AITCS

A Development of Inventory Management System for Perodua Maintenance Department

Nurlisa Azmi[1], Noraini Ibrahim[1]*,

[1]Fakulti Sains Komputer dan Teknologi Maklumat,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

*Corresponding Author Designation

Abstract: Perodua Maintenance Inventory Management System is a system which act for managing the inventory system of a maintenance department that handles the spare parts storing needs for maintaining machinery. The problem that are often encountered are the inefficiencies and error that occurred in quantity tracking due to over reliance on paperwork and spreadsheet. Thus, the system would help to reduce errors and employees will be able to trace the use and return of any spare parts item used from the store using barcode approach. This system could be used to maintain inventory details, the process of inputting and outputting spare parts, updating stock, managing employees, generating reports, requesting and approval order. This project will make use of the System Prototyping Model as an approach to develop the inventory system. The system would also go as far as advocating the usage of programming languages such as PHP, that will be utilized as the primary toolkit, and Structured Query Language (SQL) for the database. The system would provide a rapid innovation of performance and efficiency with less time and energy.

Keywords: Inventory Management System, Maintenance, Maintenance Department

1.   Introduction

The Perusahan Otomobil Kedua Sendirian Berhad which also known for Perodua is Malaysia's second car manufacturer that was established, and it comprises vehicle manufacturing, research and development, sales, after-sales, body and paint repair as well as used vehicles [1]. The mechanical equipment or machinery used by Perodua to provide efficient car production and service need regular maintenance. The primary objective of the regular maintenance is to guarantee that all production-related equipment is running at all time and slight faults must be recognized and fix before it become a problem that can halted a manufacturing line. The maintenance department is responsible to oversees preventing unplanned machine malfunctions, ensure high operational standards, keeping equipment and machinery healthy, providing high-quality maintenance services and lastly maintaining and troubleshooting problems in a timely and professional manners

The process of utilizing spare parts for machine maintenance involves technicians. Each of the machines required specific spare parts to service or fix the machine in the manufacturing company. Hence, it is important for the inventory store to obtains the spare parts at all times to ensure the process of maintaining is running without occurring any delay.

The traditional way for the storekeeper keeps the spare parts and machinery details are in the spreadsheet and the technicians that need to perform maintenance services must look up for the machine's name and code to view a list of spare parts and quantities that are frequently required. Spare part items that are currently unavailable may have an impact on the production line in the factory. Also, the process of use and return used by the technician may not be practical since the existing technique is by filling out the label form that was used to track down employees use and return of spare parts and to be passing it on to the storekeeper for it to be updated in the spreadsheet. Besides, during the process of storing and managing inventory spare parts was characterized and updated by manual field registration and excel-based system which was susceptible to an excessive number of mistakes, data redundancy, human errors, and the difficulty of updating information and tracking the items are just the challenges faced.

Hence, the project served to develop a Maintenance Inventory Management System that covered the spare parts storage needs for maintaining machines for the maintenance department in the manufacturing. The employees of the maintenance department which includes the technician, storekeeper, supervisor, and manager will be the users of the system. The main purpose is to develop system in which all information regarding the stock of the organization will be presented and the process of in and out of spare parts is track down as well to prevent misuse of the inventory.

This article is organized into five sections. The first part is an introduction describing the context of the project. The second section describes the analysis of the relevant work. In the third section, the methodology is explained. The analysis and design as well as implementation and testing are described in the fourth section. In the last section, a conclusion with some instruction for future employment is given.

2.   Related Work

An inventory management system is a system that assists in the management of a company. Inventory management is as the subsidiary of business management that deals with inventory planning and control [2]. In the absence of inventory management, an organization may experience delays in production, shortages, or customer dissatisfaction [3]. Thus, an inventory system is required for this project in order to see which spare parts are available or out of stock, as this improves stock visibility and the company sustainability.

This system will be formed through the usage of technology such as web-based technology and barcode technology. Since both technologies are crucial in the development of this inventory system. This project must be a web-based system since it makes things easier for employees to track of current stock positions, create report or information about the product and make it easier for companies to build better to be stocks. Subsequently, the barcode is one of the technological advances that is broadly used in almost sector. Barcodes are usually used in combination with databases for automatic identification extensively used in industry, military, healthcare sector, document management environments and automated storage and retrieval systems [4]. Hence, the system leverages the technology in order to maximize the benefits.

Next, the perpetual method is the inventory method chosen for the project development. This system uses the method to ensure immediate tracking and always up-to-date stock item. The advantages of using perpetual methods includes the ability to keep up-to-date and accurate records of stocks and associated costs, as well as generating reports and analyses that aid in ensuring appropriate supply and minimizing overstock [5]. For inventory techniques, whether it is system using perpetual or periodic

method, regular cycle counting is an important auditor tools to track inventory items. The key objective of cycle counting is to determine the source of errors, address the conditions that generate errors, sustain a high standard of inventory record accuracy, and offer a proper asset statement [6].

The study of existing inventory management systems is significant in creating a high-quality system that allow the developer to develop an enhanced and more usable yet efficient inventory management system. Table 1 shows the comparison between the equivalent system which are Zoho Inventory, Sortly, ManagerPlus as well as the system that will be developed which is the Perodua Maintenance Inventory Management System. Through the study, contains similarities and differences between the system studied and the system that will be developed.

Table 1: Comparison between existing system

Feature/System	Zoho	Sortly	ManagerPlus	Inventory System
Accessible by any devices	Yes	Yes	Yes	Yes (web-based)
Log in and verification	Yes	Yes	Yes	Yes
Manage employee registration in the system	Yes	Yes	Yes	Yes
Barcode scanner for updating of quantity items	Yes	Yes	Yes	Yes
Request order	Yes	Yes	Yes	Yes
Track status of an item	Yes	Yes	Yes	Yes
Manage inventory (create, read, update, delete)	Yes	Yes	Yes	Yes
Provide and manage notifications	Yes	No	Yes	Yes
Low stock alert message	Yes	No	Yes	Yes
Generate reports and analytics	Yes	Yes	Yes	Yes
Machine maintenance track history	No	No	No	Yes
Request order and approval order between employees, supervisor, and manager	No	No	No	Yes

Based on the comparison of systems done in Table 1, it can be concluded that there are some similarities and differences in these systems. The results of this comparison will serve as a guide to develop a Maintenance Department Inventory System that will use barcodes. with this comparison as well, it will be able to be used as a guide to develop a better system. The new system would make it easier for the employee to keep track of the in and out of spare parts in the store.

3. Methodology

System Prototyping Model has been selected as the development approach. It is a system development process in which a prototype is produced, evaluated, and revises as needed until a satisfactory outcome is obtained from which the whole system can be built [7]. Evolutionary Prototyping is being used in the project to create a very sturdy prototype in a systematic manner. Table 2 highlight the main phases and tasks throughout the system development.

Table 2: Software development phases, sub tasks and outcome

Phase	Task	Outcome
Planning	• Identify the problems, objectives, and scopes of the project.	• Develop a Gantt Chart and project proposal document
Analysis	• Information is collected and analysed during this phase to design the system in next phase.	• Create swimlane diagram of to be system, UML diagrams: use case diagram, activity diagrams, sequence diagrams, class diagram and requirement definition.

Table 3: (cont)

Phase	Task	Outcome
Design	• Designing the system, interface and database involved in the system	• Develop system architecture, database design and user interface design.
Implementation Prototype 1 and Prototype 2	• The system is developed in each of the interface according to the user requirements and design phase. • Test is carried out and identify the problems that existed and improve the system, the phase is repeated until the requirement is met.	• Integrate interface system with database using PHP programming language and MySQL. • Prototype of the system and test cases of the system.
Implementation System	• Improve the prototype system and identify minor errors as well as testing the system with users.	• Complete System and test cases.
Documentation	• Present the project and system to the panels.	• Final report, complete system and a complete system presentation.

3.1 Analysis

The system functional module of the system is summarized in Table 3. It contains six modules which are log in, manage use and return items, manage inventory, manage order, manage user and generate report module.

Table 4: System Functional Module

Module	Function	User
Log in	Manage user login process system	Maintenance Employees
Manage Use and Return Item Module	Manage the use and return of spare part item used from the store using barcode technology	Maintenance Employees
Manage Inventory	Managing the spare parts inventory in maintenance departments. Functions to create, read, update, and delete are used in this module.	Maintenance Employees (Depends on job role)
Manage order	Manage request orders and approval of request order of the spare parts from employees	Maintenance Employees
Manage User	Manage employee's information	Storekeeper as administrator
Generate report	Provide the user to select report based on filter on its preferred type (daily, weekly, and monthly)	Storekeeper and manager in the maintenance department

The process in the maintenance departments for the proposed system will be represents by using the to-be model. Figure 1(a) illustrates the to-be model of use and return. The system will automatically update the in and out quantity of item whenever the user scans the barcode and input the quantity. Next, Figure 1(b) shows the to-be model of adding spare parts. The storekeeper will receive the new spare parts and information whenever the department provides a new item of spare parts in the store. As a result, the proposed system allows storekeepers to log in and use the add spare part features to add new spare parts. Then, the storekeeper must fill out all of the required information as well as the current quantity of the item in stock. The system will produce the barcode based on the spare part code after the storekeeper fills out the information and submits the form. The storekeeper has the option of printing the barcode label utilising the system functionality. Figure 1(c) illustrate the to-be model of receiving stocks. The storekeeper can then use the quantity adjustment features to update the quantity of upcoming spare parts. This function eliminates the need for a storekeeper to browse through a massive list of spare

parts in Excel. Lastly, Figure 1(d) shows to-be model of request order. It does not require employee to submit physical form as the system's request order features could be used by technicians or storekeepers to request spare parts. The user fills out the form in the system and submit it. Once the application is filled, both the supervisor and the manager will receive it and will be able to assess it at the same time. As a result, sending it to the HQ departments takes less time. Once both the supervisor and the manager have given their approval, the storekeeper can check the status and send an email to the HQ department or print the form.
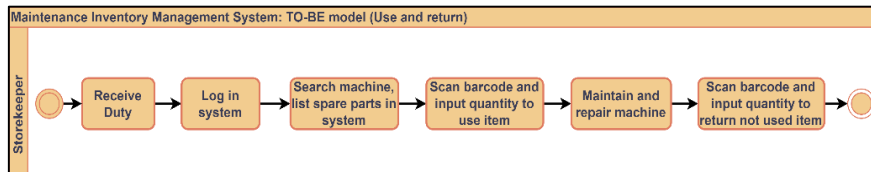
Figure 1(a): To-Be model of use and return
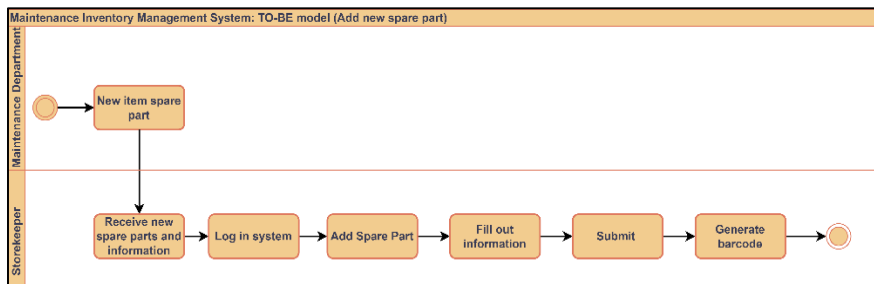
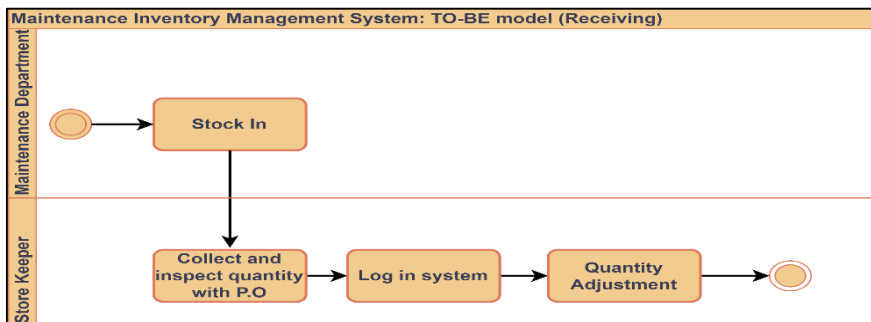**Figure 1(b): To-Be model of adding spare parts**
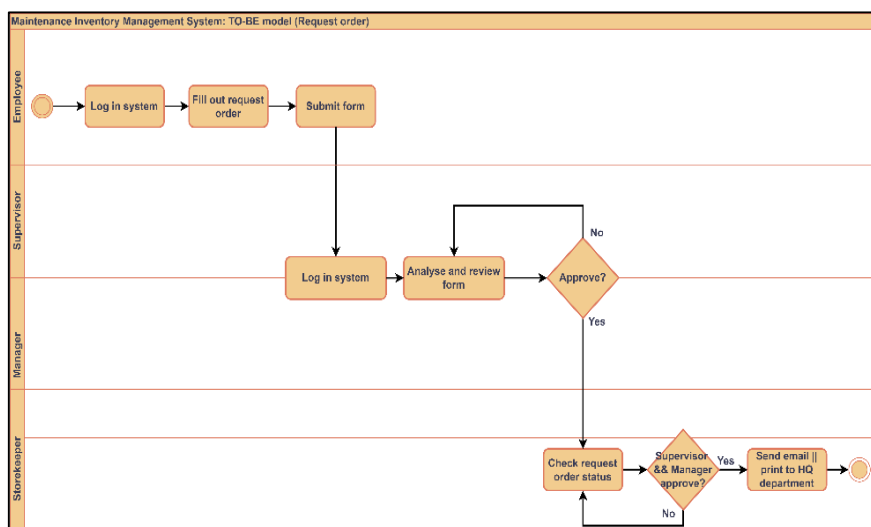
Figure 1(c): To-Be model of receiving

Figure 1(d): To-Be model of request order

The overall structure or flow of the system, as well as the diagram and data relating to how the system functions are described in the system analysis. Figure 2 shows the use case diagrams of the Perodua Maintenance Inventory Management System. The Perodua Maintenance Inventory Management System has the following main use case: log in, manage use and return items, manage inventory, request order, manage user and generate report which includes Administrator, Technician, Supervisor and Manager as the actors.
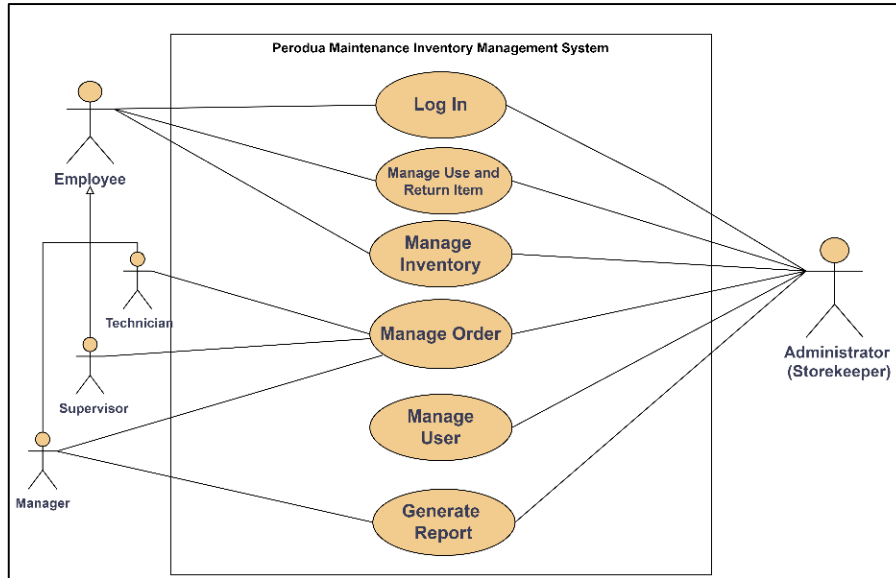

Figure 2: Use Case Diagram

Class diagrams are necessary for the development of a system because it allows users to grasp the system and see how it related to each other. Thus, Figure 3 depicts the class diagram for the system being develop for this project.
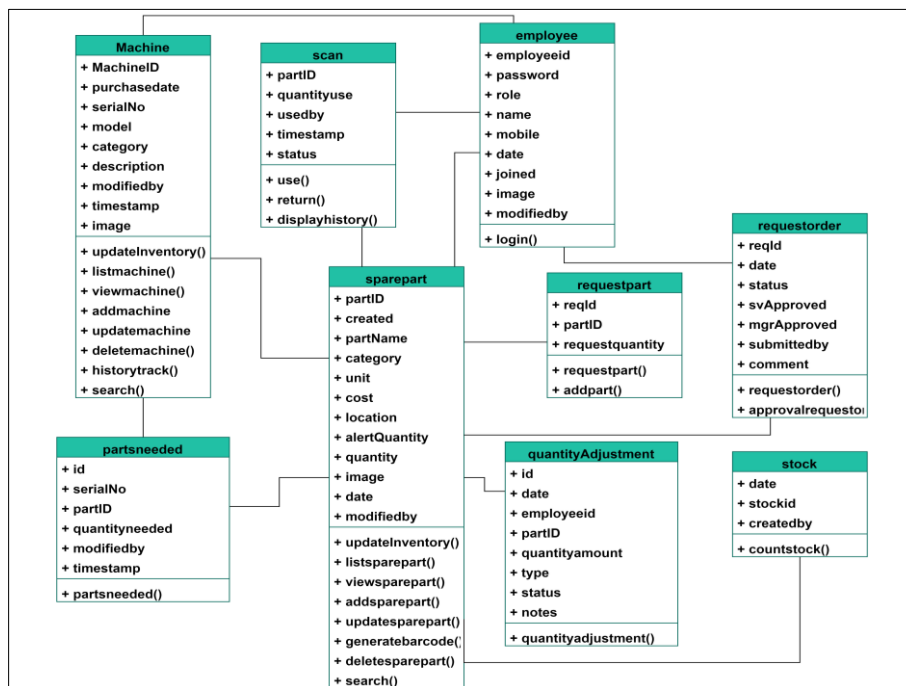

Figure 3: Class Diagram

4. Results and Discussion

This section will discuss and show the outcome of the design, implementation, and testing of this system in detail.

4.1 System Architecture Design

The aim of system architecture design is to identify a comprehensive solution or architecture based on logically related and consistent principles, concepts, and properties. Figure 4 depicts the system architecture. The three-tier architecture refers to the flow of programming logic from the user interface to the database, and then back to the user interface with the requested data. To request information, all end users will connect to the same web server, which would transmit and receive stored data from the database in response to the user request. The web server primary responsibility is to respond to user requests as well as displaying the website information by collecting, processing, and displaying pages to the end users.
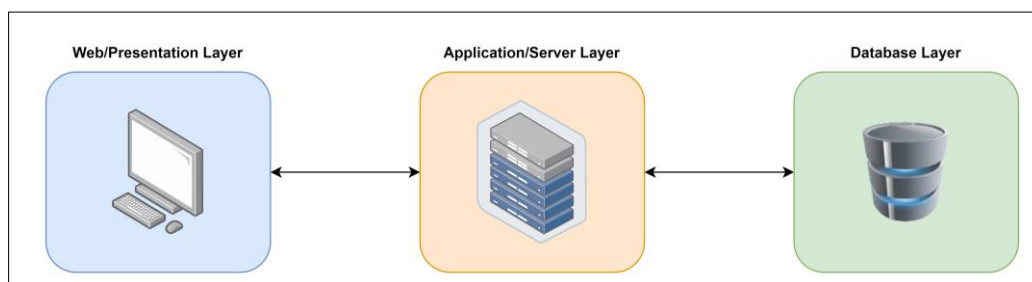

Figure 4: System Architecture

4.2 Database Design

Database schema is a specification of the database structure in a precise manner that the database management system understands. Schema will specify how the data can be arranged and how the relation between the data can be established. The following are the list of the schemes for the system.

i) employee (<u>employeeid</u>, password, role, name, mobile, date, joined, image, modifiedby)
ii) sparepart (<u>partID</u>, created, partName, category, unit, cost, location, alertQuantity, quantity, image, date, modifiedby)
iii) machine (<u>MachineID</u>, purchasedate, serialNo, model, description, category, modifiedby, timestamp, image)
iv) partsneeded (id, serialNo, partID, quantityneeded, modifiedby, timestamp)
v) requestorder (<u>reqId</u>, date, status, svApproved, mgrApproved, submittedby, comment)
vi) requestpart (reqID, partID, requestquantity)
vii) scan (<u>partID</u>, quantityuse, usedby, status, timestamp)
viii) stock (date, stockid, createdby)
ix) quantityAdjustment (<u>id</u>, date, employeeid, partID, quantityamount, type, status, notes)

4.3 Implementation

This section will present the design of the system and the implementation of the developed system that was developed using HypertextPreprocessor (PHP) language and MySQL.

The process of coding a program from the design phase is referred to as system implementation. Firstly, the employee will login into the system by entering valid information such as username and password as well as matching job role as shown in Figure 5(a). After successfully login, dashboard interface will appear as shown in Figure 5(b) depending on the employee's job role.
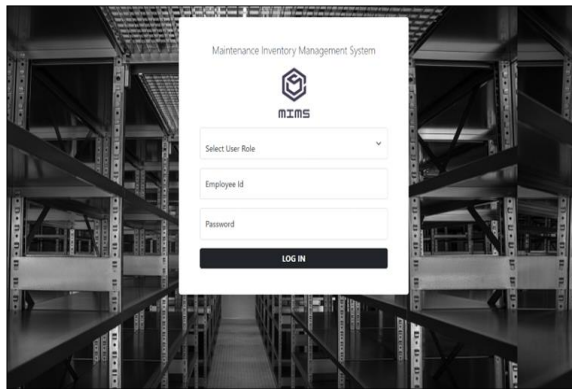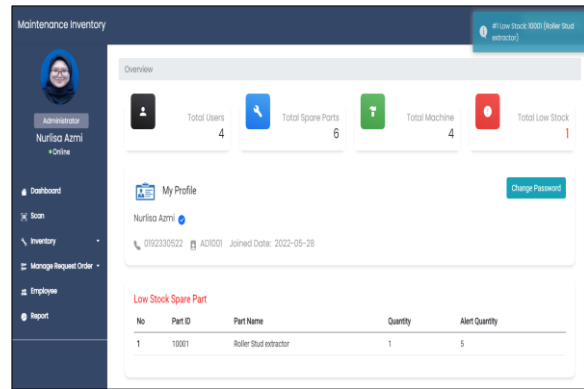
Figure 5(a): Login interface

Figure 5(b): Administrator dashboard

This feature is accessible to all employees which let them to select the scan barcode and scan barcode as in Figure 6(a). The page will display information that is existing in the database and user can enter the quantity that the user uses and choose option to use or return item as shown in Figure 6(b).
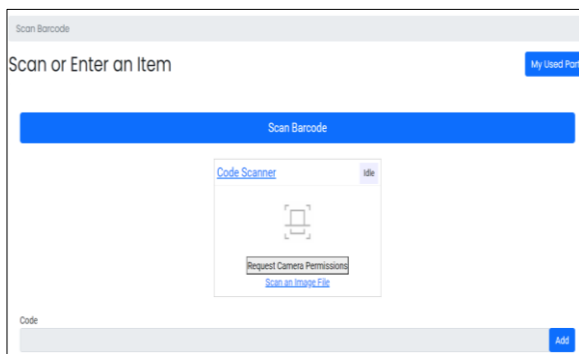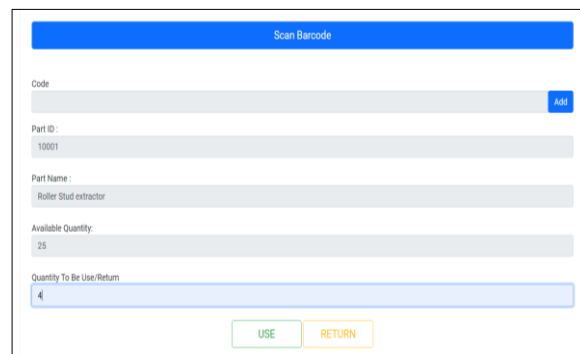

Figure 6(a): Use and Return page

Figure 6(b): Scan barcode form

The administrator has access to variety functions to manage inventory which includes view, add, update, and delete data in the system. Figure 7(a) and Figure 7(b) shows the list of spare part and adding new spare parts which administrator could either modify or delete information. While other roles can only view machine and spare part items. The employees could see the spare parts needed for each machine by clicking the view parts button in the list machine to see the parts needed as shown in Figure 7(c). Figure 7(d) shows the information of machine and the spare part needed for specific machine. The perpetual inventory method was used in this module because it allows for immediate tracking of the item's quantity for the department, which helps to avoid stockouts or overstock.
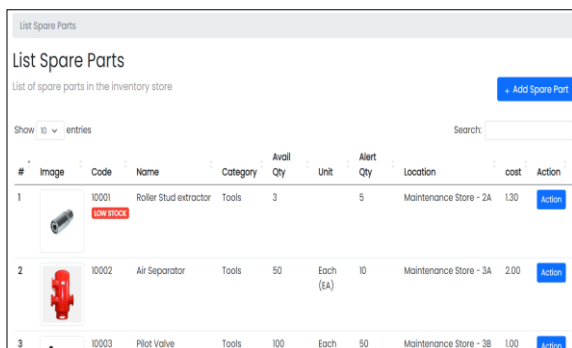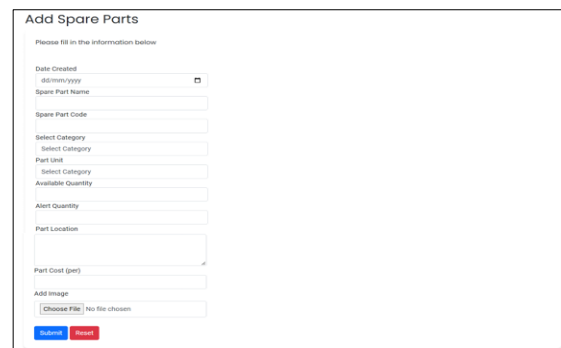

Figure 7(a): List of Spare Part page

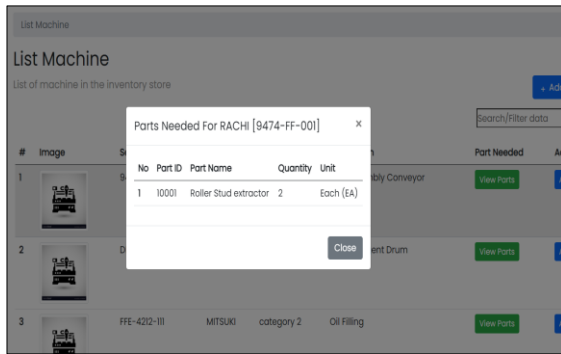
Figure 7(b): Add Spare Part page

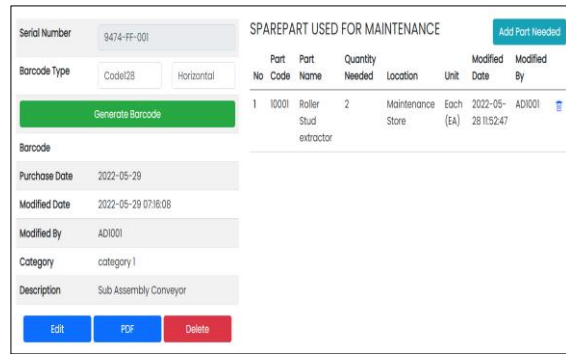**Figure 7(c): Part Needed for specific machine**

Figure 7(d): Machine Information

For spare part page, each sparer part will display how the employee used the part so that the system could keep track of what was in and out of the store as in Figure 8(a). This feature would also include the quantity adjustment feature, which employee could use if items or part received in bulk or scan features is not available on devices as in Figure 8(b).
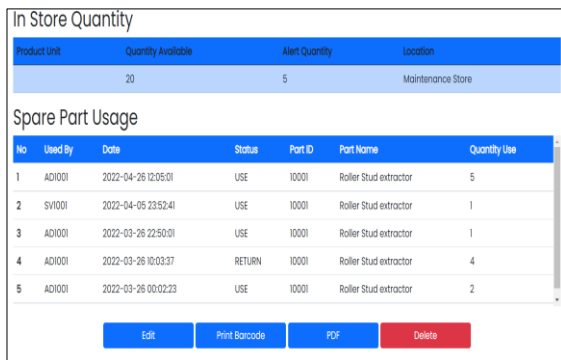

Figure 8(a): Spare Part usage
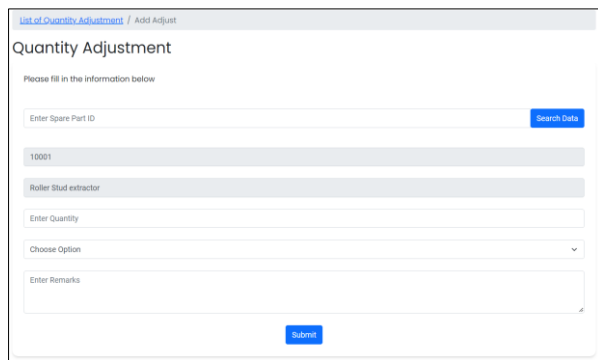
Figure 8(b): Add Quantity Adjustment page

Finally, administrator can use the stock count features to have the system count the stock of machine parts in the systems such in Figure 9(a). The system will generate an excel file that administrator can download as in Figure 9(b). This function applied the inventory technique which are the cycle counting since the administrator could use the downloaded excel file to count the item in the store and compare to the generated quantity item in the system. As a result, the administrator could perform a quick comparison and check that the count was accurate.
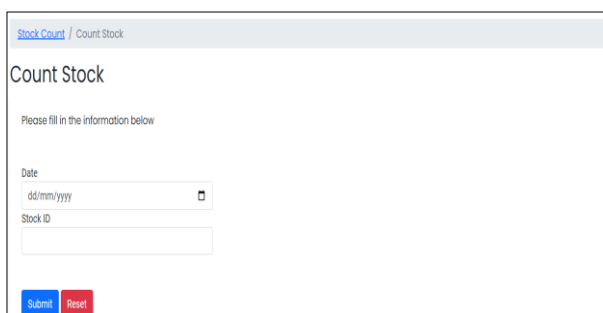
Figure 9(a): Count Stock page

Figure 9(b): Excel file downloaded

The request order module would allow employees to submit orders through the system as shown in Figure 10(a). The detail information which includes the total quantity or total cost of the request order to be reviewed can be view when submitting order as in Figure 10(b). The supervisor and manager must analyse the forms and decide whether to approve or reject the form.

| Figure 10(a): Request Order Form | Figure 10(b): Request Order Detail |

For generating report, the administrator or manager has the ability to select to view the report using the existing query button provided or custom query as shown in Figure 11(a). Figure 11(b) shows the report generated with pdf format. Administrator and manager can download the report in pdf format and also send the downloaded files via email to the HQ department. The purpose of this module to get information based on the options or button offered.

| Figure 11(a): Generate Report page | Figure 11(b): Report Generated by PDF format |

4.4   Testing

The testing phase begins once the system prototype has been completed. There are two types of testing that needs to be done which are the system testing and acceptance testing. System testing can determine whether or not the developed system is usable. Acceptance testing is collected through questionnaires that includes questions about the system features to the users. This testing is done to ensure that the system initial planning operates smoothly and in accordance with the users' goals and requirements. The functionality testing has been done as shown in Table 4.

Table 4: List of Test Cases

Test Cases	Software Requirement	Description	Status
TEST_100	SRS_REQ_100	Login Module	Pass/Fail
TEST_100_001	SRS_REQ_101 SRS_REQ_103	Verify if an employee will be able to login with a Valid employee identification number and password.	Pass
TEST_100_002	SRS_REQ_102	Verify if an employee cannot login with field is blank and submit button is clicked.	Pass
TEST_100_003	SRS_REQ_104	Verify if an employee cannot login with invalid password	Pass

Table 4: (cont)

Test Cases	Software Requirement	Description	Status
TEST_200	SRS_REQ_200	Manage Use and Return Item Module	Pass/Fail
TEST_200_001	SRS_REQ_201	Verify if an employee scan barcode item the system will display information of spare parts.	Pass
TEST_200_002	SRS_REQ_203	Verify if an employee scan barcode item and spare part does not exist, the system will display error message.	Pass
TEST_200_003	SRS_REQ_202	Verify if an employee input quantity of use and return item and choose option button the system will update the current quantity available.	Pass
TEST_300	SRS_REQ_300	Manage Inventory Module	Pass/Fail
TEST_300_001	SRS_REQ_301	Verify if employee able to view the list of spare part and spare part information of a specific part exist in the system.	Pass
TEST_300_002	SRS_REQ_301	Verify if employee able to view the list of machines and machine information of a specific machine exist in the system.	Pass
TEST_300_003	SRS_REQ_302	Verify if employee able to view the spare part needed of a specific machine.	Pass
TEST_300_004	SRS_REQ_303	Verify if administrator able to add new spare part into the system.	Pass
TEST_300_005	SRS_REQ_304	Verify if administrator able to add new machine into the system.	Pass
TEST_300_006	SRS_REQ_316	Verify if administrator cannot add spare part information to the system with field is blank and submit button is clicked.	Pass
TEST_300_007	SRS_REQ_316	Verify if administrator cannot add machine information to the system with field is blank and submit button is clicked.	Pass
TEST_300_008	SRS_REQ_317	Verify if administrator enters spare part code that have existed in the system, the system will display error message.	Pass
TEST_300_009	SRS_REQ_317	Verify if administrator enters machine identification that have existed in the system, the system will display error message.	Pass
TEST_300_010	SRS_REQ_305	Verify if administrator input spare part code and click generate barcode, the system will display generated barcode of the spare part.	Pass
TEST_300_011	SRS_REQ_317	Verify if administrator input invalid spare part code, the system will display error message.	Pass
TEST_300_012	SRS_REQ_306	Verify if employee input characters or words and click search button on the search field, the system will display searched item.	Pass
TEST_300_013	SRS_REQ_307	Verify if administrator click update button on specific spare part, the system updates the information.	Pass
TEST_300_014	SRS_REQ_307	Verify if administrator click update button on specific machine, the system updates the information.	Pass

Table 4: (cont)

Test Cases	Software Requirement	Description	Status
TEST_300_015	SRS_REQ_309	Verify administrator click on delete button on specific spare part, the system remove item from database.	Pass
TEST_300_016	SRS_REQ_309	Verify administrator click on delete button on specific machine, the system remove item from database.	Pass
TEST_300_017	SRS_REQ_308	Verify if employee select spare part information, enter quantity, and select option on quantity adjustment page and click submit button, the system will update the adjusted spare part information.	Pass
TEST_300_018	SRS_REQ_314 SRS_REQ_315	Verify if administrator able to add spare part needed to the specific machine.	Fail
TEST_300_019	SRS_REQ_312	Verify if administrator able to count the stock available in the system.	Pass
TEST_400	SRS_REQ_400	Manage Order Module	Pass/Fail
TEST_400_001	SRS_REQ_406 SRS_REQ_407	Verify if employee able to view the list of request order status and request order information of a specific order in the system.	Pass
TEST_400_002	SRS_REQ_406 SRS_REQ_407	Verify if the system generates total quantity and total cost of the request parts.	Pass
TEST_400_003	SRS_REQ_401 SRS_REQ_402	Verify if employee able to add request order into the system as well as enter request spare parts and request quantity for the request order.	Pass
TEST_400_004	SRS_REQ_403	Verify if supervisor able to approve or reject the request order through the system.	Pass
TEST_400_005	SRS_REQ_403	Verify if manager able to approve or reject the request order through the system.	Pass
TEST_400_006	SRS_REQ_405	Verify if administrator able to click email button to automatically email to HQ department request order details.	Pass
TEST_400_007	SRS_REQ_405	Verify if employee able to download or print the request order detail from the system	Pass
TEST_400_008	SRS_REQ_404	Verify if employee able to edit the request order information detail.	Pass
TEST_400_009	SRS_REQ_404	Verify if employee able to delete the request order in the system, the system will delete the request order from database.	Pass
TEST_500	SRS_REQ_500	Manage User Module	Pass/Fail
TEST_500_001	SRS_REQ_501	Verify if administrator able to view the list employees and employee information exist in the system.	Pass
TEST_500_002	SRS_REQ_502	Verify if administrator able to add new user into the system.	Pass

Table 4: (cont)

Test Cases	Software Requirement	Description	Status
TEST_500_003	SRS_REQ_505	Verify if administrator enters employee identification that have existed in the system, the system will display error message.	Pass
TEST_500_004	SRS_REQ_506	Verify if administrator leaves blank field when add employee information, the system will display error message.	Pass
TEST_500_005	SRS_REQ_504	Verify if administrator click update button on specific user, the system will update information.	Pass
TEST_500_006	SRS_REQ_504	Verify if administrator click on delete button on specific user, the system will delete user from database.	Pass
TEST_500_007	SRS_REQ_503	Verify if administrator input characters or words and click search button to search employees.	Pass
TEST_600	SRS_REQ_600	Generate Report Module	Pass/Fail
TEST_600_001	SRS_REQ_602 SRS_REQ_603	Verify if administrator/manager able to download pdf of generated reports.	Pass
TEST_600_001	SRS_REQ_603	Verify if administrator/manager able to email downloaded report to HQ departments.	Pass
TEST_600_001	SRS_REQ_601 SRS_REQ_602	Verify if administrator/manager able to choose query to generate reports.	Pass

The summary of the overall test case result is recorded in Table 5. The results for these results involve 6 system module which have a total of 44 test cases. It can be concluded that the system passed 43 of the 44 test cases which account 98% of all the test cases as shown in Figure 12. Only 1 test case on the manage inventory module failed the testing evaluation as the features does not able to perform as the system requirement needed.

Table 5: The Overall Result of Test Case

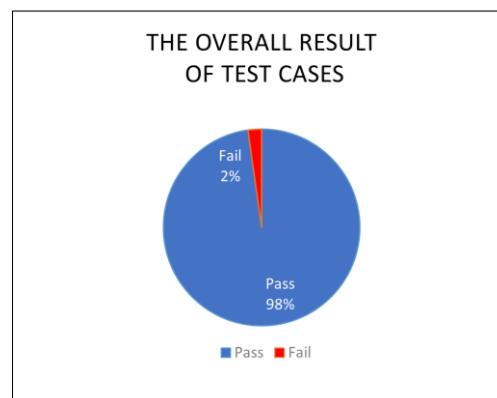| Test Cases ID	Total Test Cases	Total Success	Total Fail
TEST_100	3	3	-
TEST_200	3	3	-
TEST_300	19	18	1
TEST_400	9	9	-
TEST_500	7	7	-
TEST_600	3	3	-
Total	**44**	**43**	**1**

Figure 12: Pie Chart of the Overall Result

The user test validation is delivered via a questionnaire form between department employees to submit feedbacks on the system. The goal of this testing is to assist system developers in identifying issues and faults that may arise and to take note on things that can be further enhanced or improve for future references. The results relating to the interface and system modules involved are shown in Figure 13 and Figure 14. It has been concluded that most of the employees are satisfied and have a good

experience with the developed system. Although there are need in improvement to the system modules for certain functions and features.
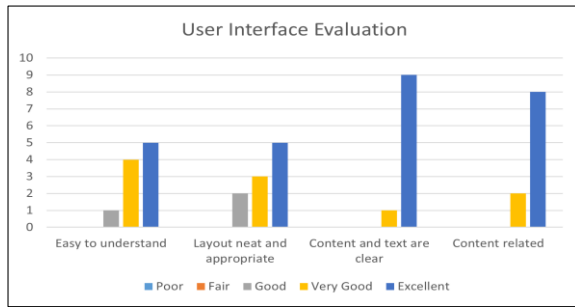

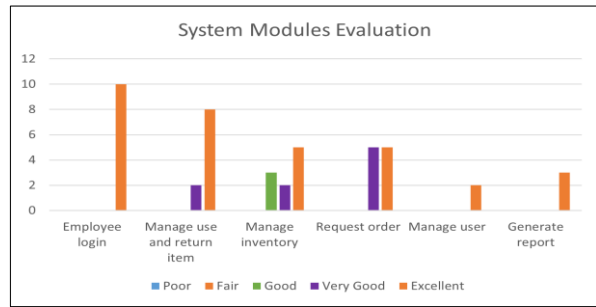**Figure 13: User Interface evaluation**

Figure 14: System Module evaluation

5. Conclusion

In conclusion, Maintenance Inventory Management System able to computerize the system and makes the process of managing the inventory systematic and efficiently. As stated on the problem statement that are faced by the organization earlier, the expected result ensures to resolve as it will overcome the inefficiency of the current process. After conducting system testing, advantages of the system were discovered such as able to eliminate the risk of losing data of spare part or outdated information, increase the quality performance of the employees, reduce department use and waste of paper and report can be generated in a quick and accurate period. However, there are limitation of the developed system, but several suggestions can be done for system refinements have been gathered in order to ensure that the system is of higher quality in the future such as develop mobile application so that employee can utilise it in a more friendly manner, attempt to make the system adaptable in any situation and creating a more interactive user interface. The Maintenance Inventory Management System is a human invention that aims to create an application that will assist in improving the organization's service quality. Thus, the system is able to save energy and cost while also ensuring that the organization privacy is maintained.

Acknowledgment

Appendix A

Table 6: Requirement Definition

Requirement	Software Requirement Specification	Description
Login SRS_REQ_100	SRS_REQ_101	All users must be able to enter a valid employee identification and password to access the system.
	SRS_REQ_102	The system shall alert the user for any invalid input.
	SRS_REQ_103	The system shall display the homepage of the user for a successful login.
	SRS_REQ_104	The system will display error message if password does not match with the employee identification.
Use and return SRS_REQ_200	SRS_REQ_201	The system should allow employee to scan the barcode on spare part to use or return by compatible device.
	SRS_REQ_202	The system should record and update the items quantity in the inventory after scanning is completed.
	SRS_REQ_203	The system should display error message when error occurred.
Manage Inventory SRS_REQ_300	SRS_REQ_301	Th e system should allow to view the list of the machine and spare part items in the inventory.
	SRS_REQ_302	The system should allow to view the list of spare parts of each item in a single machine.
	SRS_REQ_303	The system should allow administrator to create a new spare part items and generate the barcode based on the spare part code.
	SRS_REQ_304	The system should allow to add a new machine and input the list of spare part items needed.
	SRS_REQ_305	The system should allow to generate and print barcode based on the item.
	SRS_REQ_306	The system should allow to search of items in the search bar.
	SRS_REQ_307	The system should allow administrator to update spare parts or machine in the system.
	SRS_REQ_308	The system should allow employee to make adjustment of spare part quantity in the inventory.
	SRS_REQ_309	The system should allow administrator to delete spare part or machine in the system.
	SRS_REQ_310	The system should provide an alert notification to items in the inventory that are low in stock.
	SRS_REQ_311	The system should provide an alert quantity of an item that can be set by the administrator.
	SRS_REQ_312	The system should allow administrator to count the stock of items quantity in the inventory.
	SRS_REQ_313	The system should allow employee to view the history of the service machine that are in need to maintain.
	SRS_REQ_314	The system should allow employee to add spare part needed to specific machine.

Table 6: (cont)

Requirement	Software Requirement Specification	Description
	SRS_REQ_315	Employees should be able to track the history of the machine that is being regularly service and track down machine that are often in need in service as well as update the updated spare part needed.
	SRS_REQ_316	The system should provide error message upon submitting blank field information
	SRS_REQ_317	The system should provide and error message upon submitting existing items identification in the database.
Manage order SRS_REQ_400	SRS_REQ_401	The system should allow administrator or technician in the department to submit the request order form for any spare part needed.
	SRS_REQ_402	The system should allow the request form order that has been submitted to be send to the supervisor and manager account to review and revise the order.
	SRS_REQ_403	The system should allow supervisor or manager to approve or edit the order.
	SRS_REQ_404	The system should allow administrator or requester to edit information or delete the request order.
	SRS_REQ_405	The system will prompt for the order's status, after which administrator can email the form to the headquarters department or download and print the request order form.
	SRS_REQ_406	The system should allow the employees to view the status of the request order.
	SRS_REQ_407	Administrator should be able to view status or request order from all the employees in the system.
Manage administrator and employee SRS_REQ_500	SRS_REQ_501	The system should allow to view the list of employees
	SRS_REQ_502	The system should allow administrator to add new employees account for the system based on the job role.
	SRS_REQ_503	The system should allow to search the employee information.
	SRS_REQ_504	The system should allow administrator to edit information or delete employee account.
	SRS_REQ_505	The system should display error message if administrator create a user with existed employee identification.
	SRS_REQ_506	The system should provide error message upon submitting blank field information.
Generate report SRS_REQ_600	SRS_REQ_601	The system should allow administrator or manager to generate report based on query provided button or user query
	SRS_REQ_602	The system should display the report based on the query entered.
	SRS_REQ_603	The system should allow to download the generated reports or email to HQ department of downloaded report.

References

[1]   Shukor, M. B., Sulaimana, Z., Chin, T. A., & Mas' od, A. "Malaysia automotive industry: moving toward energy efficient vehicle era." In Social Science Postgraduate International Seminar (SSPIS), vol. 1, no. 1, pp. 562-658, 2017.

[2]   Toomey, J. W. Inventory management: principles, concepts, and techniques. vol. 12. Springer Science & Business Media, 2012. [E-Book].

[3]   Plinere, D., & Borisov, A. "Case study on inventory management improvement." Information Technology and Management Science, 18(1), 2015. https://doi.org/10.1515/itms-2015-0014.

[4]   Thota Sriram, K. Vishwanata Rao, S. Biswas and Basheer Ahmed. Application of Barcode Technology in Automated Storage and Retrieval Systems. Industrial Electronics, Control, and Instrumentation, 1996., Proceedings of the 1996 IEEE IECON: IEEE, 1996. 641-646.

[5]   Ali, A. K. "Inventory management in pharmacy practice: a review of literature." Archives of pharmacy practice, 2(4), pp 151, 2011.

[6]   Rossetti, M. D., Collins, T., & Kurgund, R. "Inventory cycle counting–a review." In The proceedings of the 2001 Industrial Engineering Research Conference, vol. 1, pp. 457-463, 2011.

[7]   Dennis, A., Wixom, B. H., & Roth, R. M. Systems Analysis and Design 6th ed. Wiley, 2014. [E-book].