Design and Development of Pet Cage Ordering System on Web-Based Technology

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Abstract: The online web-based Pet Cage Ordering system is proposed and developed for the shop Absolutely Hamster as the system admin and the welcoming customers as the system users that sell both online and physically in Johor Bahru, Johor. A Google form questionnaire filled by the shop manager shows that all the orders' data are recorded by handwriting on the papers or notebook and kept as a documentary in the files. The ordering process by chat via social media easier makes the wrong message received, missed order, wrong manually calculation of total price, and the wrong remark taken. This proposed project is planned to manage the online business for the shop and ease the ordering process for the customers. The main language is PHP, and the Waterfall Methodology is used in the system development. All the essential points and details about the proposed system development are reviewed in this paper.

Keywords: Online, Ordering System, Web-based

1.   Introduction

Nowadays, e-commerce is a well-known and popular business model. Most people have shifted their shopping habits from brick-and-mortar stores to digital platforms, resulting in e-commerce companies having gained many new customers [1]. An online ordering system is a system that allows shops to take orders and accept payments from a distance, and customers can simply access an online menu at anytime and anywhere. The Pet Cage Ordering system is an online ordering system that benefits both customers and sellers. There are two selling types of pet cages which are readymade and customized pet cages that buyers can choose about the size, material, accessory parts, and color.

All the information about the pet cage is only shown on the post shared by the seller on social media. For further details that need to be discussed, the buyer will have to go to the physical shop and face to face discussion with the seller or online discussion through text messages via WhatsApp, Facebook Group, and Facebook Messenger. After the buyer placed an order, the seller will need to point out the details to the pet cage maker and arrange shipment. All order information received is written down on paper and kept in the file by the seller after the order is confirmed. Before that, all order information that shows in chat conversations between seller and customer is not clear and some details may be missed by the seller. This caused the pet cage maker to receive wrong messages and make a different design from what the customer wanted.

Pet Cage Ordering System is designed to overcome the problems using a manual system such as order information through chat may be missed by the seller, not clearly ordered details given, and conversation between customer and seller may be lost due to unexpected conditions hence the possibility of making a mistake is high. With the proposed system, all product details and all order details will be saved in the database hence there is no data loss caused by human mistakes.

2.   Related Work

2.1   Web-based Online Ordering System

The term "web-based business" is usually used to refer to the online sale of tangible goods, but it can also refer to any type of online commercial transaction [2]. An online Ordering System is a system that allows customers to make an order purchase of their desired product, and also allows sellers to take orders and accept payments via the use of an Internet connection from a distance [3]. Internet connection is a crucial requirement in operating the order process, there is not possible to make it if the Internet disconnects.

2.2   Existing Pet Cage Ordering System

There are three existing systems that will be discussed in this section, that are Animal Enclosures, Pet Zoo Pet, and Petsplace.

2.2.1   Animal Enclosures

Animal Enclosures system is a web-based online pet cage ordering system. It is selling many types of pet cages such as Custom Cages, Walk-in Enclosures, and Mini Condos. It has registration, login, and log-out function and other modules such as add-to-cart, home, shop, sales, and search functions. Animal Enclosures web pages are highlighted by a green color background such as free shipping and contact number on top of the web page. All pages' content is clear and simple overall, easy to look for some information needed. There are also categories for different types of a pet cages. The page-load to another page is fast and correct. A forget password function is prepared for those users who forget their log-in password to reset the password.

2.2.2   Pet Zoo Pet

Pet Zoo Pet is a web-based online pet cage ordering system in Selangor, Malaysia, selling many types of pet cages such as Rabbit Cage, Cat cages, Bird Cage, and Parrot Cage except for pet cage customization. It does not have a registration, login, and log-out function. Other modules that are included in Pet Zoo Pet are add-to-cart, home, and products. Pet Zoo Pet has a back-to-top function hence it is easy to go back to the top of the web page. All information is clearly stated in the footer of the web page with bolded titles. The design of the web page is clean and tiny such as the name of the website is always on top of the page even if the page is scrolling down and different parts of information have different colored backgrounds or pictures. There are related products shown under the product detail page and a WhatsApp button floating at the left-side bottom of the page for users to contact them

and one sharing button floating at the right-side bottom of the page for sharing the page on different social media platforms.

2.2.3   Petsplace

Petsplace is a PHP web-based online pet cage ordering system. It sells many types of pet cages except pet cage customization. It has registration, forget password, login, and log-out functions. Other modules are available such as Our Store which is about the home page and shopping cart, Ordering which includes all categories and products, Help Files which is about the payment FAQ, and More Info. Petsplace has clearly stated all information in the footer of the web page with bolded titles and there is a floating navigation bar when scrolling the page down so users can directly look for what they want through the floating navigation bar anytime. A search function is available so that users can directly search for the information they want. All categories are listed clearly at the left-sidebar on the web page so that it is easy for users to see what they want to look for.

2.3   Comparison with the Existing Systems

Table 1 shows the comparison of the features between the previous related work and three existing systems with one proposed system.

Table 1: The Comparison of Features between Existing Systems and Proposed System

Feature\System	Proposed System	Animal Enclosures	Pet Zoo Pet	Petplace
Register & Login	Yes	Yes	No	Yes
Logout	Yes	No	No	No
Product Categories	Yes	Yes	Yes	Yes
Add-to-Cart	Yes	No	No	Yes
View Cart	Yes	Yes	Yes	Yes
Wish List	Yes	No	No	No
Product Details	Yes	Yes	Yes	Yes
Payment Option	Yes	Yes	No	Yes
Order History	Yes	No	No	Yes
Track Order	Yes	No	No	No
Generate Sales Report	Yes	No	No	No
Enquiry	Yes	No	No	No
Account Profile	Yes	Yes	Yes	Yes

3.   Methodology/Framework

The methodology is a framework used for systems development or web development that has different uses and limitations [4]. The methodology also is a formalized approach to implementing the Software Development Life Cycle (SDLC). A system or a web development methodology is defined as a project admin that controls the process of the development. In this chapter, the use of software development in this project and the activities that had been carried out in each phase will be discussed with explanations.

3.1   Waterfall Model

A software process model is an abstraction of the software development process. The Waterfall Model also known as the linear-sequential life cycle model is the first and earliest model approach in the Software Development Life Cycle that was used for software development [5]. By using the Waterfall Model methodology, the requirements are identified clearly and well before the programming of proposed systems begins and when the project starts, only limited changes are acceptable to the requirements [6].
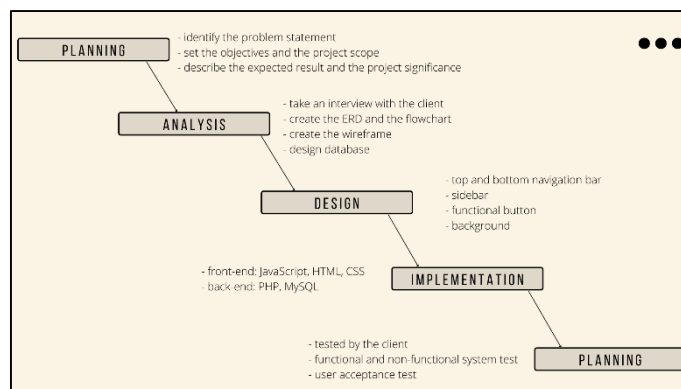

Figure 1: Development Phases of Waterfall Model Methodology

The phases are divided into five phases which are the planning phase, the analysis phase, the design phase, the implementation phase, and the system testing phase. Each phase is used for performing specific activities during the SDLC phase. These phases are crucial for maintaining the systematic development of the proposed system development process.

In the planning phase, it is a must to identify the problem statement, set the objectives and the scope of the project, and describe the expected result and the project significance. The project will start on 10th October 2021 and end on 2nd July 2022. The Gantt chart is prepared as attached in the Appendix A. Existing systems are studied for better information gathering in project development.

In the analysis phase, there is a need to take an interview meeting with the seller of the Absolutely Hamster shop to understand the requirements. An Entity-Relationship Diagram (ERD) and a flowchart are created. The project wireframe is designed as the guideline for user interface design. A database is also designed for generating the proposed system models about the conceptual and physical designs.

In the design phase, every page will display a top and bottom navigation bar on the customer site which can direct customers to other web pages such as register, login, and cart. The home page will display some featured products. The shop page will display all products with a functional sidebar. In the admin site, the dashboard will be the home page of the admin panel that displays some colorful statistical overviews and order lists. The sidebar will be the list of options for the admin to choose and manage. The ordering page on the customer site will be designed with interactive and functional icons to assist the customers in order processing. Some specific inputs such as email, password, and contact number will be instructed and reminded about the according to format type.

In the implementation phase, the design document will be executed. The front-end of this project is JavaScript, HTML, and CSS while the back-end is PHP language, and MySQL database. The programming of the web-based proposed system is written by using the Visual Studio Code. After that, the proposed system will be tested to check if the correct output is displayed.

In the testing phase, there is a need to check whether the developed proposed system has been designed as per the listed specifications to ensure the quality of the system and meets the functional and non-functional requirements stated in the analysis phase. The developed system of both user and admin sites needs to be tested by the client for finding problems and bugs to fix immediately.

3.2 Requirements Analysis

System Requirement Analysis is a systematic, or organized, approach for determining a suitable set of resources to meet a system need, as well as the functional and non-functional requirements for those resources.

Table 2: Functional Requirements

Module	Functionalities

Register
  I. user
  II. admin
	I. user and admin register to own individual account
	II. instruction of password setting
	III. system alerts for any wrong inputs

Login
  I. user
  II. admin
	I. user and admin login with email and password
	II. system alerts for any wrong inputs
	III. email verification for new customer

Admin site
  I. manage products
  II. manage manufacturers
  III. manage product categories
  IV. manage categories
  V. manage payment method
  VI. manage coupons
  VII. manage contact us section
  VIII. manage about us section
  IX. manage terms
  X. manage admin
  XI. view customers
  XII. view orders
  XIII. view order delivery status
  XIV. view payments
  XV. generate sales report
	I. admin can add, view, update, delete the products
	II. admin can add, view, update, delete the manufacturers
	III. admin can add, view, update, delete the product categories
	IV. admin can add, view, update, delete the categories
	V. admin can add, view, update, delete the payment method
	VI. admin can add, view, update, delete the coupons
	VII. admin can add, view, update, delete the contact us section
	VIII. admin can add, view, update, delete the about us section
	IX. admin can add, view, update, delete the terms
	X. admin can view and delete the customers
	XI. admin can view and delete the orders
	XII. admin can view, update the order delivery status
	XIII. admin can view and delete the payments
	XIV. admin can use system to generates sales report

User site
  I. account
  II. home and shop
  III. cart
  IV. contact us
	I. user can view, update, delete account information
	II. user can view product in home and shop page
	III. user can add, view item in the cart and wish list
	IV. user can apply coupon
	V. user can proceed to checkout

V.	about us	VI.	user can confirm payment status	
VI.	terms	VII.	user can view order history, payment method, terms	
VII.	enquiry	VIII.	user can make enquiry	
		IX.	user can track order and view order delivery status	

Table 3: Non-functional Requirements

Requirement		Description
Operational	I.	The proposed system should be work on any web browser
	II.	The proposed system should be operated with the Internet connection
Performance	I.	The proposed system should be located according to the correct session depends on the authorisation of the user
	II.	The proposed system should be available for use 24 hours per day, and 365 days per year
	III.	Ideal response time of the proposed system should be less than 3 second
Security	I.	The proposed system only accessed with the correct username and password by the user
	II.	The password saved should be encrypted first by md5 next with SHA1 to increase security

4.   Results and Discussion

There are several important details of the system analysis and design that need to be discussed which are the system architecture design, entity-relationship diagram, interface design, and the user acceptance test of the proposed system development.

4.1   System Architecture Design

The process of establishing system aspects such as modules, architecture, components, and their interfaces, and data for a system based on specified requirements is known as systems design. The method used for system design that will be shown in this section is called a flowchart, which is a type of diagram that depicts a workflow or process of the proposed system development. Figure 2 shows the flowchart diagram of Pet Cage Ordering System Development.
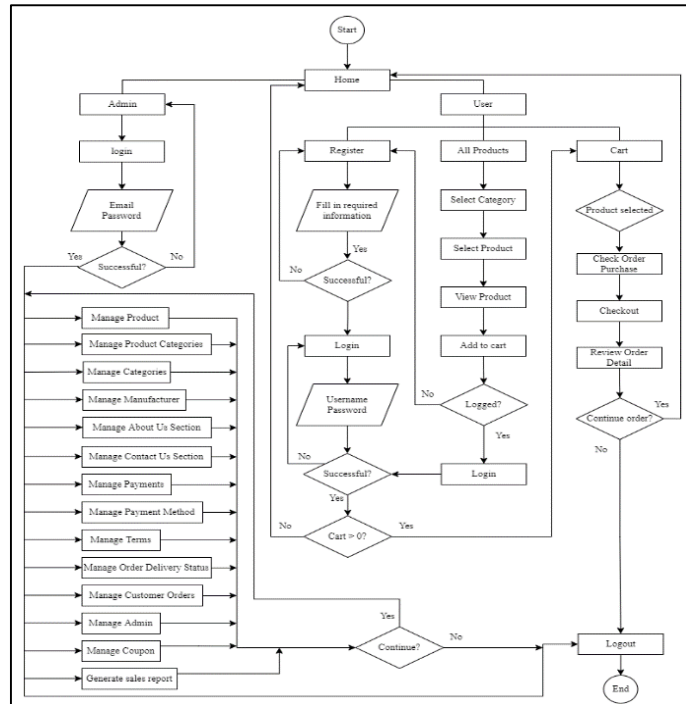
Figure 2: Flowchart

4.2   Entity Relationship Diagram (ERD)

All the relationships between entity sets that are recorded in a database are represented in the Entity Relationship Diagram [7].
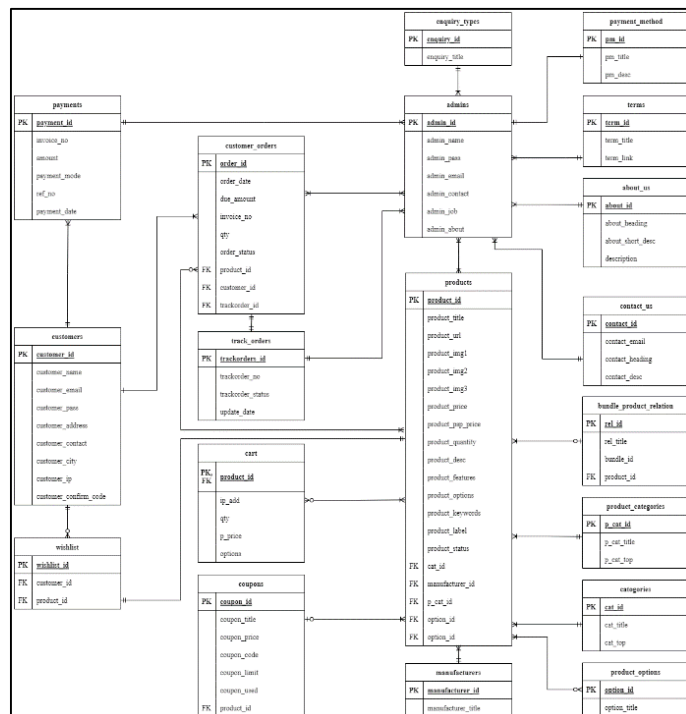

Figure 3: ERD for Proposed System Development

4.3   Interface Design

User Interface (UI) design requires an understanding of the users' needs and ensuring the interface design is easy to understand, use, navigate, and facilitate. Interface design prototyping is a mock-up or

simulation of screens, forms, or reports [8]. The wireframe is used to mockup the user interfaces of the Pet Cage Ordering system. Figure 4 shows the homepage wireframe and Figure 5 shows the admin dashboard wireframe of the proposed system which is used as a guide to implement the system interfaces. The wireframes of the cart page will be shown in Appendix B.
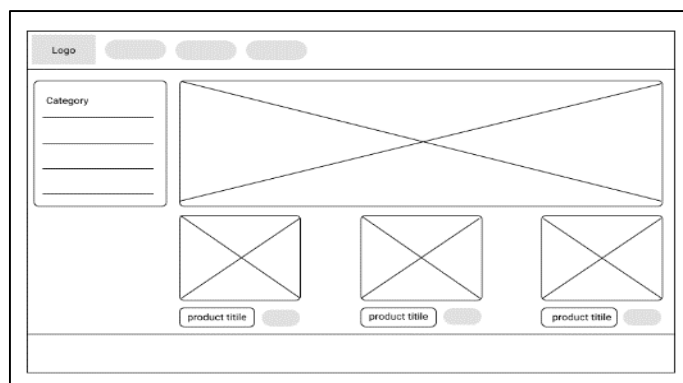

Figure 4: User Homepage Wireframe Used as Guide to Implement Interface

Figure 5: Admin Dashboard Wireframe Used as Guide to Implement Interface

4.4   Implementation

The implementation of both the user and admin site of the developed system is carried out using browsers such as Google Chrome, Firefox, and Microsoft Edge with the MySQL database, and the phpMyAdmin localhost. The system is developed in Visual Studio Code and uses Hypertext Preprocessor (PHP) language, JavaScript, HTML, and CSS. MySQL is used for database management which is connected by the system [9]. All system data will be stored within the database. Figure 6 shows the code that was used to connect the database of the Pet Cage Ordering System which is named ecom_store.

```php
<?php

$servername = "localhost";
$database = "ecom_store";
$username = "root";
$password = "";
// Create connection
$con = mysqli_connect($servername, $username, $password, $database);

// Check connection
if (!$con) {
    die("Connection failed: " . mysqli_connect_error());
}
```

Figure 6: Code Segment of Connecting Database [10]

4.4.1   Implementation of User Site

Users can browse products on the home page and add desired products to the cart before registering an account. Existing users can log in to the ordering system with their verified account to perform unrestricted operations such as checkout. An alert will be prompted if there is any wrong input of login credentials. Users can add the desired product to the cart, update the number of products added and delete selected products without login. The data of items added to the cart will be saved in and retrieved from the database table named cart according to the user's IP address. Users may register an account by submitting the sign-up form that is prepared by the system. Figure 7 shows the registration page on the user site. The footer of the user site is shown as attached in Appendix C. The order list page is shown in Appendix D and the shop page is shown in Appendix F.

Figure 7: Registration Page for User to Create Account

The code segment of registration is shown in Figure 8. The password input by the user will be first encrypted by md5 [11], then encrypted by SHA1 [12] to increase the security level. An alert will be prompted if there is any wrong input of formats of email, password, and contact number.

```
$c_name = validate($_POST['c_name']);
$c_pass1 = validate($_POST['c_pass']);
$c_pass = validatePassword($c_pass1); // validate password
$c_email1 = validate($_POST['c_email']);
$c_email = validateEmail($c_email1); // validate email
$c_contact1 = validate($_POST['c_contact']);
$c_contact = validatePhone($c_contact1); // validate phone number
$pass1 = md5($c_pass); // password encrypted by md5 first
$pass = sha1($pass1); // password encrypted by sha1 last
$c_ip = getRealUserIp();
$get_email = "select * from customers where customer_email='$c_email'";
$run_email = mysqli_query($con, $get_email);
$check_email = mysqli_num_rows($run_email);

if ($check_email == 1) { // check from existing emails
  echo "<script>alert('This email is already registered, try another one')</script>";
  exit();
}
```

Figure 8: Code Segment of Registration

4.4.2   Implementation of Admin Site

Admin may use the dashboard to overview the statistical report and the order list. The sidebar of the admin panel allows admin to manage the user site such as insert available products to display on the user site, update payment methods, update order delivery status, and so on. Admin also can generate reports by clicking the generate report button only after choosing the start and end date in the generate sales report module. The window of printing sales report will prompt out as shown in Appendix H. Figure 9 shows the admin dashboard page.
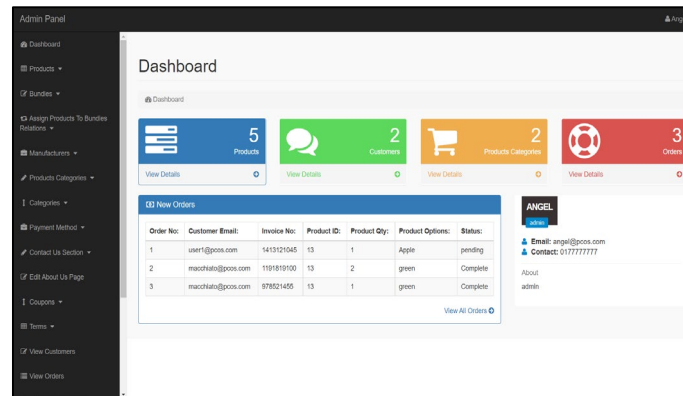
Figure 9: Admin Dashboard Used to Manage Business

The code segment of the dashboard is shown in Figure 10. The mysqli_num_rows() function is used to return the number of rows from the selected table in the database [13].

```
$get_products = "select * from products";
$run_products = mysqli_query($con,$get_products);
$count_products = mysqli_num_rows($run_products);

$get_customers = "select * from customers";
$run_customers = mysqli_query($con,$get_customers);
$count_customers = mysqli_num_rows($run_customers);

$get_p_categories = "select * from product_categories";
$run_p_categories = mysqli_query($con,$get_p_categories);
$count_p_categories = mysqli_num_rows($run_p_categories);

$get_pending_orders = "select * from pending_orders";
$run_pending_orders = mysqli_query($con,$get_pending_orders);
$count_pending_orders = mysqli_num_rows($run_pending_orders);
```

Figure 10: Code Segment of Admin Dashboard to Display Statistical Overview

4.5   Test Plan Result

The functional testing result of the Pet Cage Ordering System User site is shown in Table 4 and Table 4 (cont.). For the admin site, the result is shown in Table 5 and Table 5 (cont.). The test plan is designed to determine the quality of the developed system and to ensure that all can function appropriately for reaching the expected results [14]. Table 6 shows the non-functional system test plan result.

Table 4: System Functionality Test Plan Result (User)

Section	Test Plan	Expected Result	Actual Pass
Login	Insert one of the credentials wrongly	Messages prompt out: Login Failed	Pass
	Insert correct email and correct password	Messages prompt out: Login Successful	Pass
Register	Submit form without data input	Messages prompt out: Please fill out this field.	Pass
	Submit repeated user data	Messages prompt out: User already exists.	Pass
	Submit incorrect format of email, password, and contact number	Messages prompt out: Invalid	Pass
	Submit with all correct inputs	Messages prompt out: Register Successful!	Pass
Shop	View products	Show all available products	Pass
	Select category	Only show selected category item	Pass

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Table 4: (cont.)

Shop	Select product category	Only show selected product category item	Pass
	Select both category and product category	Only show selected category and selected product category item	Pass
	Add item to cart by clicking the Add to Cart Button	Added item is shown in the cart	Pass
	View product details by clicking the View Details Button	Show selected product details page	Pass
Cart	View cart	Show all the added items only	Pass
	Add one item quantity	Quantity of items updated by increasing one	Pass
	Minus one item quantity	Quantity of items updated by decreasing one	Pass
	Delete item	Item removed from cart	Pass
	Price calculation	Correct sub-total price for each item	Pass
		Correct total price for all item	Pass
My Account	View Profile	Show profile details	Pass
	Edit profile detail	Message prompt out: Updated Successfully	Pass
	View order list	Listed out following the user account	Pass
	Track order	Copy and paste invoice number	Pass
		Display delivery status according to the tracking number searched	Pass
	Change the Password with the wrong current password	Message prompt out: Your current password is not valid, please try again	Pass
	Change the Password with the correct current password	Message prompt out: Your password has been changed successfully	Pass

Table 5: System Functionality Test Plan Result (Admin)

Section	Test Plan	Expected Result	Actual Pass
Login	Insert one of the credentials wrongly	Messages prompt out: Login Failed	Pass
	Insert correct email and correct password	Messages prompt out: Login Successful	Pass
Dashboard	Statistic Overview with correct value	Click View Details to show the products list	Pass
		Click View Details to show the customers list	Pass
		Click View Details to show the products categories list	Pass
		Click View Details to show orders list	Pass
Product	View product list	All products listed	Pass
	Insert new product	Message prompt out: New product added successfully. The added product shows in product list	Pass

Table 5: (cont.)

Product	Update existing product	Message prompt out: Selected product updated successfully. The updated product shows in product list	Pass
	Delete selected product	Message prompt out: Selected product deleted successfully. The deleted product removed from the product list	Pass
View Orders	View order list	All orders listed	Pass
	Delete selected order	Message prompt out: Selected order deleted successfully. The deleted order removed from the order list	Pass
View Customers	View customer list	All customers listed	Pass
	Delete selected customer	Message prompt out: Selected customer deleted successfully. The deleted customer removed from the customer list	Pass
View Order Delivery Status	View status list	All status listed	Pass
	Update status	Message prompt out: Selected status updated successfully. The updated status shows in the status list	Pass
View Sales Report	Select start date and end date	The date selected is shown in the input bar	Pass
	Click Generate sales report Button	A window prompts out and displays the sales report	Pass
		A window shows the print selection	Pass

Table 6: Non-functional System Test Plan Result

Section	Expected Result	Actual Pass
Operational	The proposed system should be worked on any web browser	Pass
	The proposed system should be operated with the Internet connection	Pass
Performance	The proposed system should be located according to the correct session depends on the authorization of the user	Pass
	The proposed system should be available for use 24 hours per day, and 365 days per year	Pass
	The ideal response time of the proposed system should be less than 3 seconds	Pass
Security	The proposed system is only accessed with the correct username and password by the user	Pass
	All inputs are validated to remove whitespace from both sides of a string, clean up data retrieved and convert some predefined characters to HTML entities.	Pass
	The password saved should be encrypted first by md5 and next with SHA1 to increase security	Pass

4.6   User Acceptance Testing

User Acceptance Testing (UAT) is the process of user or client testing to determine whether the developed system can be accepted [15]. This section is going to analyze the user acceptance testing form which is made for evaluating the test case for the proposed system. There are only 5 respondents who have been involved in this testing. The results collected from respondents are evaluated and presented in the graphs as shown in both Figure 11 and Figure 12. Figure 11 shows the user interface evaluation result. It can conclude that most of the respondents give the highest rating to the user interface of the developed system of the ease of use, navigation, layout, design, and text and no respondent is unsatisfied.
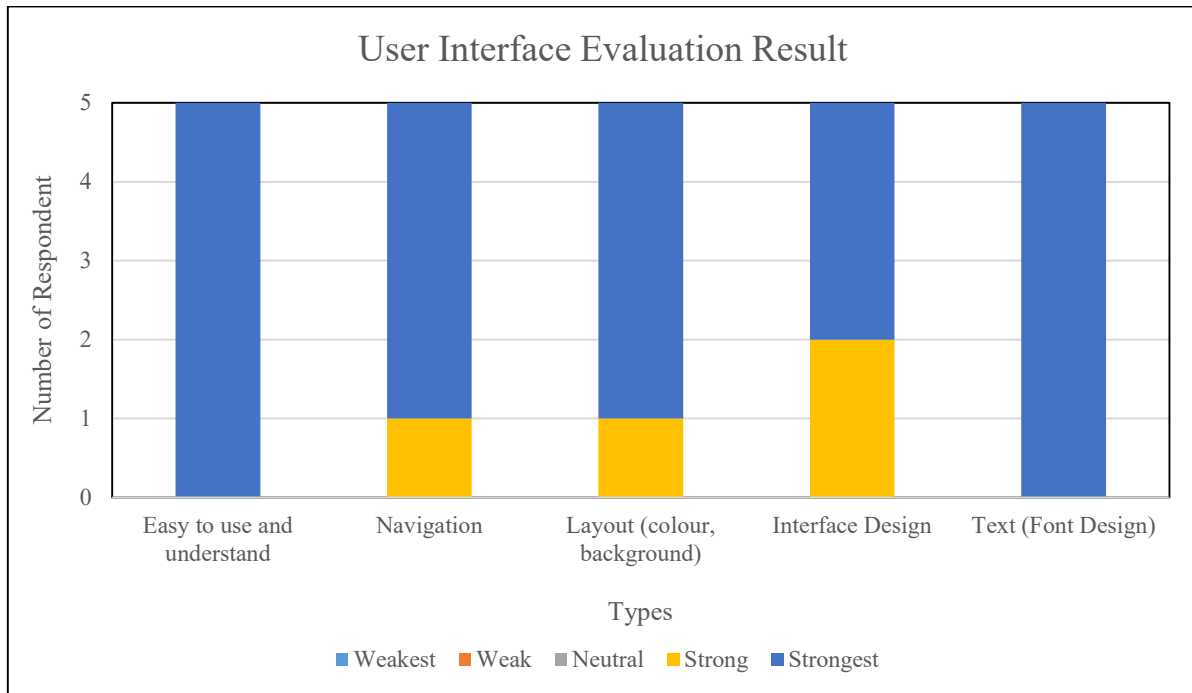
Figure 11: Result of User Interface Evaluation

Figure 12 shows the result of the system features evaluation. Based on the result, most of the respondents give the strongest rating to the developed system. However, improvement is still needed on the payment function.
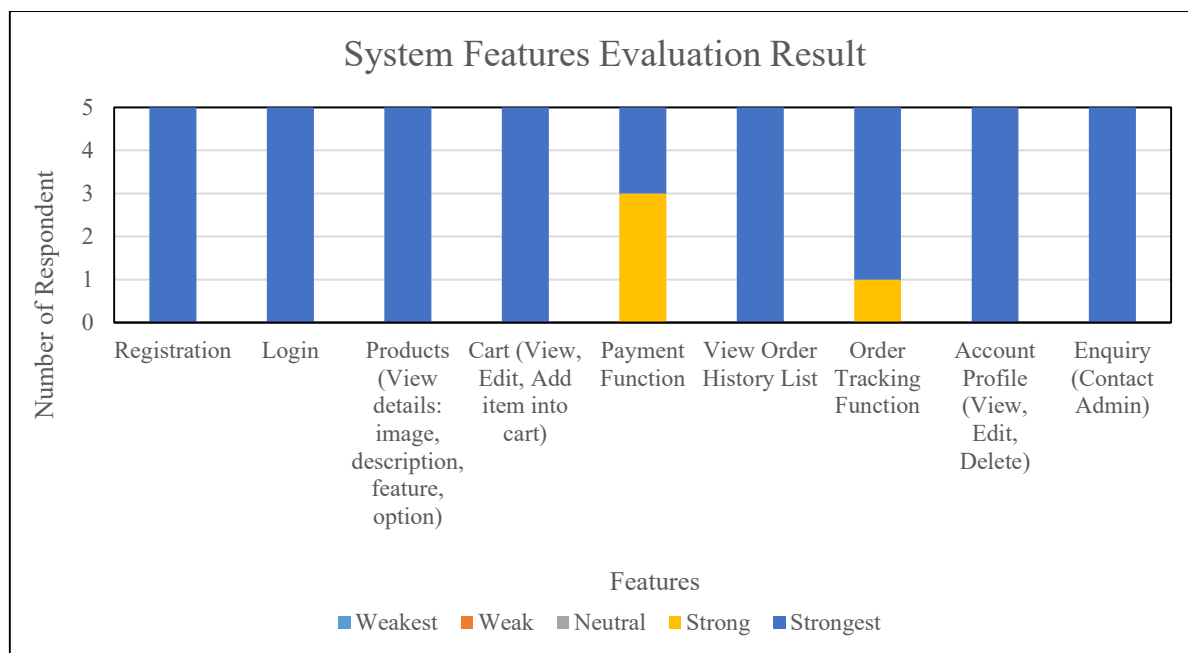
Figure 12: Result of System Features Evaluation

5. Conclusion

In a nutshell, the development of the Pet Cage Ordering System is completed successfully. With the implementation of the web-based technology, the Pet Cage Ordering System makes the potential benefits to their online business where the customers can make online purchases through the user-friendly interfaces that better save time and emotion of ordering and ease the management of the business through various operations available in the system. However, there are still some imperfect aspects to this system. For example, there is no notification function for this developed system such as push notification for receiving new orders on the admin site, and only a limited payment method is implemented

Various disadvantages of the manual ordering system are solved and settled by developing the proposed system. It will be better if there is a QR code for system users to scan and redirect to the proposed system website with the use of the Internet [16]. Implementation of a review and rating function is best recommended to increase the reliability of the developed system. More payment methods such as credit or debit cards, PayPal can be implemented to provide a wider payment choice for the user to proceed with an order purchased. Furthermore, push notifications and reminders are also recommended to include in the admin site of the developed system for a better result in the management of the online business.
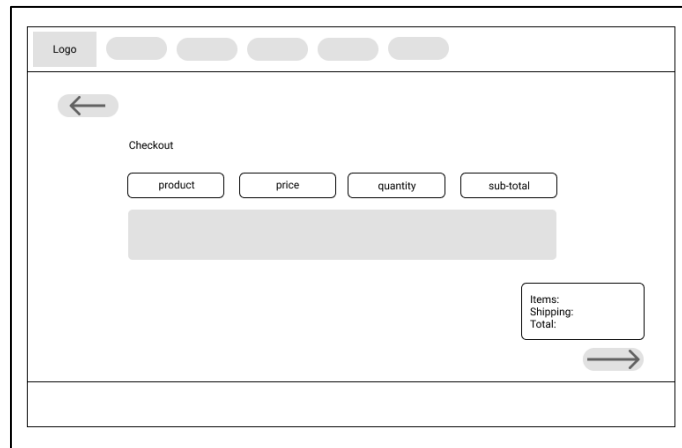
Acknowledgment

Appendix A (Gantt Chart)

Appendix B (Cart Page)

Appendix C (User Site Footer)

Appendix D (User Site My Orders & Track Order Page)
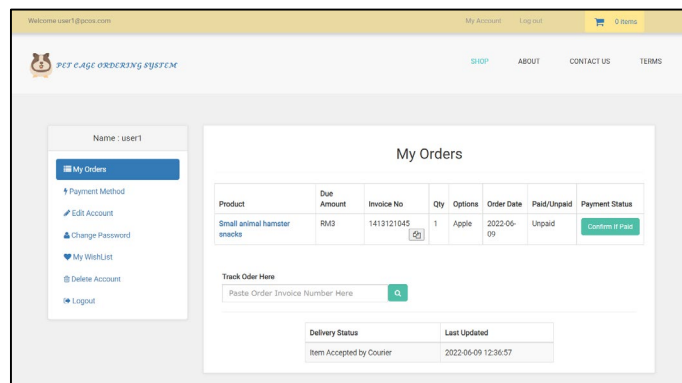
Appendix E (User Site Enquiry/ Contact to Admin Page)
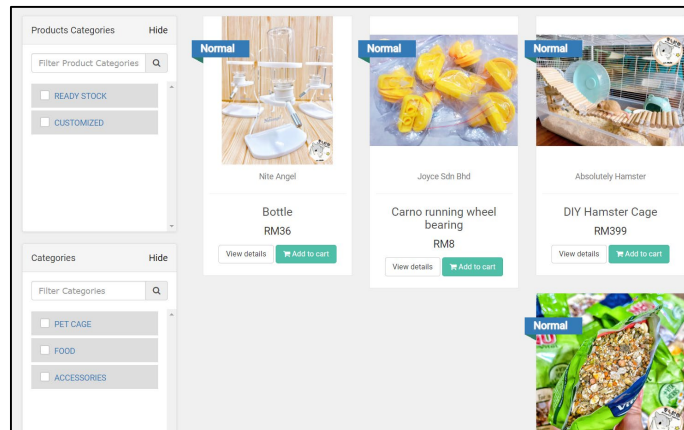
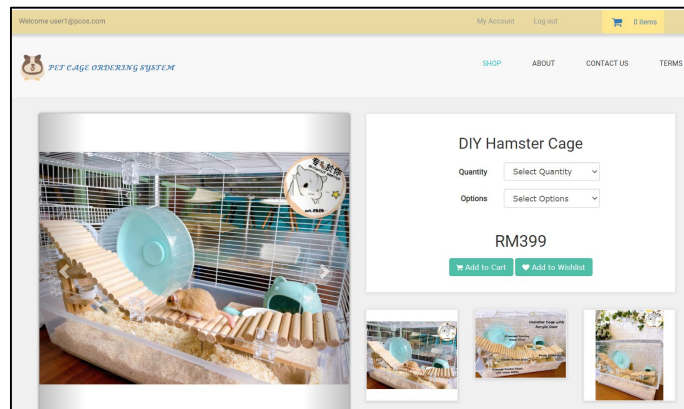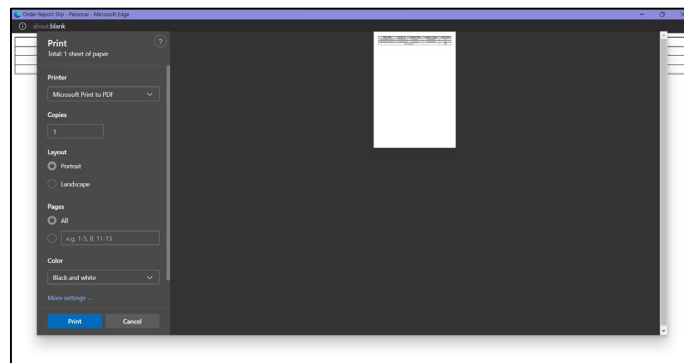**Appendix F (User Site Shop Page)**

Appendix G (User Site View Product Detail Page)

Appendix H (Admin Generate Sales Report Window prompt out Page)

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