



Improving Retail Operational Efficiency Through an Intuitive Web-Based Point of Sales Information System: A Case Study at Ternak Express

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Abstract

The advancement of information technology has significantly impacted various sectors, including the fields of economics and business. One sector experiencing this transformation is livestock enterprises, such as Ternak Express, a business focused on providing animals as sacrificial (Qurban) and Aqiqah services. Currently, Ternak Express manages product and livestock data manually, a method that is prone to errors and can lead to data inconsistencies and potential financial losses for the business owner. To address this issue, this study aims to develop a web-based Point of Sale (POS) information system to support business operations more effectively and efficiently. The system is designed to manage sales transactions, product data, and customer information and generate business reports in a structured and automated manner. The development process uses the Laravel framework and applies the Waterfall model as the methodological approach. This research results in a web-accessible POS system that helps Ternak Express reduce data entry errors, streamline transaction processes, and improve the accuracy of business data management. With the implementation of this system, business operations are expected to become more integrated and professional, thereby supporting the company's growth and long-term development.

Keywords: *Point of Sale, Information System, Web-Based Retail System, Integrated System.*

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1. Introduction

Today, technology has become essential in supporting work across various sectors. One of the most significant impacts of technological advancement can be seen in economics and business. Traditional business practices are now being transformed by the presence of information technology, which not only streamlines operations but also adds value by enhancing the competitive advantages of the business[1]. The increasing use of technology has led to various advancements that have significantly transformed the business world. These changes provide numerous conveniences and benefits, including time efficiency and reduced labor requirements, ultimately streamlining business processes and improving overall productivity[2]. Businesses and enterprises are also becoming more diverse, adapting to the plans and interests of entrepreneurs. These include small cafés, fashion ventures, livestock farming, agriculture, etc.

Ternak Express is a livestock-based business that provides sacrificial animals (Qurban) and Aqiqah services, located in Bekasi Regency, specifically on Swadaya Street, Bojongmangu, Bekasi. In operating the company, it is essential to keep proper livestock records to ensure that the cashier and the business owner can monitor and verify all types of transactions. One of the main challenges the owner faces is monitoring stock and sales data in real time. This issue can lead to either overstocking or stock shortages, which may result in financial losses—either from unsold inventory remaining too long or missed sales opportunities due to stockouts[3]. In addition, the data recording process is still done manually using Microsoft Excel whenever there are sales or orders. This method is time-consuming and increases the risk of data entry errors, affecting the accuracy of financial reports and sales stock management.

Furthermore, the ease with which customer data can be lost hinders the business's ability to provide personalized and efficient services and maintain strong relationships with customers[4]. The owner of Ternak Express requires a system that can be used to manage sales data, with features similar to a cash register. The Point of Sale (POS) system includes pricing calculations for purchased items, financial management, inventory tracking, order recording, and buy-sell calculations. Additionally, the system can be customized to meet the specific needs of Ternak Express. By implementing a Point-of-sale information system, store management will become more streamlined and efficient [5].

A Point of Sale (POS) system is an application system implemented in businesses such as minimarkets or retail stores to manage data processing for purchase transactions, retail sales transactions, purchase returns, and transaction reporting. These functions are generally essential for making strategic decisions by supermarket owners, organizations, or small and medium-sized enterprises (SMEs)[6]. A Point of Sale (POS) application system is expected to provide better service to customers, such as faster calculations of prices and quantities of purchased items, eliminating the reliance on manual record-keeping for inventory. Therefore, businesses or enterprises should have an automated system in place, as it will make operations more efficient and reduce the likelihood of information errors[7]. This Point of Sale (POS) application is designed to minimize manual data entry for inventory and transactions and use phone calls to place orders with distributors[8]. With this application, inventory tracking and ordering of out-of-stock items can be done quickly, referencing the company's existing database. This will enable employees to perform tasks more effectively and efficiently[9]. Based on the description of the problem above, this study aims to analyze and develop a web-based Point of Sale (POS) information system to assist business owners in managing transaction processes, member and supplier data, sales inventory, and accurate report generation. This system is expected to benefit business owners in making informed decisions to grow and develop their businesses [10].

2. Research Methods

2.1. Data Collection Methods

Data collection methods interpret field data following the research's objectives, design, and nature. [11]. The data collection techniques are as follows:

1. **Observation** refers to directly observing the studied object, allowing the researcher to obtain accurate data.
2. **Interviews** involve direct question-and-answer sessions with sources related to the object or issue being addressed by the researcher.
3. **Literature Study** involves indirect data collection by reviewing the literature, which includes gathering data and theories related to the writing of this thesis report.

1. Observation Data.

The results of the observation data, obtained through direct observation of the research object, revealed issues in the sales data recording process. At Ternak Express, staff members manually input sales and order data into Microsoft Excel. This process is time-consuming and increases the risk of data entry errors, which can negatively impact the accuracy of financial reports and sales stock management.

2. Interview Data.

The interview data was obtained from two sources: a livestock staff member and the owner of Ternak Express. In the first interview, the livestock staff member explained that they are responsible for recording data via WhatsApp whenever a customer places a sale or order. The staff must manually transfer this sales data to Microsoft Excel. They expressed concern that this manual process is time-consuming and often leads to data entry errors.

The second interview with the owner of Ternak Express revealed that sales reports are essential for monitoring the business' progress. The owner emphasized the need for accurate reports, including sales data, product stock, and customer information, to evaluate service quality and improve business efficiency. However, challenges arise during the report compilation process, as it is still done manually. This leads to difficulties in filtering report data, record discrepancies, and an inability to monitor stock levels in real-time.

3. Literature Review

The literature review was conducted to gain knowledge by collecting data from previous research, such as journals and scientific works, and theories from books relevant to this study. Based on the literature review, several previous studies that addressed similar problems indicate that implementing a Point of Sale (POS) application can improve performance and service in managing transactions, tracking product stock, registering customers, and simplifying the generation of necessary reports. Being internet-based, such systems enable business owners to monitor and control ongoing business processes more easily [12].

Furthermore, based on the results of other literature studies, the researcher chose a software development method for designing the web-based Point of Sale information system[13]. The Waterfall model provides a sequential approach to the software development lifecycle, starting from analysis, design, coding, testing, and then the support phase[14]. The Waterfall model was chosen because this approach allows developers to tailor the system according to user needs while ensuring quality and smooth implementation at each stage. In designing the Point of Sale information system, the researcher gained an understanding of the use of frameworks, which are defined as collections of scripts (mainly classes and functions) that assist developers/programmers in handling various programming challenges, such as database connections, variable calls, file handling, and enabling faster development of the Point of Sale system[15]. The Laravel framework was chosen to assist in the development of the web-based Point of Sale information system in

this study, making the development process more practical and efficient. [16]. The system testing was conducted using Black Box Testing, where the program was tested by entering data into each form. This testing was performed to ensure the program met the required specifications[17].

4. Analysis Phase

a. Analysis of the Current System

From the data collection results, it was found that there are shortcomings in the current system used at Ternak Express, including The manual process of recording sales and orders in Microsoft Excel, which is time-consuming and prone to data entry errors, which can affect the accuracy of financial reports and stock management. Additionally, the business owner faces difficulties generating reports due to the manual data filtering and processing methods. This makes monitoring stock levels in real time and identifying data discrepancies challenging. These issues hinder the ability to make timely and informed decisions for effective business management.

b. Analysis of the Proposed System

The proposed system is a web-based Point of Sale (POS) information system that allows the owner and staff to automatically generate reports related to sales, product stock, and customer data. This application can quickly filter data, enabling business owners to receive accurate and timely reports. This will reduce reliance on manual data entry in Microsoft Excel and minimize human errors.

2.2. Software Development Methods

The methodology used for software development is the waterfall model, which simplifies the research process. The System Development Life Cycle (SDLC) Waterfall model is the sequential linear or classic life cycle. The Waterfall model provides a sequential approach to the software lifecycle, starting from analysis, design, coding, testing, and then the support phase[14]. Here is an image of the application development model created using the Waterfall model:

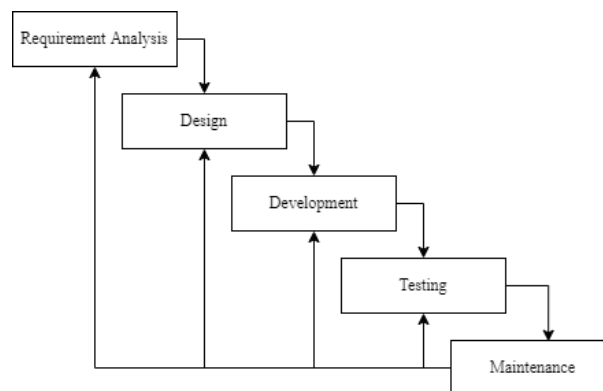


Figure 1. Waterfall System Development Life Cycle

1. Requirement Analysis

At this stage, observation and literature review were conducted as references for the development of the application. Direct interviews were also carried out with the owner of Ternak Express to gather information regarding the current business processes.

2. Design

At this stage, the application was designed based on existing literature and tailored to the needs of the livestock business owner. The design process involved identifying the fundamental abstractions of the software and their relationships.

3. Development

At this stage, coding was carried out using the Laravel framework to build the system according to the predefined design.

4. Testing

Testing was also conducted at this stage using the black box method, which introduced the system's features to the users. Several tests were performed during the development of the system to ensure that it met the required functionality and user needs. The system was tested using the black box testing method.

5. Maintenance

This stage aims to ensure the software runs smoothly and fix bugs to improve user satisfaction.

2.3 System Design

The general purpose of system design is to provide an overall overview to users of the new system and to serve as preparation and detailed planning by identifying the components of the information system[18].

1. Proposed System Flowmap

The following is an overview of the proposed system flow:

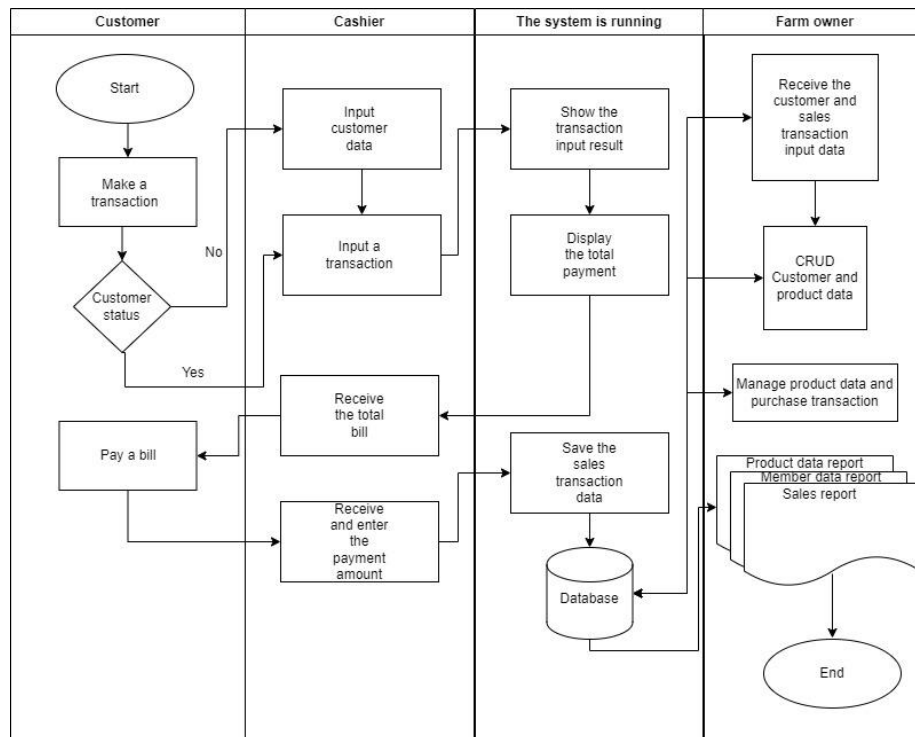


Figure 2. Proposed System Flowmap

The diagram above illustrates the process flow of the proposed application as follows:

- When a customer makes a transaction, the Peternakan Express staff will check the Customer's status.
- If the Customer is making a transaction for the first time or has not yet subscribed, the Peternakan Express staff will request the Customer's data to be entered and saved into the system.
- After the customer data is saved, the Peternakan Express staff will provide the total bill the Customer needs to pay.
- Next, the Peternakan Express staff will input the payment amount into the point-of-sale system.
- The system will then display the transaction input result and the total payment on the point of sale dashboard.

Both the staff and the owner of Peternakan Express can view the data integrated with the database in real-time.

- In the Point of Sale system, the staff and owner of Peternakan Express can create, read, update, and delete archived data, including Customer, product, and sales transaction data.
- Use Case Diagram

A Use Case diagram represents the interaction between the system and its users and administrators. In this subsection, the author attempts to illustrate the system using a use-case diagram[14]. The following is the designed Use Case Diagram:

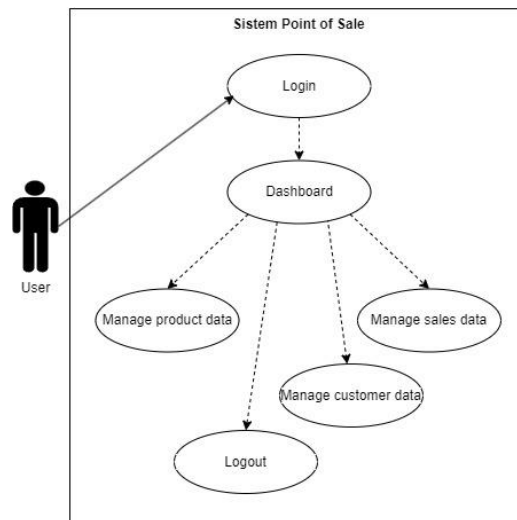


Figure 3. User and Administrator Use Case Diagram

The description of the Use Case Diagram above is as follows:

- The user can log in to the system.
- The user can view all data on the dashboard.
- The user can manage product data, including adding, deleting, and editing product information.
- The user can manage customer data, including adding, deleting, and editing customer information.
- The user can manage sales data, including processing payments for ordered products. The user can filter data by date and export sales reports in Microsoft Excel format.
- The user can log out of the account.

4. Class Diagram

A Class Diagram illustrates the relationships between different classes within a system being built and developed. The following is an overview of the designed Class Diagram:

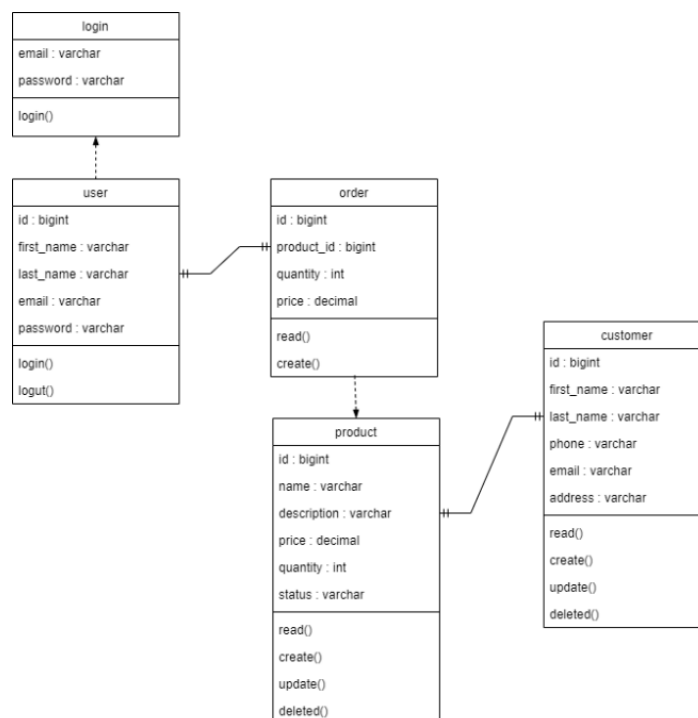


Figure 4. Application Class Diagram

Descriptions of the class diagram:

Table 1. Description Class Diagram

Class Name	Information
Login	This page requires the user to input an email and password.
User	This is a data class used to process all access to other tables.
Order	This process class is derived from the defined use cases, which handle the product sales transaction process.
Product	This is a data class that has a relationship with the order table. It is responsible for creating new data viewing, deleting, and updating data based on real-time conditions.

5. Mockup

The user interface mockup is an essential part of the application design process, as it directly relates to the appearance and interaction experienced by users when using the application being developed[19]. Here is the user interface mockup that has been created.

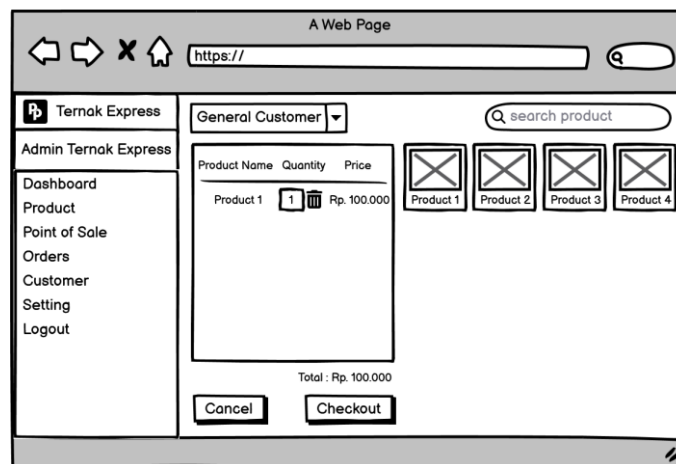


Figure 5. Mockup

3. Result and Discussion

3.1. User Interface Display

The user interface display is the view of the system that has been created, where users can interact with the system. Below is an explanation of the user interface display used in this system as follows:

1. Login Website

The image below shows the login page on the website. Before accessing the main page, users must enter their email and password to log in. If the user enters the wrong email or password, the system will display a notification saying, "Whoops! Something Went Wrong." If the credentials are correct, the system will display the dashboard page. There is also an "I Forgot My Password" button for resetting the password if the user forgets it and a "Remember Me" button that allows the system to remember the user's login information.

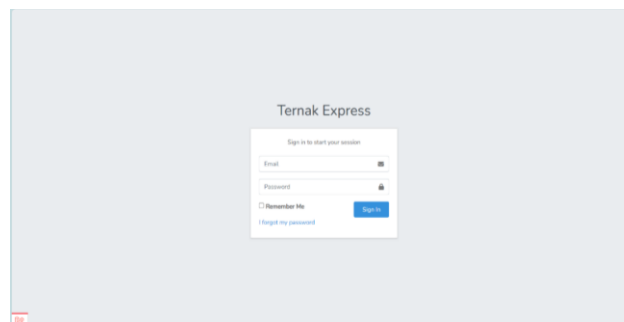


Figure 6. Login Page

2. Dashboard Page

The image below shows the Dashboard display. On this Dashboard page, the system will display the Order Count to track the number of transactions, the Income information to show the total revenue, the Income

Today information to indicate today's revenue, and the Customer Count to display the total number of customers.

Figure 7. Dashboard Page

3. Products Page

The image below shows the Products page. On this page, the system displays product data as a product list, which includes the following information: Product ID, Product Name, Product Image, Product Barcode or Code, Product Quantity, Product Status, and Created and Updated Dates.

An Actions button is also available for each product, allowing users to update or delete the data. If users want to add a new product, they can click the Create Product button, and the system will redirect them to the product creation page.

ID	Name	Image	Barcode	Price	Quantity	Status	Created At	Updated At	Actions
4	T-Shirt TE		TS001	97000.00	99	Active	2025-01-19 15:18:03	2025-01-24 12:21:18	
3	Kambing		KR001	2799000.00	29	Active	2025-01-19 15:16:18	2025-01-22 18:01:03	
2	Sapi		SP001	19500000.00	20	Active	2025-01-19 15:06:39	2025-01-19 15:06:39	
1	Domba Tanduk		DT001	2799000.00	30	Active	2025-01-19 15:04:26	2025-01-19 15:04:26	

Figure 8. Products Page

4. Create Product Page

On the Create Product page, users can add new product data by filling in the following product information: Name, Description, Image, Barcode or Code, Price, Quantity, Product Status.

The user can click the Create button once all the fields are filled out correctly. The system will then save the data into the database and display the newly added product information in the Product List table on the Products page.

Figure 9. Create Product Page

3.2. Point of Sale Page

On the Point of Sale page, the system displays a chart-style interface with the Product Catalog available at Ternak Express Farm. Users can add sales data based on customer purchases by selecting products from the catalog or using the search feature to find products by name.

After selecting a product, users can enter the quantity purchased by the Customer in the quantity table. If a customer cancels a purchase, the chosen product can be removed by clicking the red trash can icon in the quantity table.

Once all selected products match the Customer's order, the system will display the total amount that needs to be paid. The user can then click the Checkout button, and the system will display the Received Amount form to complete the transaction.

Figure 10. Point of Sale Page

3.2.1. Form Received Amount

The Received Amount form is a continuation of the point of sale page. After the Customer makes a payment, the user can enter the amount into the Received Amount form.

If the entered payment is correct, the user can then click the Receive button. The system will then save the transaction data in the database and display the latest product sales information in the Order List table on the Orders page.

Figure 11. Form Received Amount

3.2.2. Orders Page

On the Orders page, the system displays real-time sales data based on customer purchases at Ternak Express. The information shown includes the sales ID, Customer Name, Total Price, Amount Paid, Payment Status, Outstanding Amount (if any), and Purchase Date.

The page also features a date filter to help users easily sort and view sales data based on a specific date range, according to their needs.

Finally, selected sales data can be exported to a .xlsx file by clicking the Export as XLSX button. The system will retrieve the relevant data from the database and generate the Excel file for download.

ID	Customer Name	Total	Received Amount	Status	To Pay	Created At
2	Rinaldy Hudan Permana	Rp. 97,000.00	Rp. 90,000.00	Partial	Rp. 7,000.00	2025-01-24 12:21:17
1	Working Customer	Rp. 2,799,000.00	Rp. 2,799,000.00	Paid	Rp. 0.00	2025-01-22 18:01:02
		Rp. 2,896,000.00	Rp. 2,889,000.00			

Figure 12. Orders Page

3.2.3. Customers Page

The image below shows the Customers page. On this page, the system displays customer data in the form of a Customer List, which includes the following information: ID, Avatar, First Name, Last Name, Email, Phone Number, Address, Date Joined as a Customer.

There is also an Actions button for each Customer, which allows the user to edit or delete customer data. If the user wants to add a new customer, they can click the Add Customer button, and the system will navigate to the Create Customer page.

ID	Avatar	First Name	Last Name	Email	Phone	Address	Created At	Actions
1		Rinaldy	Hudan Permana	rinaldyhudanp@gmail.com	08161699002	Puri Nirwana Residence QH 21 RT 02/08 Sukaraya, Karang Bahagia, Bekasi	2025-01-22 16:44:07	

Figure 13. Customers Page

3.2.4. Create Customer Page

Users can add new customer data on the Create Customer page by filling in the following information: First Name, Last Name, Email, Phone Number, Address, Customer Avatar.

The user can click the Create button once all the fields are filled out correctly. The system will then Save the customer data into the database and display the newly added customer information in the Customer List table on the Customers page.

Figure 14. Create Customer Page

3.3. Testing

The development of this system involves several tests to ensure that the system meets the functionality and user requirements. System testing is conducted using the black box testing method.

Black box testing is carried out by inputting data into the system. Then, the input is processed according to its functionality. If the output generated by the system matches the expected results, the system is considered functioning correctly and meeting user needs. However, if the production does not align with the expected functionality, the system contains errors, and an investigation will be conducted to identify the root cause of the problem[20].

1. Test Results on the Login Page

Table 2. Login Page Testing

No.	Testing Plan	Test Case	Expected Results	Status
1.	Login without a username and password	Leave the username and password fields empty, then click 'login.'	The system displays the message "Please fill out this field."	Valid
2.	Log in without a username.	Enter the password without entering the username.	The system displays the message "Please fill out this field."	Valid
3.	Login without a password.	Enter the username without the password, then click 'login.'	The system displays, "These credentials do not match our records."	Valid
4.	Successful login.	Enter the correct username and password, then click 'login.'	The system displays the dashboard page.	Valid

2. Test Results on the Product Page

Table 3. Product Page Testing

No.	Testing Plan	Test Case	Expected Results	Status
1.	Leave all fields empty on the Create Product page, then click	Add a new product without filling in any data, then click	The system displays the message " Please fill out this field. "	Valid

	Create.	the Create button.		
2.	On the Create Product page, fill in all product data correctly, then click Create .	Add a new product, fill in all the required data, and click the Create button.	The system saves the product data into the database and displays the data on the product page.	Valid
3.	On the Product page, click the Edit button in the Action column of the table.	Edit the existing product data, fill in all the updated information, then click the Update button.	The system displays the Edit Product page; the updated data is saved into the database and displayed on the Product page.	Valid
4.	On the Product page, click the Delete button in the Action column of the table.	Delete the existing product data by clicking the Delete button.	The system deletes the data from the database and removes it from the Product page.	Valid

3. The result on the Orders Page

Table 4. Orders Page Testing

No.	Testing Plan	Test Case	Expected Results	Status
1.	On the Point of Sale page, add a new sales transaction.	Add a new sales transaction by clicking the Catalog Product button, entering the quantity of the purchased product, clicking the Checkout button, and inputting the total payment in the Received Amount field.	The system displays the Point of Sale page, then saves the latest sales transaction data into the database and displays it on the Orders page.	Valid
2.	On the Orders page, search for the sales data based on the sales date.	Search for sales data by the date of the sale using the date filter feature.	The system automatically displays the sales data based on the searched sales date.	Valid
3.	On the Orders page, click the Export as XLSX button.	Export the sales data into an Excel file.	The system will export the data in Excel format.	Valid

4. The Results on the Customers Page

Table 5. Customers Page Testing

No.	Testing Plan	Test Case	Expected Results	Status
1.	Leave all fields empty on the Create Customer page, then click the Create button.	Add a new customer without filling in any data, then click the Create button.	The system displays the message " Please fill out this field. "	Valid

2.	Fill in all customer data correctly on the Create Customer page, then click the Create button.	Add a new customer, fill in all the required data, then click the Create button.	The system saves the customer data into the database and displays the data on the Customer page.	Valid
3.	On the Customer page, click the Edit button in the Action column of the table.	Edit the existing customer data, fill in all the updated information, then click the Update button.	The system displays the Edit Customer page; then, the updated data is saved into the database and displayed on the Customer page.	Valid
4.	On the Customer page, click the Delete button in the Action column of the table..	Delete the existing customer data by clicking the Delete button.	The system deletes the data from the database and removes it from the Customer page.	Valid

4. Conclusion

Based on the system development results, conclusions and recommendations can be drawn concerning the discussions presented in the previous chapters. This system was created to improve the performance and services of Express Livestock Farming in managing customer data, sales data, and product data processes, thereby facilitating the generation of necessary reports. The system is now web-based, making it easier for the owner to monitor the ongoing business processes. In addition, there are several benefits of this system, including:

- With the development of this information system, all activities, including data retrieval, data processing, sales recording, reporting, and data storage, can be carried out effectively and efficiently.
- The owner can monitor and track the business processes anytime and anywhere because this information system is online based.
- The information system can provide reports according to the needs of the database and filter the data stored in it.

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