DEVELOPMENT OF A WEB-BASED POINT-OF-SALES AND INVENTORY SYSTEM FOR SPEEDLAB

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ABSTRACT

This study was developed to describe Speedlab's operations and problems regarding the management of inventory and transaction data. The features of the developed web-based point-of-sale and inventory system address the identified problems of Speedlab. The system covers products and services information management, processing on-site and online transactions, and reports generation. The researchers conducted interviews and surveys to acquire data from Speedlab. The gathered data is used to determine the objectives of this study. The research methodology used in this study was the descriptive developmental approach. The descriptive approach was used to identify the problems based on the gathered data from Speedlab. The developmental approach was applied to develop processes and solutions for the identified problems and to meet the client's requirements. Agile Software Development methodology was used to develop the web-based system. The Agile Software Development methodology allows the researchers to modify past phases without completing the cycle to maintain consistency. Using the standard web evaluation criteria, the overall mean of the study was 4.44 with the descriptive interpretation of "Very Good." This indicates that the intended users and IT experts accepted the developed system. After the system evaluation, the researchers concluded that the web-based point-of-sale and inventory were the appropriate solution to Speedlab's problems. The system's implementation may improve the operations for inventory and transaction management of Speedlab.

Keywords: *point-of-sale, inventory, e-commerce, web-based, automotive company.*

Introduction

The growth of information technology and the internet has affected businesses in how they operate. Point-of-sale (POS) is a system integrated into the business operation to manage inventory and sales records (Mangmang, 2018). Retail businesses nowadays use POS systems to process transactions and update inventory records. According to Sabri (2022), an e-commerce website allows customers to buy products anytime or anywhere from a business. With the growing technology, retail businesses capitalize on the available technology for ease of data management and new method of selling products and services.

Speedlab is an automotive company founded by Sidney Ang and Ferman Lao on October 6, 2006. Speedlab is a retail company that sells automotive products and services for cars. The current problems of Speedlab are inaccurate stock records of products. Employees of Speedlab are having a hard time processing transactions because the recorded stocks are inaccurate causing delays. The increasing customer demand affected Speedlab by having a mismatched stock record and the actual product quantity. Also, Speedlab stated that they have an issue in determining if they are making a profit because the employees cannot generate reports based on sales and inaccurate inventory records.

The researchers have determined to develop a system that manages products and services information and processes transactions. Automating the record tracking of inventory and sales based on completed transactions. Inclusion of report generation based on recorded system data, instead of relying on manual report generation. Also, the development of an e-commerce system to provide customers with a new option for transactions.

Project Objectives

The developed system considered the following specific objectives:

1. To design and develop an e-commerce website that will integrate the following features:
    1.1. Catalog for products and services of Speedlab;
    1.2. Online shopping cart;
    1.3. Online payment processing; and
    1.4. Chatbot for customer support;
2. To design and develop a web-based point-of-sale and inventory system that will integrate the following features:
    2.1. Product and service data management;
    2.2. Process on-site transactions; and
    2.3. Report generation;
3. To determine the acceptability of the system using the ISO/IEC 25010:2011 software quality evaluation criteria as perceived by the respondent on the following:
    3.1. Functional Suitability;
    3.2. Performance Efficiency;
    3.3. Compatibility;
    3.4. Usability;
    3.5. Security;
    3.6. Reliability;
    3.7. Maintainability; and
    3.8. Portability

Literature Review

Development of an E-commerce Website

The research aims to develop an electronic commerce (e-commerce) website for Speedlab for displaying products and services and processing online transactions. According to Ullah et al. (2016), e-commerce is growing, leaving brick-and-mortar businesses aside. E-commerce also refers to a wide variety of buying and selling products and services.

In the development of an e-commerce website, business owners and clients can experience advantages and disadvantages. The basic advantages of an e-commerce website are the display of all offered products and services, continuous availability, faster selling of products and services, easier price comparison, low operational cost, and more customer reach (Niranjanamurthy, 2013). Also, disadvantages are still present in an e-commerce website, such as the need for internet access and security issues. Research by Huseynov & Yildrim (2014) showed that most internet users use smartphones to access the internet. In the population of mobile users, 90% of the users prefer applications compared to 10% of web browsing (Palestino, 2019).

In developing a website, required features differentiate depending on the website type. Heriyandi et al. (2021) stated the required features of an e-commerce website are the main page, categories page, product details page, cart, checkout page, and profile management page. The main page contains the products and services that the business is offering to the customers. The categories page displays the group of products to give an overview of the products and services of the business. The product details page is for

viewing detailed information about the product and displays specific information depending on the product category. The cart page displays all the products pending order confirmation. The checkout page displays the order details such as the ordered products, delivery fee, and the total amount. The profile management page is for the end-users to view and edit their information. Research by Khan et al. (2017), defined online payment as the transaction between a seller and a buyer with the help of digital financial instruments that are supported by a company.

With all the advantages, features, and effects an e-commerce website has for a company, it is beneficial to develop an e-commerce website for Speedlab. For a stable brick-and-mortar business, developing an e-commerce website could increase sales by offering online transactions. Not only Speedlab will benefit, but customers can also experience the ease an e-commerce website can offer.

Development of a Point-of-Sale and Inventory System

Point-of-sale (POS) system is widely used in retail businesses. According to Kabir & Han (2016), POS systems bring forth faster and more favorable ways of managing transactions for a business. POS systems allow companies to manage transactions and generate reports.

Inventories are the company's products, stocks, and supplies that are held to offer to customers. Inventory management is used for maintaining the inventory data. Inventory management is a system for handling information on the products and controlling supplies. The goal is to maximize the flow of the products and to pay attention to the total products of a company (Munyao et al., 2015).

From a manual checkout and adapting to an automated checkout process, Cote (2015) stated that POS systems and inventory management systems can increase the profitability of a business. An inventory management system tracks the products consistently helping to improve inventory decisions such as cutting off products, procuring products, and reducing inventory costs, which makes the inventory management system highly recommended for a retail business. Meanwhile, POS systems collect data on products bought by consumers and produce a variety of sales reports which will be the basis of the owner tracking the highest gross generating products. With all it is said, it is proven that POS and inventory management systems work well together for a retail business.

Point-of-sale (POS) and inventory systems play an immense role in a business. Data discrepancies or errors can cause a lot of loss for the company. The development of the essential features of a POS and inventory system can be beneficial to the company in managing its inventory and transaction data. The possibility of the POS and inventory system with their essential features can help Speedlab manage its current problems and bring a positive impact to the company.

Acceptance Testing using Standard Software Quality Evaluation Criteria

Acceptance testing is software testing that assesses a system's acceptability. The purpose of acceptance testing is to determine whether the system satisfies the business requirements and is ready for launch. After system testing and the fourth and final phase of software testing, the system is used in business operations (Software Testing Fundamentals, 2020).

Regarding this procedure of testing the software, acceptance testing will verify that the developed system meets the client's requirements. Acceptance testing will be beneficial to the client to assure that the developed system is compatible with their business operations and capable of providing a solution to the current problems.

Methods and Design

Research Design

A descriptive method was applied to describe the client of the study. The descriptive research objective is to describe the identified variable by providing systematic information. The researchers also used developmental research in this study. Developmental research is defined as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness (Seels & Richey, 1994).

Project Development

Agile methodology was chosen as the SDLC methodology because it enabled the researchers to revisit phases based on changes encountered during development. Past phases are modified based on the experienced issues and changes to maintain consistency.

Requirements. In this phase, the researchers interviewed Speedlab to gather information about their inventory and sales management processes. After analyzing the collected data, possible system features are planned. Then the planned features are proposed to the client to identify if the features meet the client's requirements. The features are then adjusted based on the client's request or changes. After the adjustment of features, the point-of-sale and inventory system functionalities are ready for the next phase.

Design. Flowcharts, data flow diagrams, and business relationships of the system requirement are created in this phase to establish the logic behind the system. The researchers identified the programming language, libraries, and other back-end requirements needed in software development. The design phase also includes the creation of prototypes for the user interface (UI) and user experience (UX) of the system.

Development. In this phase, the planned features of the point-of-sale and inventory system were developed. The back-end developers developed the features according to the chosen programming language. The front-end developers put the prototype into effect on the system's user interface. The back-end and front-end developers communicated to integrate the developed user interface and functionalities.

Testing. In the testing phase, the researchers tested if the developed functionalities met the required output of the system. Once the testers detect bugs or defects in the system, the developers debug the detected issues. Retesting of the system functionalities is conducted after debugging to assure that the issues are fixed.

Research Instrument

The ISO/IEC 25010 Standard is the criteria used for evaluating the functionalities and properties of the web-based system. The developed system was evaluated by the respondents using a Likert scale based on the criteria from the ISO/IEC 25010 model. The researchers used Google Forms to conduct the survey from the respondents.

Data Gathering Procedure

Survey is the data-gathering procedure used for the evaluation of the system. The sampling technique used for choosing the survey respondents is the simple random

sampling technique. In this technique, each member of the population has an equal chance of being selected as a subject. The survey forms are distributed using Google Forms for the respondents.

Population and Sample of the Study

Speedlab employees are categorized as managers and cashiers. These employees will use the point-of-sale and inventory features of the developed system. Speedlab customers are included as the respondents to evaluate the e-commerce feature of the developed system. IT experts are included as the respondents to evaluate the technicalities of the developed system. The total population of the respondents is fifty (50), five (5) Speedlab employees, thirty-five (35) customers, and ten (10) IT experts.

Statistical Treatment

The respondents that evaluated the system used the Likert Scale based on the ISO/IEC 25010 Standard. The numerical and descriptive rating of the Likert scale was displayed on the survey to evaluate the system. The scale starts from 1 to 5, 1 indicates "Poor," and 5 is "Excellent."

Scale	Range	Descriptive Rating
5	4.50 – 5.00	Excellent
4	3.50 – 4.49	Very Good
3	2.50 – 3.49	Good
2	1.50 – 2.49	Fair
1	1.00 – 1.49	Poor

Table 1. Five-point Likert Scale

Results and Discussion

Catalog for products and services of Speedlab

Figure 1 shows the products page consisting of the offered products and their categories. The displayed product information is name, price, and picture. A services page is also developed for the e-commerce system. The services page contains a detailed description and pictures of services. The products and services page is used as the e-commerce system's catalog feature.

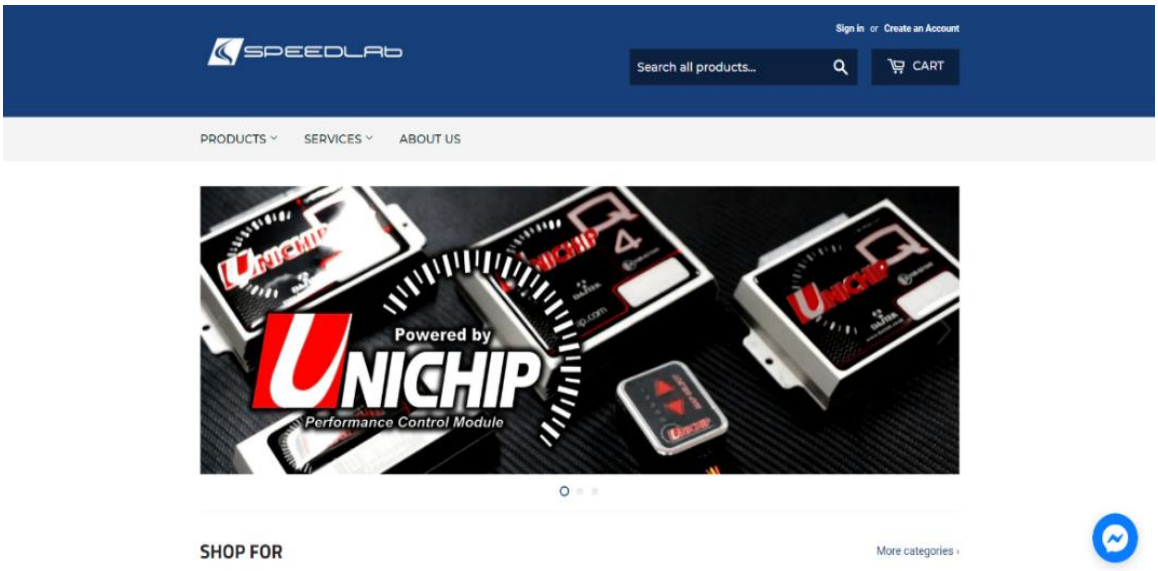

Figure 1. Products Page

Online shopping cart

The shopping cart manages the products waiting for order confirmation from the user. Figure 2 displays the list of products with quantity and price. The checkout button is included to process the customer's order.

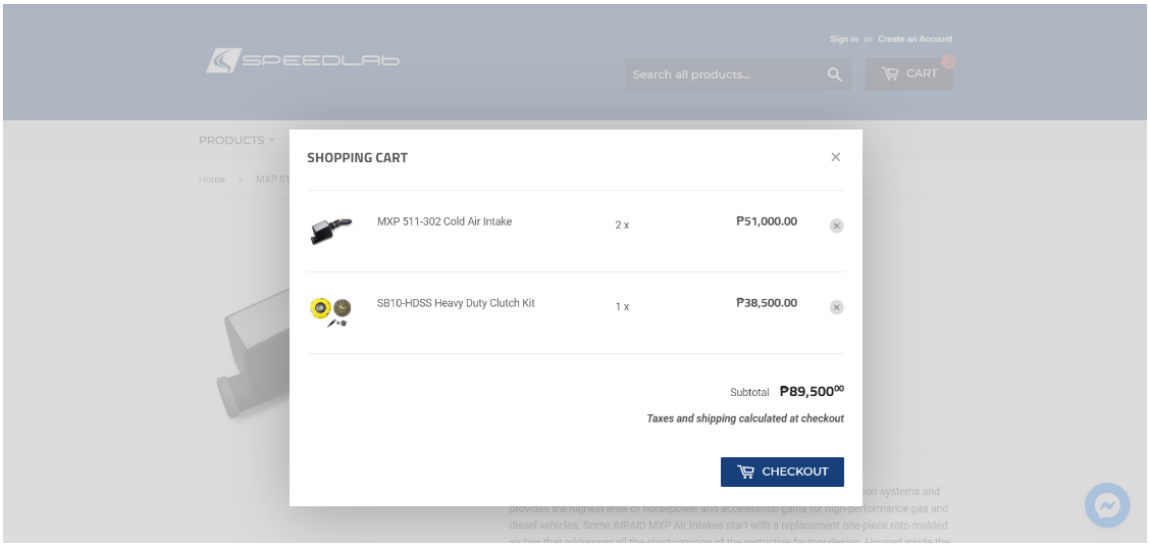

Figure 2. Shopping Cart

Online payment processing

Figure 3 is the payment processing page which displays the order details, such as the product's subtotal, delivery details, and total. The shipping details and payment method is displayed to finalize the transaction.

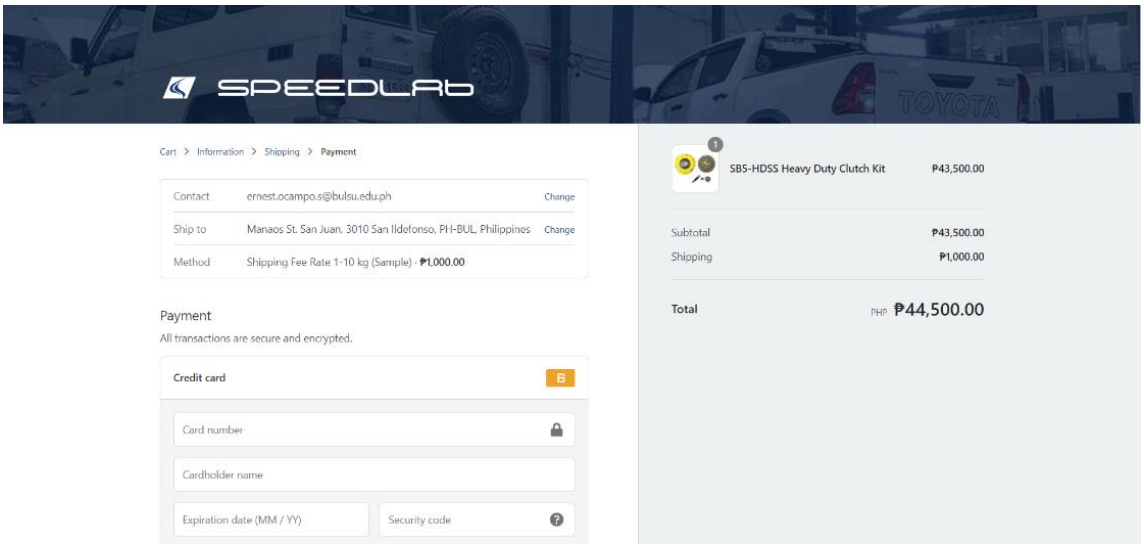

Figure 3. Payment Processing Page

Chatbot for customer support

The chatbot is powered by Messenger developed by Meta Platforms. The chatbot asks permission to connect to the user's Facebook account. After a successful account connection, Speedlab's Facebook page will automatically send messages to manage customer support. The logged-in user is now connected to Speedlab's Facebook page and can send questions.

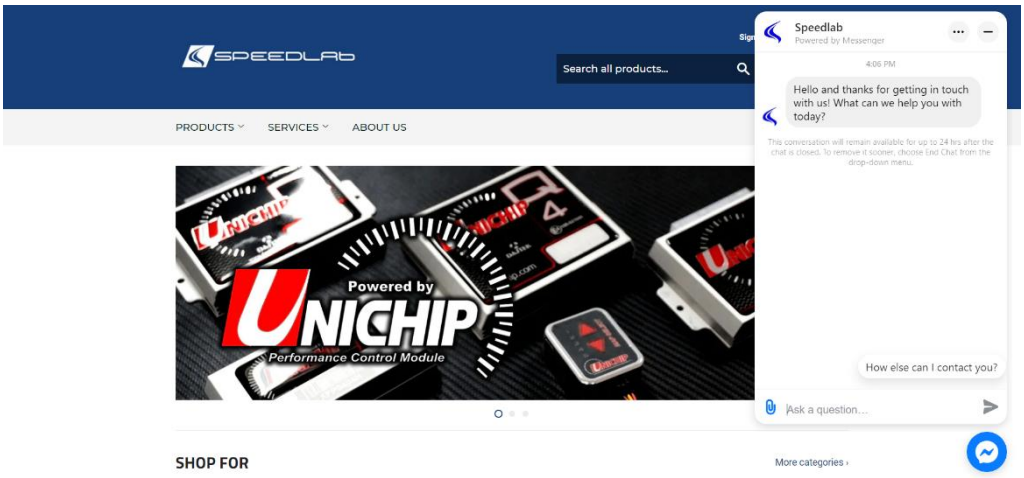

Figure 4. Chatbot

Product and service data management

Figure 5 displays the inventory page of the developed system. The inventory page is divided into product, service, supplier, and shipment information. The adding, viewing, editing, and archiving of information are included in the inventory page. An add information feature is included for adding information on the inventory page. The view information feature is to present a detailed description of the selected information on the inventory page. The editing feature is used to update the edited information on the point-of-sale and inventory system. The archiving feature is used to hide the selected data, not

delete the data. An add, view, edit, and archive button are included on every sub-page of the inventory page to access the data management features. The adding, editing, and archiving of information is limited to super admin and admin user levels only. The cashier type of employee account can only view information.

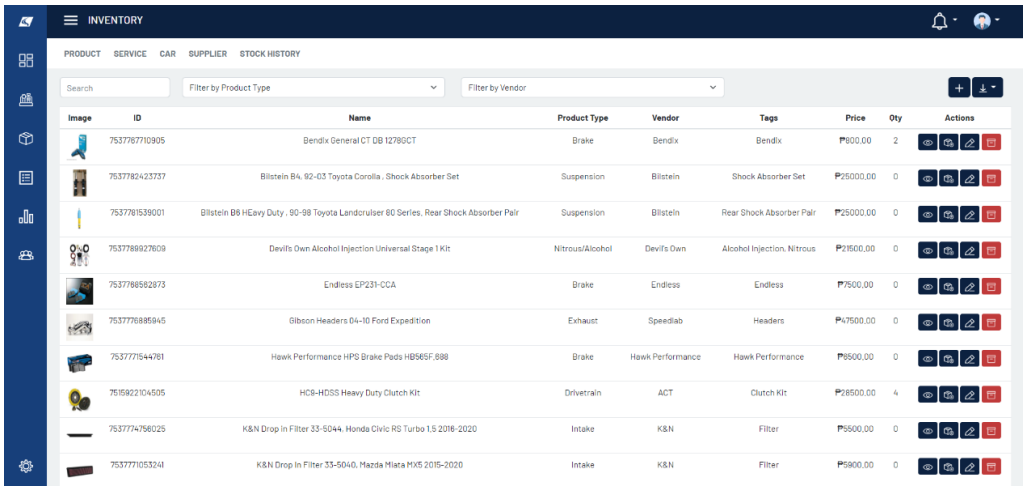

Figure 5. Inventory Page

Process on-site transactions for products and services

The transaction page is divided into the products and services tab to process an on-site transaction. Figure 6 displays the products tab of the transaction page, which contains a table displaying the available products. The products tab of the transaction page is used for product selection for a transaction. An item summary table is included on the transaction page to display the selected products. The services tab of the transaction page, displays, and processes the services offered by Speedlab. The selected services are displayed on the service summary table. Employees are allowed to edit the labor fee of the selected service. The subtotal, Value Added Tax (VAT), and total are included in the transaction page to display the summary of the transaction. The checkout button is used to

finalize the on-site transaction. The checkout modal displays the receipt after completing the transaction. The receipt contains the customer information, transaction summary, and Speedlab-related information.

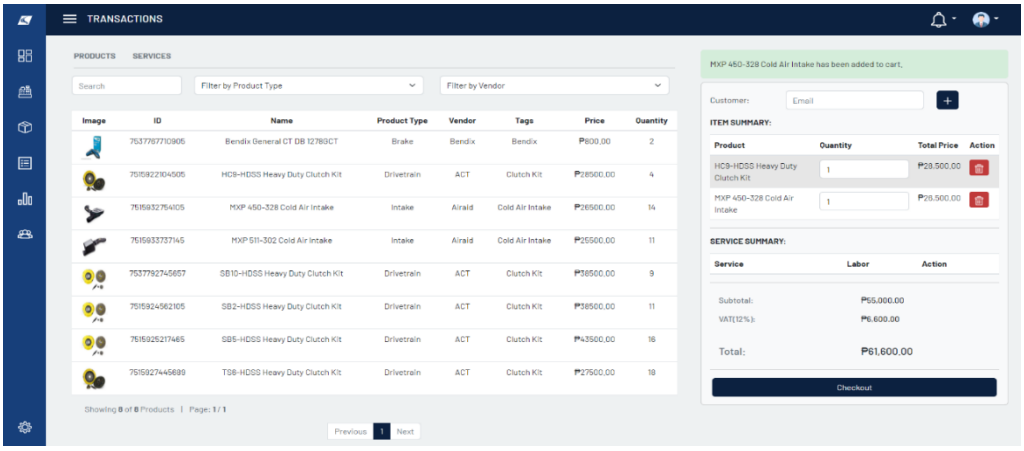

Figure 6. Products tab on Transaction Page

Report Generation

The reports page shows Speedlab's data based on inventory and transactions. It is filterable by date and a download button is included to save the report in portable document format (PDF). This report generation was made to print, view, and download company data for future use. Figure shows the generated report in PDF.

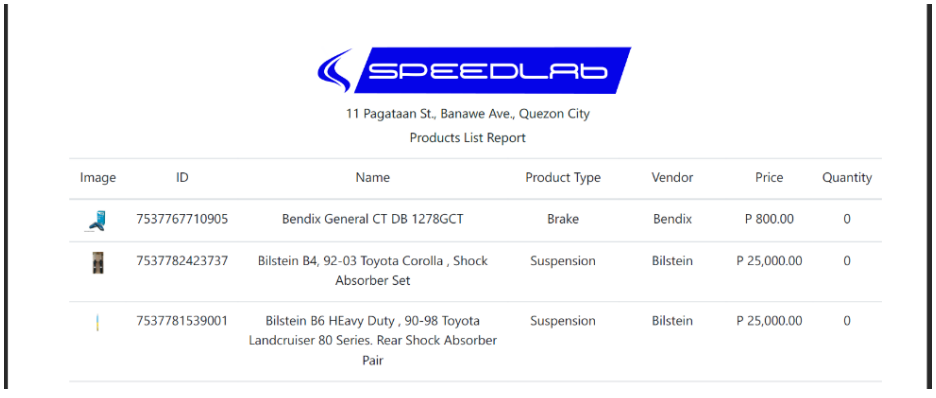

Figure 7. A generated report in PDF file format

Conclusions

The collected data from the system evaluation was interpreted and analyzed to develop a conclusion. This study found that the point-of-sale and inventory system was the appropriate solution to Speedlab's problems. In addition to the conclusion: (1) the e-commerce feature was successfully developed, and it helps Speedlab customers to view the Speedlab offers, manage orders, and process payment; (2) the development of the point-of-sale and inventory features was also complete, and it helped the Speedlab employees to manage company data, process on-site transactions, and track product stock; (3) the developed system received an overall mean of 4.44 with a descriptive interpretation of "Very Good", which indicates that the system functions well, displays correct and accurate data, and was accepted by the respondents.

Recommendations

The following are the recommendations for developing the same kind of study and it can be used by future researchers in the field of Information Technology:

1. Develop a feature for ordering products from the supplier.
2. Develop a mobile application for the e-commerce feature of the system.

Research Implications

After the development of the web-based point-of-sale and inventory system for Speedlab, the company may improve its inventory and transaction data management upon the system's implementation. With the stock tracking feature of the system, it can provide accurate and complete inventory data and improve on-site transaction processing. The e-

commerce feature of the system can offer new options for the transaction of Speedlab's customers.

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