

Development of a Real-Time, Secure and Reliable Automobile Service Center

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ABSTRACT

Lack of ambition will prevent you from moving forward in life, as much like a car without petrol. The majority of people on earth is obsessed with automobiles. We have provided you with a web application for Real time automobile service that functions effectively on all the platforms. Occasionally, automobiles and other motorized vehicles require maintenance. They must be maintained clean, just as humans practice proper hygiene. They run on dirty streets and in polluted environment. They are subjected to loads that harm them since they travel on uneven roads with obstacles. Therefore, it is necessary to maintain automobiles and other motorized vehicles on a regular basis. This project aims to keep service centers running smoothly in terms of things like vehicle maintenance, customer quotation generation, vehicle servicing, spare parts sales, customer information, and customer feedback. The system is efficient at generating reports that will make service center routine maintenance easy. Additionally, it can handle car repairs, insurance, payments, delivery, etc. This project will be very helpful to customers who want to fix or repair their cars. As a result, we develop a software that is both compatible and unique.

Keywords-- Automobile Service Management, Secure and Reliable System, MVC Adopted Design, Token Based Security Design

I. INTRODUCTION

Over time, technologies have continued to have an influence on society, raising the overall standards of the living. People should follow the technology and think ahead because without technology they will find some

difficulties. The present technology has an effect on the country itself, so if the country lives without technology, it is called undeveloped country. Automotive industries have been extremely growing recently, especially for car. Automobiles are highly complex machines and ones which need to be maintained to keep them running smoothly and efficiently. Regular maintenance should help to keep you on the road and often you will find that it is maintenance that you can easily do yourself which can be rewarding and help you to make big savings. As I'm seeing this problem day to day life. Having my own personal car I realized the maintenance of it, is much more necessary.

There were several issues with the outdated manual system. The process of storing, preserving, and retrieving the information was exceedingly time-consuming and labor-intensive because the entire system had to be maintained manually. The records were never kept in a structured manner. It used to be quite difficult to connect each specific transaction with a certain context. It was necessary to go through the various records for information because report generation never existed for papers. Every time records are entered or retrieved, time is wasted in an unwanted manner. Another issue was that it was exceedingly challenging to spot mistakes made when entering the records. Since there are currently more cars in Sri Lanka than ever before, more cars will need to be serviced at the technician shop. The current situation will influence a chain at the repair shop. The problem of lengthy waits and queues can become quite significant eventually. Any vehicle client can use this website to locate local help centers or carports, contact them, and reserve an available slot with the selection of the necessary services. Customers will know after making the

reservation for sure how long the adjustments will take and how much they will cost and also have access to a FAQs section to aid them with any questions.

This is due to the fact that managing a business requires keeping track of a lot of information, which is why we have included features. Even though the current method is computerized and partially automated, helps to run the organization smoothly and efficiently.

The rest of the study is organized in the following manner. The Goal of the Service Center is outlined in Section 2. The Literature Review of Adapted Methods and Technology of Service Center is summarized in Section 3. Methodology for the Service Center System is found in Section 4. The proposed System is described in Section 5. Discussion about service center is found in Section 6. Finally, Section 7 summarizes the improved service Center and offers suggestions for additional research.

II. OBJECTIVE

Anything can happen on isolated highways, so it's important to take the right precautions to prevent such situations. Therefore, you should inspect your automobile on a regular basis for hidden issues such a damaged battery, loose belt, or broken hose. Maintaining your car properly can not only guarantee its dependability and safety but may also improve fuel efficiency. Simple and Regular maintenance might save you up to \$1,000 year, according to the [6].

- To resolve the current framework concerns and reduce the time utilization for vehicle maintenance.
- Portable across various platforms.
- Consumers may see every charge for the services they have chosen due auto-billing system.
- Consumers can get in touch with any city help center online
- Better Description about the Products and Services Offered

Maintaining vehicles helps to protect the general public, as well as the comfort and safety of passengers and drivers.

III. LITERATURE REVIEW

Data from a number of sources are included in the survey on this system. These sources range from some websites to IEEE publications to related research papers.

A study article [1] provides an illustration of how to run an automotive center, and the analysis of numerous websites, including Car Service Station, Vehicle Service Station, and Automobile Service Station which were very helpful in the development of this project in terms designing of modules, diagrams, etc.

Upon booking, the mechanic may view the list of outstanding requests, as shown in the study report [2]. From the booking list, they pick up the owner's car during their free time, do the necessary repairs, and then return to owner's location and payment is done via online or at that instance. By assisting consumers and preventing service center overcrowding, this concept makes the service center even more portable.

According to the study report [3], road assistance and one-stop services are sometimes provided when a customer's automobile breaks down in the middle of nowhere. In these situations, a repairman is dispatched to the scene to fix the vehicle, and payment is made either on the spot or online. By assisting consumers and gaining their confidence, this concept makes the service center even more portable.

The requirement for automotive servicing and how it affects consumers' relationships with their cars is discussed in the research report [8]. This idea helped us understand the system's uncertainty by illustrating functionality of auto service centers operate and assist consumers. This motivated us to deliver a high quality product to end user by meeting their needs and wants.

According to the study paper cited above, the following factors are highly important to the system;

- Guarantees of authentic parts, service warranties, and simple service progress monitoring
- Offers time slots for automobile maintenance
- Auto billing.
- FAQs for all questions.
- Road Assistance
- Chat Bot Assistant and Instant Chat
- Directions to the nearby service.
- On Spot Service for vehicles.

IV. METHODOLOGY

This Automobile Service Center was created using the software design pattern known as Model-View-Controller (MVC). A Model View Controller pattern is made up of the following three parts:

- Model Layer- The lowest level of the pattern which is responsible for maintaining data. Processing data from or to the database. Only connected to the controller.
- View Layer- Displays visualization of the data to the user. Only connected to the controller.
- Controller Layer- Processes server-side logic and acts as a middleware between View and Model that is controlling the flow of data.

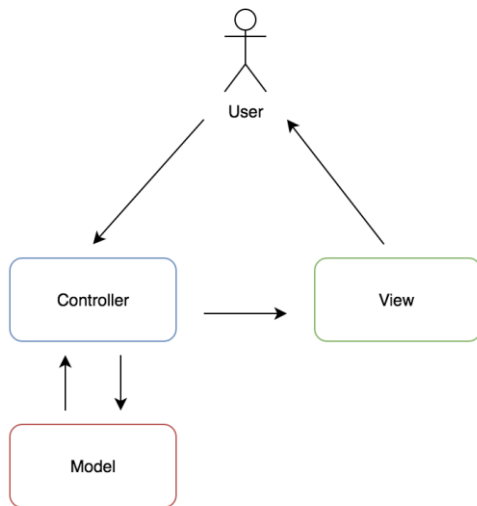


Figure 1: MVC Architectural Pattern

MVC is well-liked because it facilitates the separation of tasks and isolates the application logic from the Frontend. In this case, the Controller Layer takes in all requests for the application and collaborates with the Model Layer to prepare the data sets that the View Layer needs. The View Layer then creates a final presentable response using the data that has been prepared by the Controller [5]. The figure 1 illustrates how the MVC abstraction works.

The project has been planned to be having the view of distributed architecture, with centralized storage of the database. Using the constructs of MERN Stack and all the interfaces have been designed using the React, Express and Node.js technologies. The database connectivity is planned to use the “MongoDB” methodology [4]. The standards of the security and data protective mechanism have been given a big choice for proper usage [7]. The application manages many sections and the reports that go along with them. In addition, the system has been implemented using a number of different tools. They are;

- Azure Boards - For scheduling features, tasks between team members, and management of the project
- GitHub - For simple branching and merging of the project's whole codebase among team members (version control management)
- SonarQube - For continuous inspection of code quality
- Selenium - For testing the system

A. Features Of The System:

a. ADMIN Module

- View, modify, remove, add, or retrieve customer information

- View, modify, remove, add, or retrieve stock information
- View, modify, remove, add, or retrieve service information
- View, modify, remove, add, or retrieve payment information

Note: Log in as the administrator to gain access to the aforementioned features

b. USER Module

- View and retrieve customer information.
- View, retrieve and buy stocks.
- View, retrieve and consume services
- View and enter card information

Note: The aforementioned capabilities can be accessed by the user without user authentication.

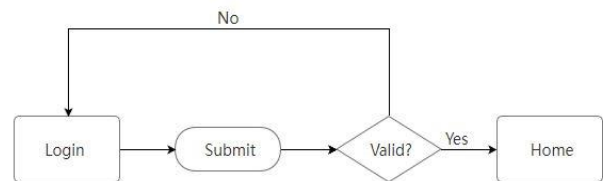


Figure 2: Flowchart of login process

The two roles in the system are customer and administrator. Upon logging as an administrator, the submitted information is compared against the database's data. As figure 2, after successful attempt, the administrator can continue and obtain access to a number of the module's functions. The frontend admin routes are secured using the tokens received from the backend to frontend and validated against the system roles, while the backend admin routes are secured using JWT token-based authentication. For the aforementioned admin-related functionality, a backend connection has been established as mentioned in figure 3. Data remain consistent across the system, and any necessary modifications are communicated to users via the frontend user interface.

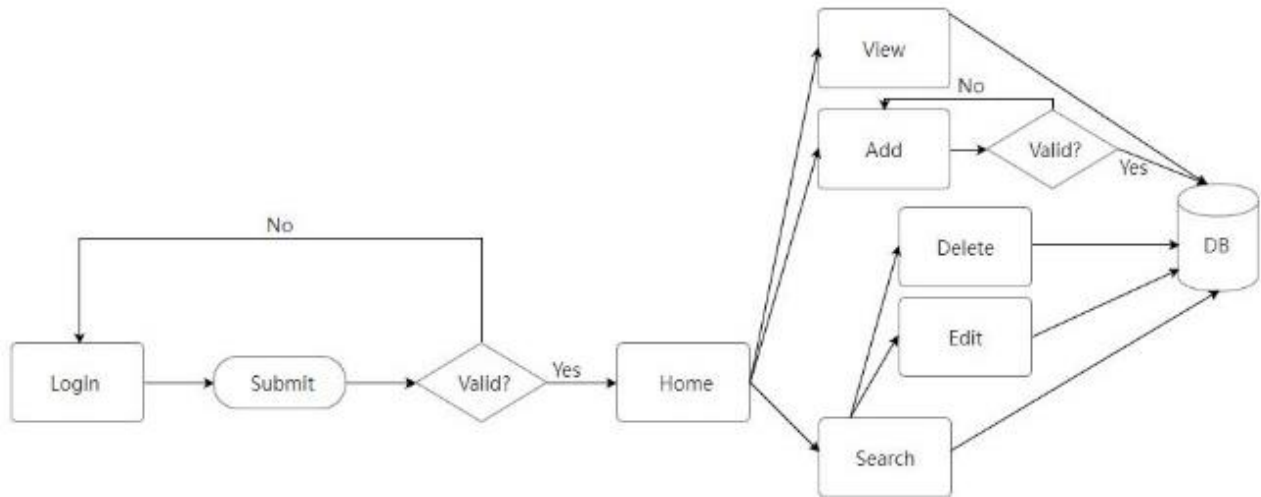


Figure 3: Flowchart following successful Login

V. PROPOSED SYSTEM

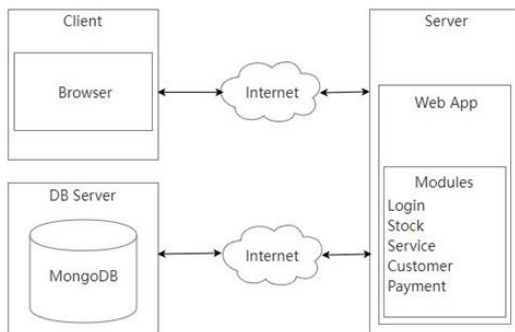


Figure 4: Overview of System

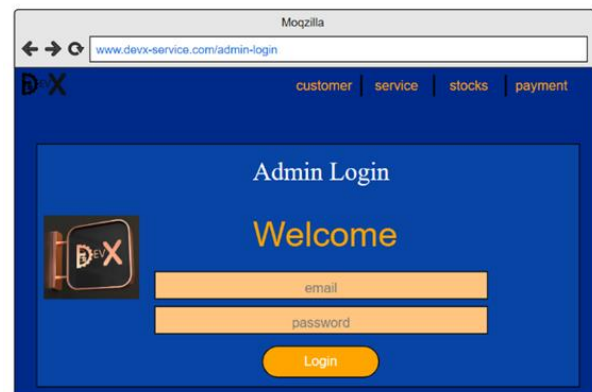


Figure 5: UI for Login Module

This project is aimed to developing a management system for a vehicle service station. The entire project has been developed keeping in view of the web-based application, in mind as mentioned in figure 4. The system is to create an e-information about the customers, vehicles, processes, and the personnel that are related to the service station. Through this application the customers, vehicles, and suppliers are registered and the service, stock and financial sector are managed. Administrators are the main authority who can do addition, deletion, and modification if required.

A. Modules

a. Login Module

The interface for system login by the admin is shown in figure 5. The system generates a token for controlling the database data after a successful login. The admin can access protected routes by using the token that is generated above.

b. Stock Module

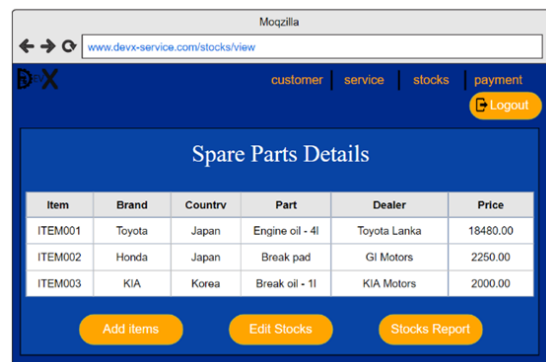


Figure 6: UI for Stock Module

The figure 6, is employed to manage stock details. This module allows for the system to add stock data, delete stock data that is kept in the system database, modify the system database's stock data, and acquire a thorough understanding of the stocks included in the database. Furthermore capable of printing the database's results. However, the customer has restricted access to viewing and adding consume services.

c. Payment Module

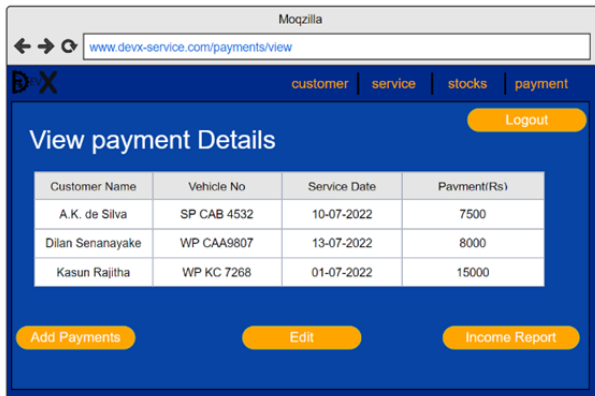


Figure 7: UI for Payment Module

The figure 7, It is employed to manage payment information. This module allows for the system to add payments, delete the system database's storage of payment data, modify system database-stored payment information and gain a general grasp of the people mentioned in the database who are paid. Furthermore capable of printing the database's results. However, the customer has restricted access to viewing and adding customer card details.

d. Service Module

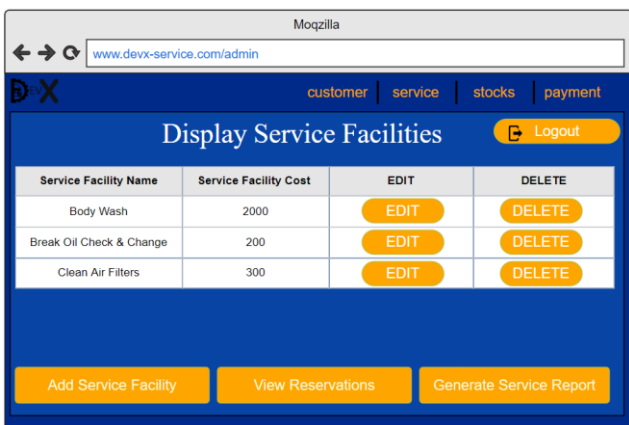


Figure 8: UI for Service Module

The figure 8, is employed to manage the Service information. This module allows for the system to add Services, delete the system database's storage of Services data, modify the system database's storage of Services data and gain as much as you can about the Services that are

included in the database. Furthermore capable of printing the database's results. However, the customer has restricted access to viewing and adding consume services.

e. Customer Module

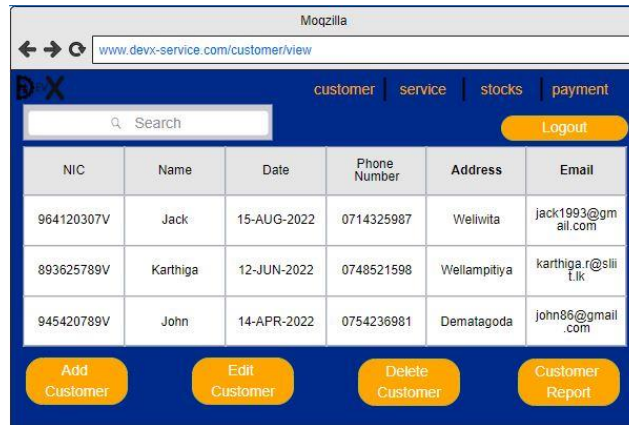


Figure 9: UI for Customer Module

The figure 9, is employed to manage the Customer information. This module allows for the system to add Customers to the Database, delete customer data from the database, modify customer data from the database, gain a broad understanding of the customers who are listed in the database, gain a general notion of the number of visits and most recent visit information for each client stored in system database and visualize the data graphically. Furthermore capable of printing the database's results. However, the customer has restricted access to viewing and retrieving customer details. In this Instance, Sensitive Data is concealed from view from the user.

B. Input Data And Validation Of The Project

- All the fields in Customer, Service, Stock, Payment module are validated and does not take invalid values.
- Each form in Customer, Service, Stock, Payment module cannot accept blank value fields
- Avoid errors in the form using Toast Notification.
- Integration of all the modules/forms in the system.
- Preparation of the test cases.
- Preparation of the possible test data with all the validation checks.
- Manually Tested Each and Every Module.
- Recording of all the testing using Selenium.
- Modifications done for the errors found during testing.
- Prepared the test result trends after rectification of the errors.
- Check Functionality of the entire module/forms.
- Checking of the Coding standards to be maintained during coding.
- Testing the module with all the possible test data.

- Testing of the functionality involving all type of calculations etc.
- Check for Bugs and rectifying Errors using SonarQube

VI. DISCUSSION

The idea of serving consumers properly by assessing their requirements and wants is straightforward, yet we had numerous issues about it during the project's development. They are;

- How effectively people use application in daily lives?
- When having their cars repaired, what are the clients' needs?
- Do you require vehicle service apps?
- When the application is operating, what is necessary?
- Is it possible for the application to raise the satisfaction index?
- When having their cars repaired, what are the clients' needs?
- Do you find the existing vehicle service application useful?
- How successful are the current car service apps?
- When the application is operating, what is necessary?
- What are the application's effects on customers—both good and bad?
- Do you require details regarding your cars estimated service costs?
- Which type of screen view would you prefer?
- Do you consider the Service Advisor's chat feature to be very helpful?

Everyone has a busy, chaotic existence in the current era of the modern period. As a result, people do not have any spare or free time to go to the garage and fix their cars. We have developed a thesis-based system by evaluating the aforementioned fact, however we are unable to discover every question that may be asked. Although we believe that we done our best to cover every element of the user activities, occasionally changes in technology may cause these assumptions to alter. We believe that more steps must be taken in the future in order to offer a comprehensive application that satisfies client demands and desires. However, this might vary from time to time, thus the final application is constantly subject to modification in order to meet demands and preferences. It can be summed up in a few words by saying that the project's future scope revolves maintaining information regarding:

- We can add Chat Bot Features to assist customer to handle in emergency situation.
- Use of instant messaging program that permits to use the immediate chat feature and connect to the service advisor online, simply click "Chat."
- Implement "PickUp Car" feature whenever the vehicle's owner, is unable to drive the vehicle to the service facility, use the "PickUp Car" option.
- Implement of application's mobile version.
- Improve Security
- We can give more advance software for Automobile Service Management System including more features
- Currently the Service runs on local machine, we hope host the platform on online servers to make it accessible worldwide
- Integrate various load balancing devices to spread the system's loads.
- Implement a backup system in place so that code and databases are regularly backed up on several servers.

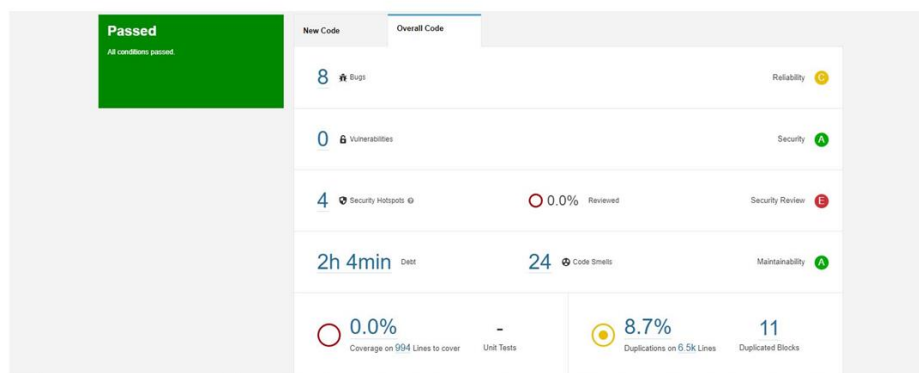


Figure 10: SonarQube Test Result

We utilized SonarQube to check the web application's code quality, and have reduced errors as much as we could while maintaining clean code as stated in figure 10. We anticipate reducing mistakes and improving security standards generally. We have left room for questions, allowing for the implementation of any additional system enhancement requests that users may have in the future. Last but not least, we would like to extend our gratitude to everyone who was directly or indirectly engaged in the construction of the system. We anticipate that by highlighting the process' success, the project will fulfill the objective for which it was developed.

VII. CONCLUSION

In this article, the current state of the vehicle service management system was analyzed, and issues encountered are optimized by offering remedies by utilizing new design and development techniques. This includes a thorough analysis of the foundations of the automobile service management system, as well as a full elaboration of the system architecture, function, and software as well as its placement in terms of hardware. Information system for managing the automobile service center is developed which is capable of gathering, storing, transferring, processing, displaying, and analyzing all types of data related to the sale of automobile service center in order to realize data sharing, staff collaboration, and process optimization of the sale of automobile service center, and improve the overall benefit of the automobile service center. In conclusion, data alteration is only possible if and only if the token is valid. Because the token is checked before to any action, we can guarantee the consistency and security of the system's data against vulnerabilities. In future, we plan to conduct a more thorough study of user needs in relation to the application to see whether they can be accommodated while retaining user simplicity and adopting the additional features mentioned above.

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