

## Development of an Inventory and Service Management System for an Auto Repair Shop using Agile Methodology

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### ABSTRACT

In an analysis of Cruven Auto Specialist's business operation, researchers found that the company's operations and business processes are prone to errors due to how they manage their information. Cruven mainly stores their data in a spreadsheet, where data such as inventory, customer, and sales invoice records, could be prone to error by its users and be easily accessed and manipulated by unauthorized personnel. The objective is to create a new information system that would help the company to have a smooth business operation. The system would contain functionalities that would allow the employees to manage their customers and services and track their inventory and sales invoice. The finished product will be tested and evaluated by Cruven Auto Specialist. Agile Methodology would be used to create this system.

**KEYWORDS** - Inventory, Sales Invoice, Auto Repair, Software Development, Agile Methodology

## INTRODUCTION

Cruven Auto Specialist is an automobile shop founded by Mr. Carlo D. Cruz. The shop has been operating for more than ten years. They provide various repair services such as mechanical services, suspension alignment, air-conditioning services, etcetera. Cruven Auto Specialist has two branches in Metro Manila: Crame and Makati. Cruven considers itself as a small company but has plans on expanding in different areas aside from Metro Manila in the next 5 to 10 years.

The researchers analyzed the day to day process of Cruven Auto Specialist for a period of three semesters. By analyzing their business process, the researchers were able to identify problems such as data inaccuracy, data loss, and unauthorized manipulation of data in their service and inventory management. It is considered to be vital because any inaccuracy in the inventory might cause loss of profit and delays in service.

## LITERATURE REVIEW

### On Inventory System

In any type of business venture, it is important to keep track of all products that will be used for consumption. Tracking of inventory is essential because of how it can reduce the data redundancy, data loss, and inaccuracy of data. It can also lessen the work of the users in terms of having an automatic computation of data.

There are four reasons why Auto Shop Management Software matters, according to Luke Folsom [1], which are also relevant to the researcher's system. The first reason is that the Auto Shop Management Software can keep track of all your inventory. In addition, you can print the inventory report to see what you really have in your Auto Shop inventory. The second reason is to find software that really fits or necessary for your auto shop. This is because there is no shop software that has all the utilities you need for your shop. The third reason is a built-in time clock is another important factor in choosing software for your auto shop. This is to keep track of the ins and outs of the products and services which will many hours of manually adding up timesheets. The fourth reason is to have a system that can keep track of both customers and vehicles separately and together. It is important because the more you have information about your customer and vehicles, the better the business decision can be made.

According to KJ Henderson [3] from his article, "What are the Benefits of Using a Computerized Inventory System?", there are 3 major advantages of using a computerized inventory system. To begin with, the first advantage is time savings. This is because, with a computerized inventory system, the manager would not have to manually monitor and record inventory. In addition, the master inventory list will always be updated with every transaction made. Moreover, the second advantage is accuracy. Accuracy has a big role in recording transactions. It is important for a manager or a staff to accurately input the records in the master list. With the help of a computerized inventory system, the manager will not have a hard time recording transaction because of the generated formulas created in the system. Finally, the third advantage is consistency. It is also important for a master list of inventory system to be organized. In addition, feedbacks, transactions, and other documents must be uniform in their presentation. Also, it can create a professional presence, which can help to impress associates and investors.

### On Agile Approach

Agile, also known as "*Extreme Programming*", focuses on the concept of incremental delivery and continuous improvement, according to Somerville [2]. It follows a step by step procedure. With this said, it breaks down the stories to segregate tasks. Furthermore, it helps the researchers to focus on one story at a time, which can also help in refactoring -- looking for possible improvements to the software and implements them immediately.

It also involves the customer by gathering data and information from them and keeping them updated on the work done. The agile approach also involves having a frequent face-to-face meeting to work together throughout the entire project and to easily transfer information to each developer. Also, it focuses on developing a simple, sustainable, and efficient system which can make the clients understand and operate the system with ease.

Moreover, if an agile approach is adopted to develop a system, the first increments are known, but the development of the later increments can depend upon progress and client priorities. Furthermore, in the agile approach to software development, the design and implementation stage the central activities in the software process.

## **METHODOLOGY**

The method that the researchers will use in the development of the Customer, Sales and Inventory Management System for Cruven Auto Specialist is the Agile Approach. The researchers will be employing this methodology because it gives transparency for the developers of the system and the client about the status of the project by regularly setting meetings. It also allows the researchers to improve and implement changes throughout the development process based on the customer's feedback. In relation to this, the researchers also base their refactoring on understanding the client's current problems and providing a simple and suitable system for them. Furthermore, through using Trello application, the tasks, which are divided into three Sprints, are given to the researchers with deadlines to deliver work progress in the shortest possible time span. It presents what was already done and what should be finished. Also, the researchers frequently meet to work together, face-to-face, throughout the entire project.

Moreover, the researchers opted to use programming languages based on their expertise and capability. The researchers will use JAVA and Javascript to program the methods and objects to define how the system should work. In addition, CSS will be used to design the front end of the system; making the system simple and user-friendly. Lastly, the researchers will be using MySQL to store data.

## **RESULTS & DISCUSSION**

The researchers created a system that is based on their current day-to-day process. This system would contain the following: account database— where the admin keeps the records of their employees, customer database— where the user of the system stores the records of their customer, inventory database— where the user could keep track of the products in stock, service request processing— user of the system could process a service request for a customer, restock processing— user of the system could process a restock of product and, sales invoice processing— user of the system could process a sales invoice for a customer.

Cruven Auto Specialist's day to day service process starts with the verification of customer. The secretary verifies whether the customer has an existing profile or if it's a new customer through the use of Microsoft Excel. This is an identified problem because it is prone to data loss and it is an unorganized way of storing files.

The company only accepts walk-in customers because sometimes the customer who schedules an appointment does not show up. If the customer does not show up, the mechanic reserved for the customer would be stalled. The secretary usually assigns a mechanic and reserves it for the customer with the appointment. Due to the secretary doing everything in the process, the secretary would lose track of the appointments.

The secretary is the only person who has authorized access -- aside from the owner -- to handle the processes such as managing customers and service requests. This factor may result in a bottleneck because the secretary could only handle one customer at a time. The secretary also keeps track of the inventory by physically counting each item in stock. This process might cause inaccuracy which is a problem. If there is an inaccuracy in the inventory, they might perform a service wherein they lack needed supplies are in the Excel sheet but not in stock. Untimely restocking will delay the service.

The secretary is also in charge of issuing the sales invoice after the service is rendered. This sales invoice serves as a warranty for the service, which is honored in any of their branches. This may cause a problem because it is fairly easy to fake a sales invoice, as no record of the service rendered is readily available to all the branches. Consequently, if the customer loses the sales invoice, the other branches will have to contact the branch who catered the services to ask for the customer details and their invoice to confirm details of the supposed service rendered.

To address the problems identified above, the researchers designed a system with functionalities to be delivered in three sprints.

### **First Sprint**

To reduce the bottleneck of the waiting queue for the customers in a branch, the researchers started working on the user accounts and customer record management components. The former allows the admin to create employee accounts and grant them access to the system; the admin could also disable and enable an employee account. The latter is the component where employees could create and update customer records to keep track of their customers.

### **Second Sprint**

On the second sprint, the researchers added a new function where employees could create a service request for a customer. After checking on the customer's vehicle, the services and products to be provided by the company would be listed in the service request; this would help the company monitor their products from their inventory that they are using and the progress of the service. Once a service request is processed, the products that were added in the service request would automatically be deducted in the inventory.

### **Third Sprint**

On the last sprint, the researchers focused on inventory and sales invoice. The researchers created a function where the system would display the availability of the products in the inventory. If the product is running low in stock, employees would have to send a restock request to the admin. The admin would have to check the inventory before performing the restock. This way of keeping track of the inventory is more efficient than doing a physical counting, through this, it would eliminate the inaccuracy of data in Cruven's inventory. The researchers also created a feature where the sales invoice could be generated from the service request. Through the use of this system, it would be easier for the employees to monitor the sales invoice. This way of keeping the records is more effective because it reduces data loss. The researchers also managed to create a feature where employees could view the data of other branches of Cruven.

During the development of the system, after every sprint, the researchers performed functionality testing where the researchers tested the functionalities one by one to check whether the system conforms to the system specifications and user requirements before presenting the system to Cruven for them to test it out themselves. The feedback and suggestions from Cruven were considered in the development for the next sprint.

### **Entity Relationship Diagram**

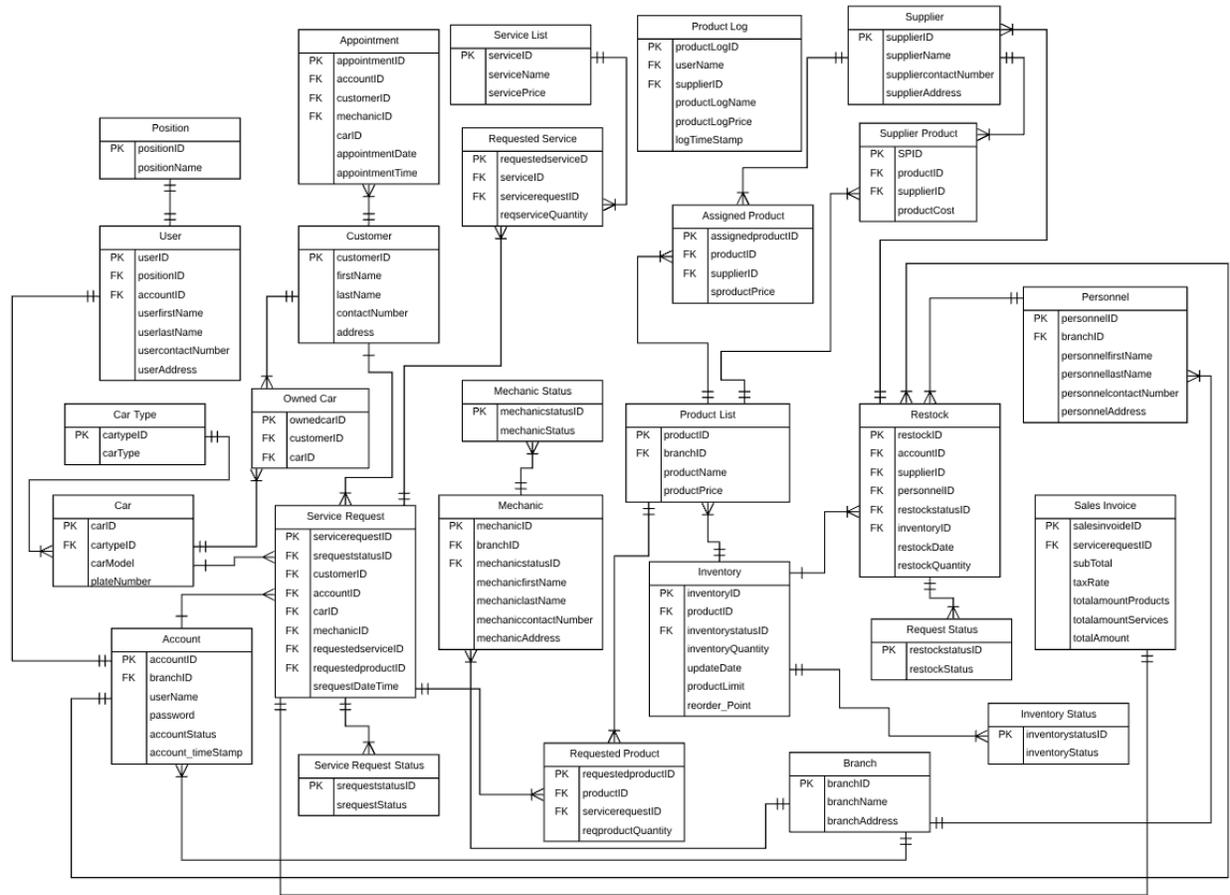


Figure 1. Entity Relationship Diagram

**CONCLUSIONS AND RECOMMENDATIONS**

The researchers studied the day to day process of the company in order for them to break down the problems experienced by Cruven. The company experienced understock, overstock, and depletion in its inventory, which originally was recorded in an Excel spreadsheet and on paper. This may lead to a huge profit loss because if there is an oversupply in the inventory, there are chances that not all the products would be sold to customers thus losing money. They also experienced unauthorized data manipulation in their customer, service, and sales invoice records due to the fact that they store their records in an unsecured spreadsheet. The researchers were able to create a system through the use of Agile Methodology. This system contains functionalities that would help Cruven to monitor their service and inventory management.

The Inventory and Service Management System developed by the researchers is the most suitable option in replacing the current system of Cruven Auto Specialist that solely uses paper and excel spreadsheets to keep track of their data and their products. By using the inventory and service management system, errors such as the loss of data, inaccuracy of data, and unauthorized manipulation of data can be avoided. For the users of the system, the researchers recommend that they need to be trained on how to properly use the system to familiarize themselves with the new process. This training would help the current and future employees of Cruven Auto Specialist avoid any inaccurate information being stored in the new system.

**Table 1. Mean Score of 3 Sprints**

Criteria	Mean Score
Ease of use	4.67
Nice UI	4.33
Reliability	4.33
Security	4.67
Efficiency	4.67
Completeness of Function	5
Completeness of System	5
Readiness for Deployment	5

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