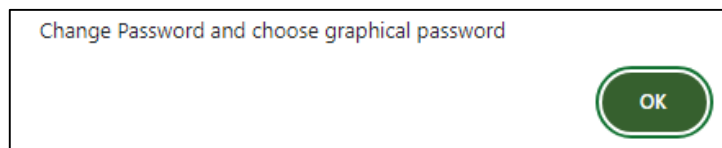


Figure 25: Warning message if user enter password match with phone number for first time login

Figure 26: Change password page

### 5.1.6 Report Sales Module

Figure 27 shows the interface of report sales page in administrator module. Next, Figure 28 depicts a partial code which the given PHP code snippet performs calculations and retrieves statistics related to monthly sales. It starts by assigning the current year and month to the variable `$this_month`. Then, it counts the total number of customers, staff members, and services by executing corresponding queries using the `numRows()` function. Next, it retrieves the total sales for the current month by querying the "booking" table, summing the "amount" column, and filtering by the current month and a status of "complete". The result is stored in the `$rst_sales` variable. The fetched row from the result set is then stored in the `$dat_sales` array. Finally, the value of the "sales" column from the `$dat_sales` array is assigned to the `$sales` variable.

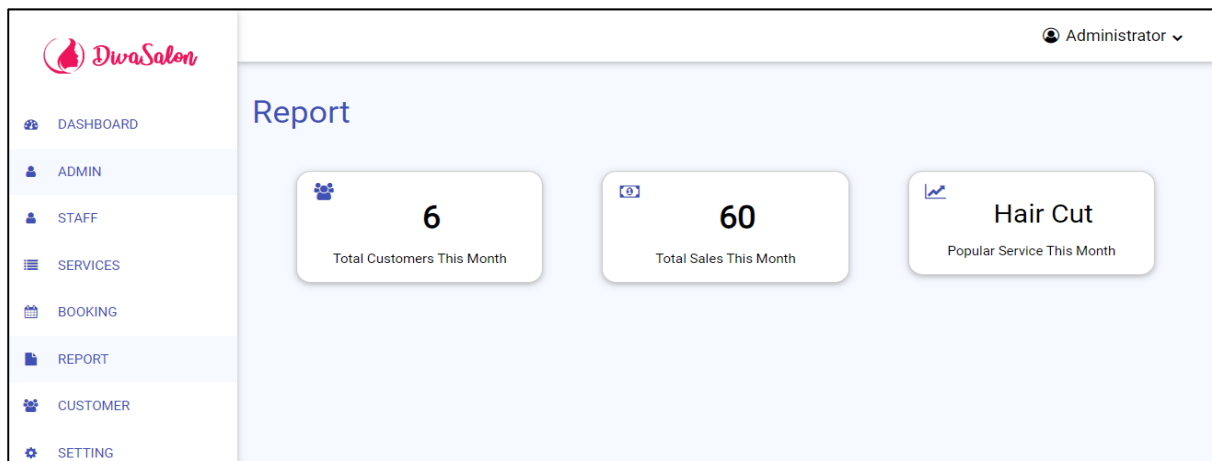


Figure 27: Interface of report sales page

```

<?PHP
$this_month = date("Y-m-");
$tot_customer = numRows($con, "SELECT * FROM `booking` WHERE `date` LIKE '". $this_month . "%' ";
$tot_staff = numRows($con, "SELECT * FROM `staff`");
$tot_service = numRows($con, "SELECT * FROM `service`");
$rst_sales = mysqli_query($con, "SELECT SUM(amount) as sales FROM `booking` WHERE `date` LIKE '". $this_month . "%' AND `status` = 'complete'");
$dat_sales = mysqli_fetch_array($rst_sales);

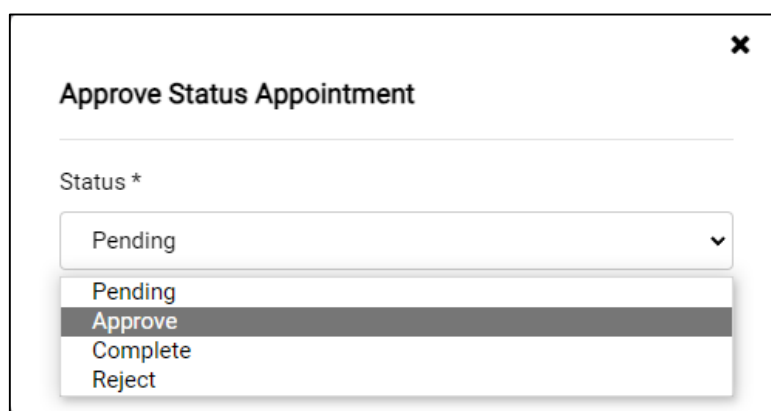
$sales = $dat_sales["sales"];
?>

```

Figure 28: Partial coding for generating report sales

### 5.1.7 Approval Booking Module

Figure 29 depicts the approval status appointment interface, in which either staff or the administrator can determine whether the appointment status is changed from pending to approve if the user has already uploaded receipt deposit in the system.



**Figure 29: Interface of approval status appointment**

## 5.2 Testing

User testing helps identify usability issues, validate design decisions, and ensure that the product or system meets the needs and expectations of its target users. Table 4, Table 5 and Table 6 show the test plan for Admin, Staff and Customer respectively.

**Table 4: Test Plan for Admin**

No.	Test case	Pass	Fail
1.	System can be executed from start to end.	Yes	
2.	Admin able to login and logout to the system.	Yes	
3.	Admin able to register admin, staff, customer, service and view list of admins, staff, report, customers, services, appointment.	Yes	
4.	Admin able to set holiday and off days in the system.	Yes	
5.	Admin able to remove admin, staff, customers, services and reject appointment.	Yes	
6.	System will be able to block same appointment date and slot for booking.	Yes	

**Table 5: Test Plan for Staff**

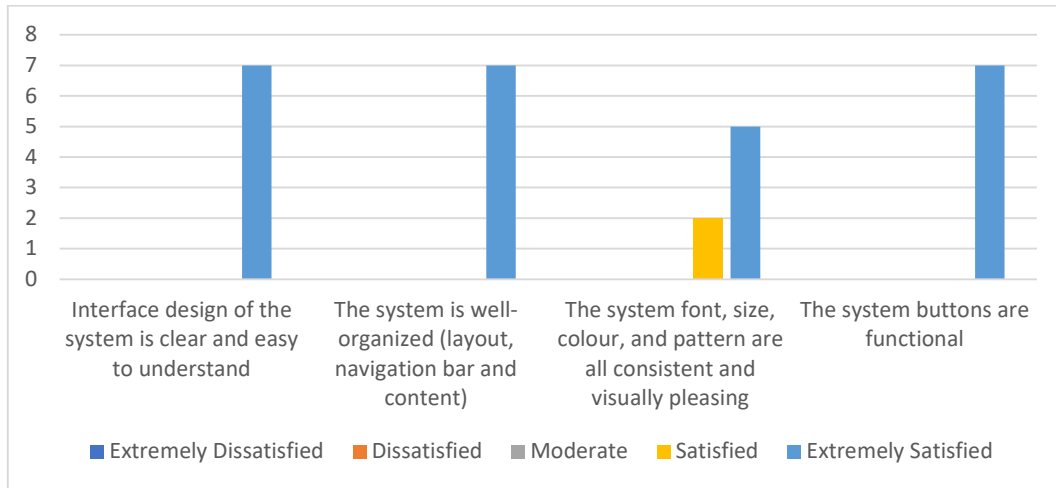
No.	Test case	Pass	Fail
1.	System can be executed from start to end.	Yes	
2.	Staff able to login and logout to the system.	Yes	
3.	Staff able to view list of assigned customers, services, appointments.	Yes	
4.	Staff can scan QR code of the customers.	Yes	
5.	System will be able to block same appointment date and slot for booking.	Yes	

**Table 6: Test Plan for Customer**

No.	Test case	Pass	Fail
1.	System can be executed from start to end.	Yes	
2.	Customer able to sign up, login and logout to the system.	Yes	
3.	Customer able to schedule appointment.	Yes	
4.	Customer able to view list of appointment.	Yes	
5.	System will be able to block same appointment date and slot for booking.	Yes	

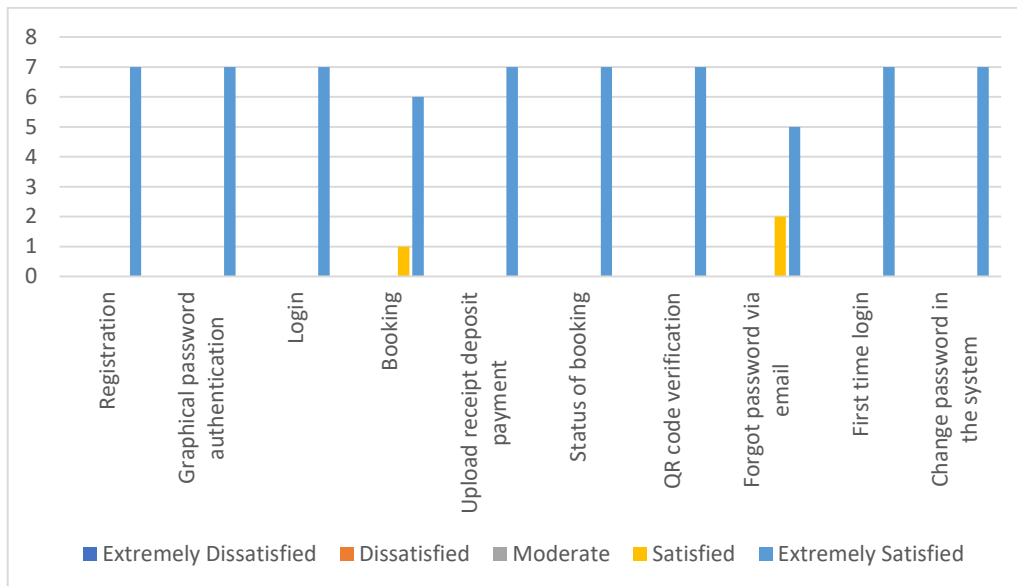
### 5.2.3 User Acceptance Test

User Acceptance Testing (UAT) is one of the last phases of the software development life cycle, and this is where UAT comes in. It is carried out after comprehensive testing of the system. The respondents of this UAT are the owner of the hair salon (administrator), 2 staff and 4 customers.



**Figure 29: System design testing result**

Figure 29 displays google form user acceptance result for Section A which is for interface of the system. The statement for this section is interface design of the system is clear and easy to understand, the system is well-organized (layout, navigation bar and content), the system font, size, color and pattern are all consistent and visually pleasing and the system buttons are functional. The respondent rate 5 to all questions except 2 respondents' rate satisfied meanwhile 5 rate extremely satisfied.



**Figure 30: System functionality testing result**

Figure 30 shows google form user acceptance result for Section B which is functionality of system. 7 respondents rated extremely satisfied for registration, graphical password authentication, login, upload receipt deposit for payment, status of booking, QR code verification, first time login and change password in the system. However, a respondents rated satisfied meanwhile 6 rated extremely satisfied for booking and only 5 respondents rated extremely satisfied for forgot password via e-mail function. The administrator also left a notable comment, stating that the system is well-functioning.

## 6. Conclusion

In conclusion, Diva hair salon booking appointment system with graphical authentication is a web-based system that is complete with security features that will ensure the security of users in the system. The security features that are implemented in this system are graphical password authentication, hashing and salted password, hash graphical password, forgot password, QR code verification and role-based access control.

Diva hair salon booking system has advantages compared with the current system and other online booking systems. This booking system is completely developed with graphical authentication as users need to enter plain text password and graphical password to ensure only authorized user can enter the system. Next, the benefit of this booking system is that the user must upload the deposit receipt within 2 hours of booking the slot or else, the slot will be deleted from the user's book and made available to other users. Furthermore, one of the benefits of using this system is that by scanning the QR code, the system automatically registers the customer's attendance.

There are several disadvantages of this booking appointment system which are users cannot make payment directly in the hair salon system, the notice of booking status changes is only known if user open their account in the system and there is no calendar for each member of staff of their booked slot.

Future improvement for the booking system are Users can do payment of deposit directly in the hair salon booking system such as implementing payment gateway, the notification of booking status changes will be sent through the user's email address and develop a calendar feature so that employees can easily view which booking slots they have each month.

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