Operation of Vehicle Maintenance System in Context of Developing Countries Emphasizing Nepal

P. B. Jha [1], A. K. Mishra [2], & P. S. Aithal [3]

[1] Assistant Professor, Madan Bhandari Memorial College, Kathmandu, Nepal, Email: prod@mbmc.edu.np

[2] Associate Professor, Madan Bhandari Memorial College, Kathmandu, Nepal, OrcidID: 0000-0003-2803-4918; Email: anjaymishra2000@gmail.com

[3] Professor, Institute of Management & Commerce, Srinivas University, Mangalore, India, OrcidID: 0000-0002-4691-8736; E-mail: psaithal@gmail.com

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P. B. Jha [1], A. K. Mishra [2], & P. S. Aithal [3]

[1] Assistant Professor, Madan Bhandari Memorial College, Kathmandu, Nepal, Email: prod@mbmc.edu.np

[2] Associate Professor, Madan Bhandari Memorial College, Kathmandu, Nepal, OrcidID: 0000-0003-2803-4918; Email: anjaymishra2000@gmail.com

[3] Professor, Institute of Management & Commerce, Srinivas University, Mangalore, India, OrcidID: 0000-0002-4691-8736; E-mail:psaithal@gmail.com

ABSTRACT

Purpose: *The condition of the vehicle depends upon its maintenance. If there is a need of maintenance of a vehicle, then an optimum vehicle maintenance system is needed. This aims to develop a system for Vehicle Maintenance to facilitate the vehicle service through online access which is easy to use, simple, quick, and savvy.*

Design/Methodology/Approach: *This venture is a basic web application for a vehicle fix/administration shop or business. It deals with the provision of user request through user's information, location details, service details, etc. The main function of the system is to facilitate users through the best service with both pickup and drop off facilities. This task has a Public Module and Administrator Module using PHP Programming Language, Java Script, HTML, Bootstraps, and MySQL.*

Findings/Result: *The administrator module is the side of the task where could the administration at any point deal with every one of the information recorded/can't avoid being recorded on the framework. Here, the administrator has full command over the framework including mechanics and administration expansion. Just the administrator can add information into the data set. The information can be recovered without any problem. The client can present their administration demand at this side and the submitted solicitation will be set apart as forthcoming. This undertaking can assist with decreasing the time consumed by the two closures (The board and Clients) as far as dealing with their administration demands.*

Originality/Value: *An online system of maintenance with optimal time and minimized cost with the centralization data set has been developed to solve real-life problems.*

Paper Type: *Research paper*

Keywords: Centralization platform, Web application, Vehicle repair, Pickup and drop off

1. INTRODUCTION :

Quick urbanization has driven development of country regions to metropolitan regions in a short time frame raising the high demand of vehicle and its support components like roads, garage, charging station or petrol pumps [1, 2&3]. With the developing utilization of Vehicle, it has become essential for administrators to be completely acquainted with the administration of Vehicle. The expense investigation and the desire of embracing legitimate strategies fit to the circumstance are the essential elements for the achievement and in this way, there is a requirement for reasonable preparation, appropriate choice and prudent improvement of Vehicle [4, 5, and 6]. Connection with the circumstances to accomplish ideal use of Vehicle. Vehicle supervisor ought to facilitate with different wings of association in releasing his occupation of Vehicle upkeep. Subsequently, Vehicle the executives coordinates and constantly cooperates with human, specialized, monetary, and useful frameworks to accomplish high productivity and cost viability [7, 8 & 9].

An effective Vehicle management system helps to save time, minimize operation and maintenance cost, optimize utilization of Vehicle, lengthen Vehicle life, reduces interruption,

lower repair and maintenance cost and increase reliability and durability of Vehicle (Chitrakar, 2008: C. K. Gomathy and S. Rajalakshmi, 2014) [10, 11, 12]. The more muddled the hardware turns into; the more confounded turns into its support. Appropriate and orderly Support of Vehicle in individual life sets aside time and cash.

In this busy and growing world with full of luxury, people prefer their own vehicle. As the growth of desire and massive population, vehicles are added day by day. And in correspondence, there will be the service demand on the increasing rate. This system entitled as "VEHICLE MAINTENANCE SYSTEM (VMS)" is proposed to computerize the service and provide them service immediately with minimal cost. The Vehicle Maintenance Framework is intended for clients to supplant their current manual arrangement of the carport with online easy system. The project Vehicle Maintenance System includes user's request with necessary details along with address, storing their details into the system, status of the service and also provide final report. This venture is a basic web application for a vehicle fix/administration shop or business. This application gives an internet based stage to the said shop's clients or potential clients to present their administration demands. This undertaking can assist with diminishing the time consumed by the two closures (The board and Clients) as far as dealing with their administration demands. It has a straightforward UI and easy to understand functionalities.

Today's life is much busy and people are not able to spend time on vehicle repair. This may cause the system failure on the way and people cannot reach to destination on time. So, it is necessary for users to shift themselves from daily garage visits to online mediums for service that keep their lives running smoothly & successfully. The manual system is also extremely wasteful and a tedious cycle noticing the persistent expansion in populace and number of vehicles in the city. VMS has been intended to meet the necessities of the greatest and most requesting administrators in the country.

2. RATIONAL OF THE RESEARCH :

With the observation and interaction among maintenance provider and drivers/owners of vehicles in Cities of Nepal like Kathmandu, Biratnagar, Birjung, Pokhara. It was found the manual system for vehicle maintenance that is visiting to the garage for even small problem. The manual system is quite time consuming and less user-friendly. So, it was decided to work on this problem to overcome with effective online project. The motivation behind this venture is to mechanize or make on the web, the issues of the vehicle through solicitation and office of pickup and drop off. It has been attempted to plan programming so that client might not have any trouble in utilizing this bundle and further development is conceivable absent a lot of exertion. Despite the fact that it can't be asserted that this work is completely comprehensive, the principal reason for my activity converts the habit of manual visit to garage to the computerized way which saves time [6, 8, & 12].

3. OBJECTIVES :

The goal of the research is to develop software for Vehicle Maintenance Systems to convert manual garages in to the standard online cost-effective reliable maintenance system.

4. METHODOLOGY :

The proposed software product is the Vehicle Maintenance System (VMS). This venture is a straightforward web application for a vehicle fix/administration shop or business. This application gives an internet based stage to the said shop's clients or potential clients to present their administration demands. The on-going framework being used is a manual framework. It is very tedious and can't meets client's necessity. The goal of the proposed framework is to diminish after some time pay and increment adaptability in work through web-based demand. The cascade system is carried out in this venture since it assists with building the task in a straight way to accomplish objectives in light of the necessities of the business [13, 14]. It is a direct, successive way to deal with the software development lifecycle (SDLC) [15,16] that is well known in computer programming and item advancement. The waterfall model purposes an intelligent movement of SDLC ventures for a task, like the bearing water streams past the brink of a precipice. It lays out unmistakable endpoints or objectives for each period of improvement. Those endpoints or objectives can't be returned to after their fulfilment.

5. BUSINESS DEVELOPMENT :

The current framework is manual based and need part of endeavors and consume sufficient opportunity. In the present creating period, the quantities of vehicles are expanding in practically from one side of the planet to the other. In this way, offering productive support to every vehicle client is a difficult undertaking for carports in future. Furthermore, vehicle clients need to remain in line for getting administration. Utilizing this application, the client can find the close by dynamic carports/mechanics and speak with them to get administration out of luck. The motivation behind planning this application to work with the client as well as specialist co-op (for example carport) client will be benefited on the grounds that they not have to move the carport which at last saves the time, endeavors and cash. then again (for carport) number of clients increments which increment the turn over and give exceptional yield of speculation.

By keeping every one of the disadvantages of the current framework in the psyche new proposed framework have been planned. This comprises of three boards Client, Carport and Administrator. Client who needs to take administration from this stage probably enrolled them self by giving essential subtleties. After enrollment login will be required. They need to enter the vehicle enrollment number (Plate Number), approve the number for additional handling. They need to pick the kinds of vehicle, (for example whether 2 wheeler or 4 wheeler), running against the norm they can involve crisis choice in the event of fast help. Client needs to characterize the issue or issues in vehicle by picking the issues. Whether the client know the issue or don't have any idea (select likewise). Select the closest dynamic carport, posting the carport depends on the spot and the rating. Assessed sum for the chose issue will be determined and shown to the client; Client might go on for additional handling or can change the carport. Client may either come to carport or get the support of his area once settled on value; solicitation will be made to an individual carport.

5.1 Drawbacks Manual System:

Continuous observation and interaction with the garage owner and vehicle owner following drawbacks of manual maintenance system were found.

· More time consuming
· More strength and type of physical work required
· Frequent visit to the garage
· Difficult to manage if problem arises on the way.
· Difficulty in the update of the work completion and efficiency.

5.2 Existing Possible Applications:

Quality devices and strategies are the significant instruments which the association can use to work on its condition, whether in the help given to the clients, process, conveyance time, number of imperfections, and so on. There are numerous strategies that the association can decide to work on quality, like Total Quality Management (TQM) [17]. In this period of innovation, everyone needs their work done exceptionally fast and on fingertips. The quantity of vehicles continues expanding so it is troublesome errand for garage shop to offer speedy and productive types of assistance to their clients. The review with respect to this web application incorporates data gathering from different sources. These sources incorporate a portion of the carports administration application. Ola garage [18] is web application give the stage through which client can get administrations which incorporate a wide range of administration. Despite the fact that it is given by Ola however it isn't the case well known. "Serviceko" [19] is likewise an android application fundamentally implied for vehicle administration reason, it isn't completely evolved and presently not being used. The GUI isn't basic thus challenging to utilize. A few papers are utilized for knowing the benefits and hindrances of the recently proposed framework with watchwords on "Vehicle Administration Center Administration Framework" [20, 21, 22, 23, 24 and 25].

It is an android-based application which gives offices like Tell client to support, Next help portion, EMI mini-computer yet not offer support in out regions, no crisis administration when net will not accessible and mechanics not go outside for administration. In a paper named as "Vehicle Upkeep Framework". It is an electronic framework utilizing PHP, MYSQL, for clearing the ideas and calculations remembered

for this task such as Data Encryption and Decryption algorithm (DES) to protect password of admin and prevent from hacking [26, 27, 28, 29 & 30].

6. SYSTEM DESIGN DEVELOPMENT :

After the requirement analysis, the system is designed and the process of system design is represented by a highly detailed activity diagram and a database schema that is used for making the application.

6.1 System Design:

System analysis is a strategy for critical thinking that arrangements with the separating of a system into parts to concentrate on how well the singular parts work and collaborate to achieve their objectives. It includes the most common way of counting the current issues, dissecting the proposed system for expenses and advantages, investigating the framework and client prerequisites, and taking into account the conceivable elective system. System examination is significant in the plan of resulting systems. System configuration comprises of plan exercises that produce system details which fulfill the practical prerequisites that have been created in the system examination process. System configuration is essentially the primary execution of framework investigation. Framework Investigation is a division of a substance into parts for study and their execution and definite assessment. Prior to planning any framework, it is critical that the idea of the business and the manner in which it right now works are plainly perceived. The itemized assessments gives the particular information expected during planning to guarantee that every one of the client's necessities are satisfied [26].

The examination or the review directed during the investigation stage is to a great extent founded on the plausibility study. Maybe it wouldn't be inappropriate to say that the examination and attainability stages cross-over. Significant level investigation starts during the practicality study. However examination is addressed as one period of the framework advancement life cycle (SDLC), this isn't correct. Examination starts with system initialization and goes on during operation and maintenance. Indeed, even after fruitful execution of the system, examination might assume its part for intermittent support and up degree of the framework. One of the primary drivers of task disappointments is lacking comprehension, and one of the primary drivers of insufficient comprehension of the necessities is the lack of common sense of framework investigation [17]. It can be comfortable expressed as Admin panel which has an administrator that can erase any post and check client solicitation and reaction in like manner. Followed by Public panel where Public can browse all services without any account and request for the service. Public has to add all the information of the vehicle and location with contact. Public can choose one, either drop off or pickup for quick service.

6.2 Use Case Diagram:

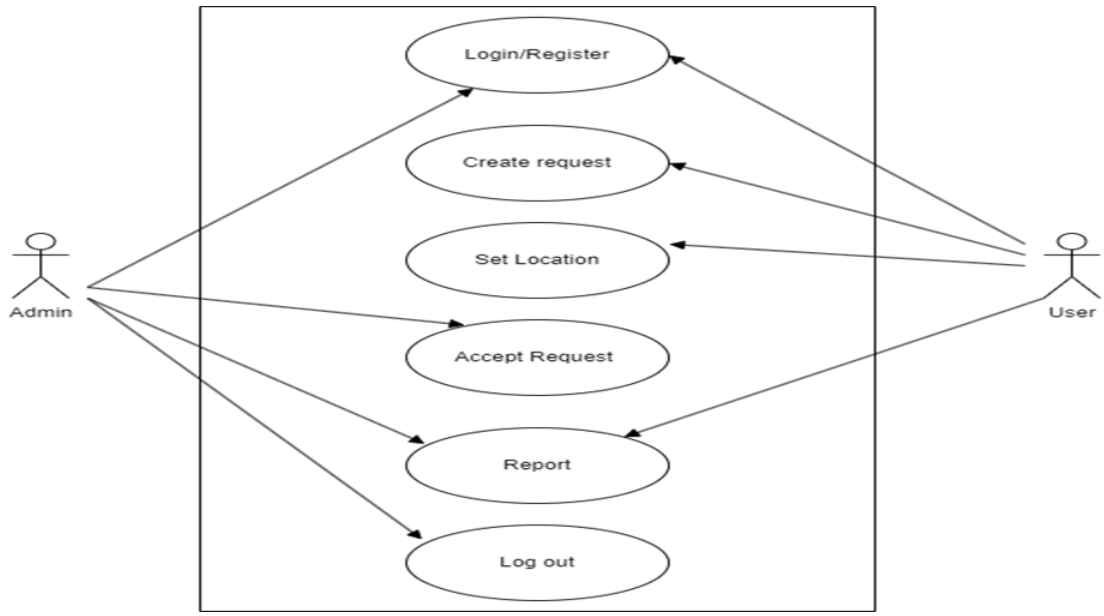


Fig. 1: Use Case Diagram for Vehicle Maintenance System proposed in this work

A use case diagram described by and produced using a usage case assessment (figure 1). Its inspiration is to present a graphical diagram of the convenience given by a structure concerning performers, their goals (tended to as utilize cases), and any circumstances between those use cases. Use case charts are authoritatively associated with two exhibiting vernaculars described by the OMG: the unified modeling language (UML) and the systems modeling language.

6.3 Object Modeling:

Class diagram as of figure 2 are by and large used in the displaying of article arranged frameworks since they are the primary UML outlines, which can be arranged clearly with object-situated dialects.

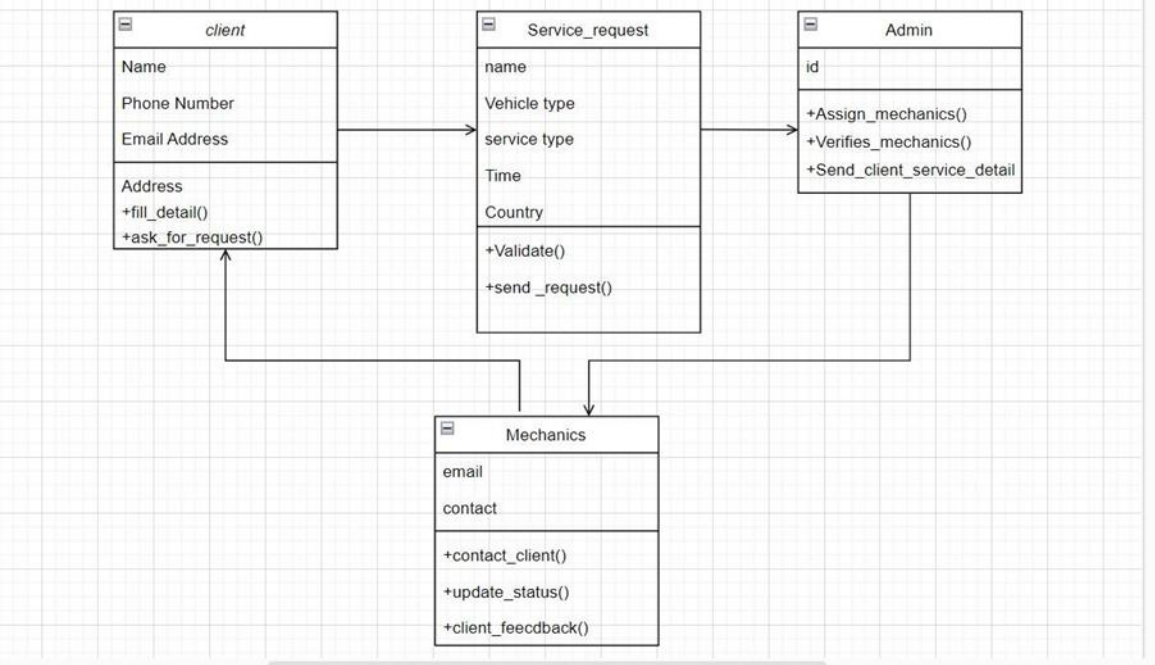


Fig. 2: Class diagram of VMS (Source: Authors)

6. 4 Dynamic Modeling:

Sequence Diagrams are interaction diagrams that detail how tasks are done (figure 3). They catch the interaction between objects with regard to a coordinated effort. Sequence Diagrams are time concentration and they show the request for communication outwardly by utilizing the vertical axis of the diagram to address time what messages is sent and when.

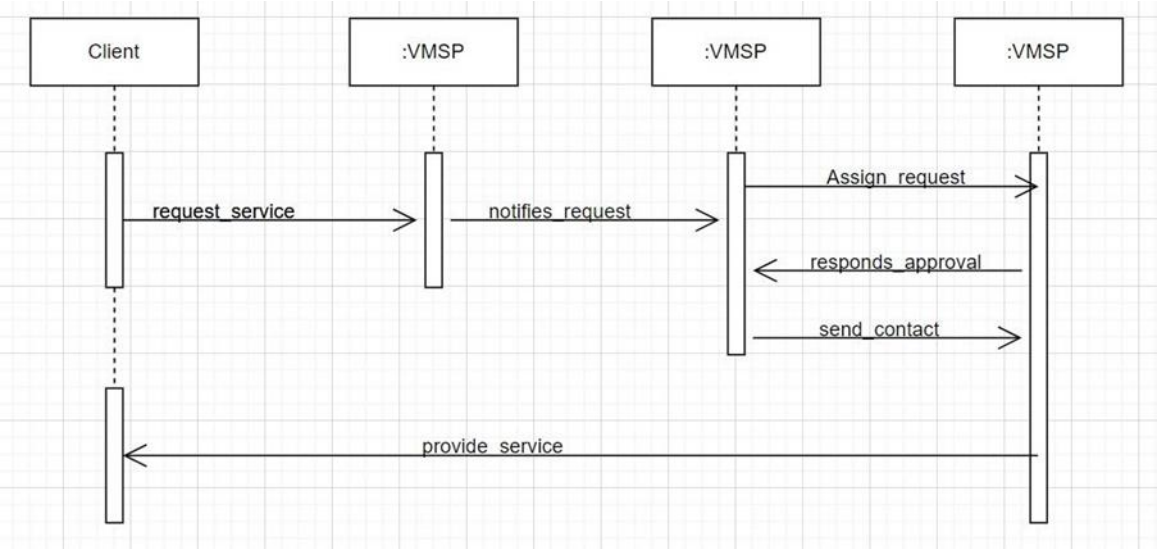


Fig. 3: Sequence Diagram of VMS (Source: Authors)

6. 5 Process Modeling:

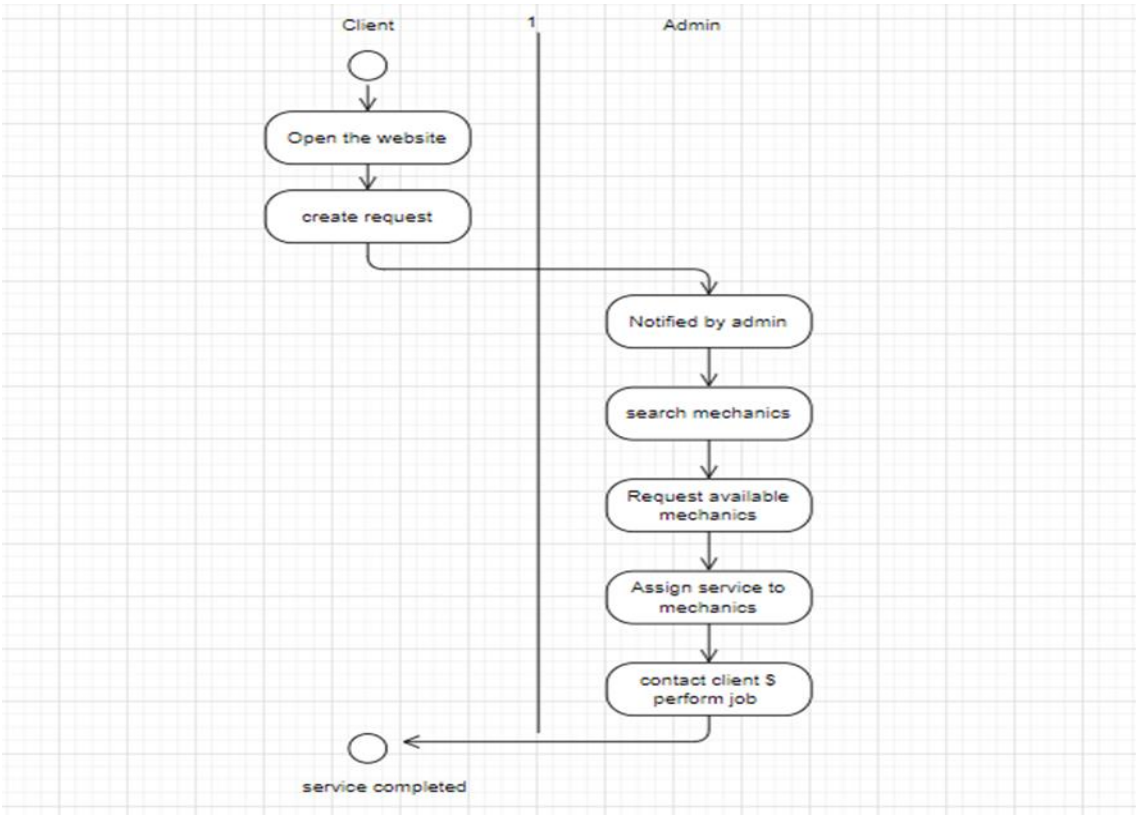


Fig. 4: Client Request Activity (Source: Authors)

Activity diagram is one more significant social chart in the UML diagram to portray dynamic parts of the framework (figure 4). Activity diagram is basically a high-level adaptation of stream graph that demonstrates the stream starting with one activity and then onto the next activity.

6. 6 Architectural Design:

The architectural plan of the proposed framework is displayed in figure 5.

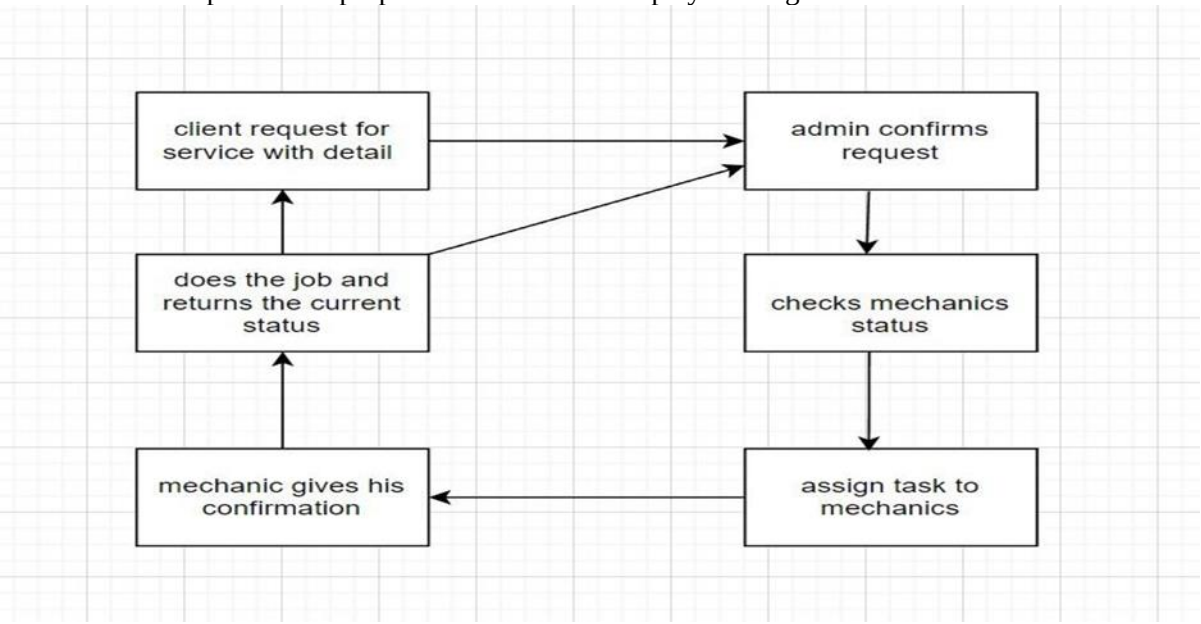


Fig. 4: Architectural design of the system (Source: Authors)

6.7 Database Schema Design:

The database schemas for VMS are depicted in figure 5.

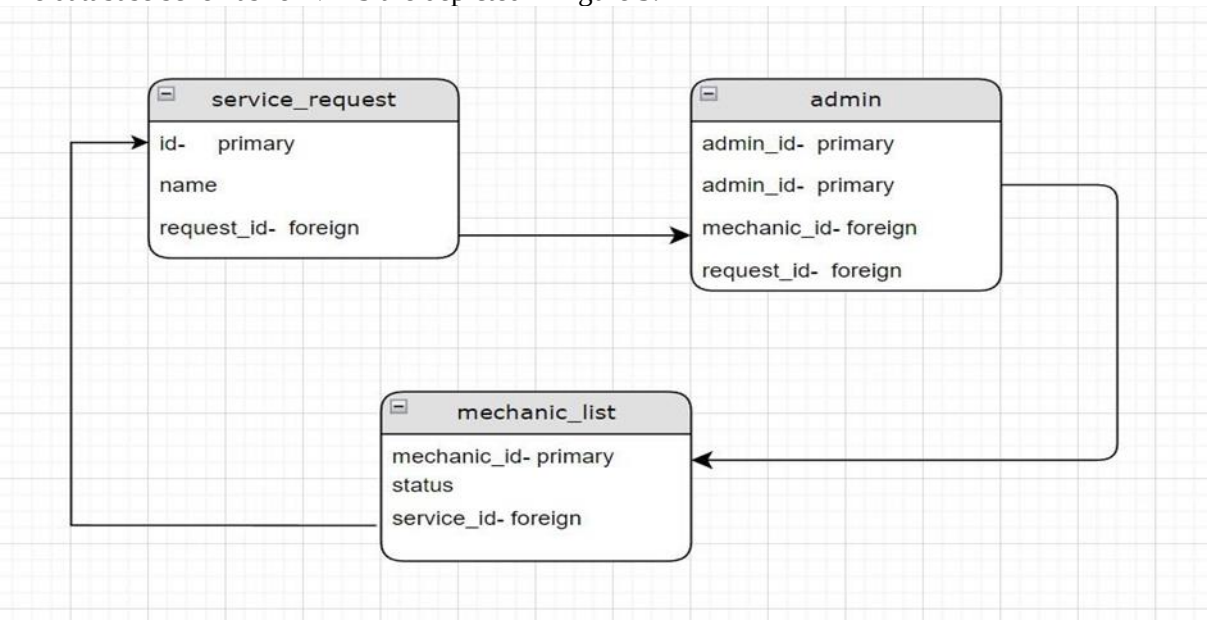


Fig. 5: Database schemas for VMS (Source: Authors)

6.8 Interface Design:

User Interface design of this system is generally referred to the visual format of the components that a client could connect with in a framework and technological item. User interface plans should not exclusively be alluring to possible clients, yet should likewise be utilitarian and made considering clients.

These squares are joined together by links without arrows. No arrows are needed as it is assumed that you can move forward and backward from screen to screen without limitations. Arrowheads would only be used if access to screens was one way only. The dialogue diagram of this system design as required for interface design (figure 6).

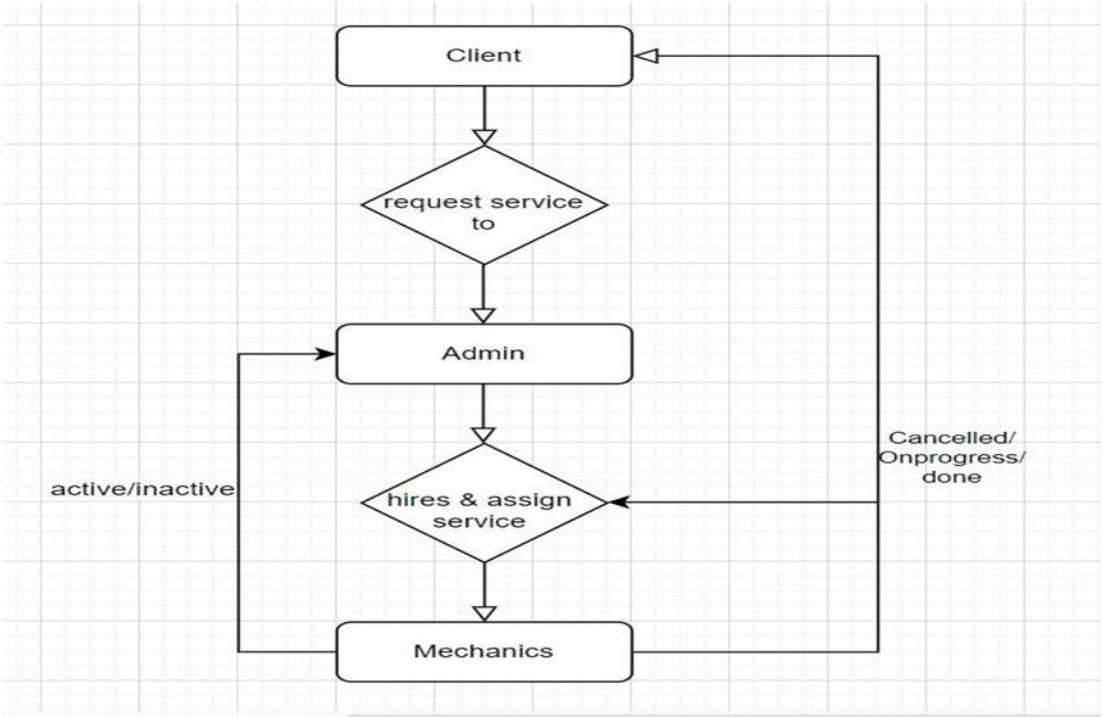


Fig. 6: Dialogue diagram for interface design (Source: Authors)

6.9 Physical DFD:

With the help of given Data Flow Diagram, we can understand how data secured as input gets converted as output (figure 7).

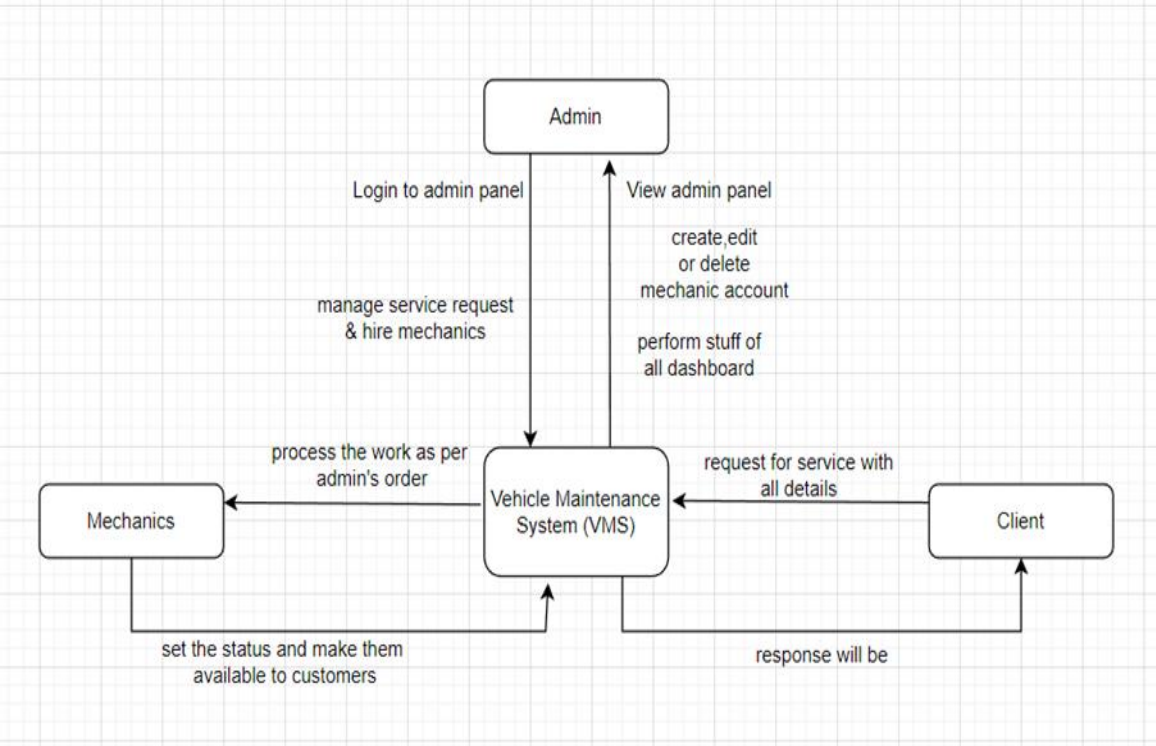
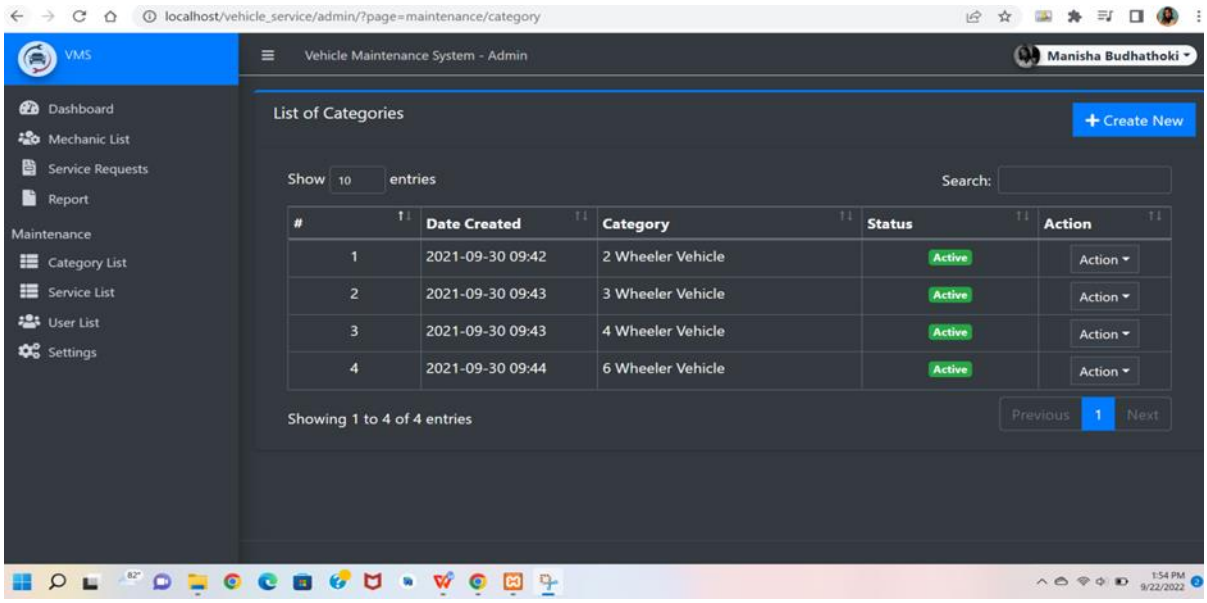


Fig. 7: level-1 DFD of VMS (Source: Authors)

6.10 Project Features:

The project features can be simply expressed through screen shoot and as admin panel and public panel as given below points (figure 8).



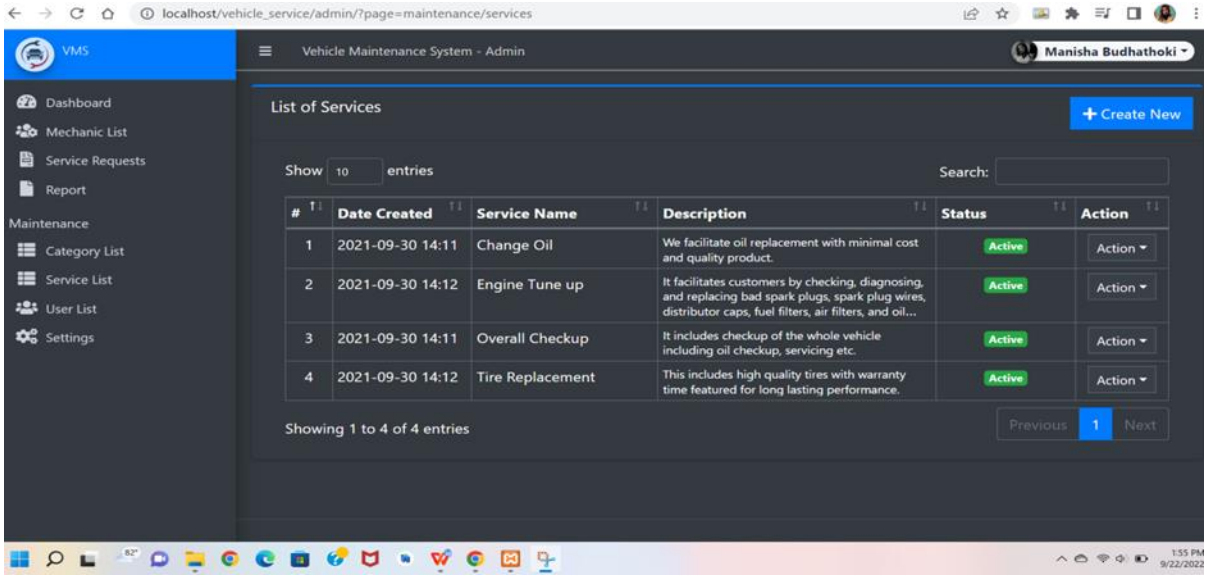


Fig. 8: Admin and Public Panel of the System (Source: Authors)

Administrator board

- Secure Login/Logout
- Landing page
- Oversee Repairman Rundown (CRUD)
- Oversee Administration Solicitations Rundown (CRUD)
- Oversee Vehicle Class Rundown (CRUD)
- Oversee Administrations Rundown (CRUD)
- Produce a Date-wise and Printable Report
- Oversee Client Rundown (CRUD)
- Oversee Site Data
- Oversee Record Certifications

Public Board

- Landing page
- Show the rundown of vehicle types/classifications that does the shop's obliges
- Show the administrations that do the shops give.
- Submit Administration Solicitations
- Show About Us Content.

7. TEST CASES FOR UNIT TESTING :

The software units in the systems are tested to ensure that each performs it (Tables 1 to 3).

Table 1: Unit Test Specification for Admin Login

S. N.	Test Conditions	Expected Result	Test Result
1.	Valid User Name and Password is entered	Admin Panel is displayed	As Expected
2.	User Name and Password is Invalid	Invalid User message box is displayed	As Expected
3.	if User Name or Password is not entered	Warns customer to fill the items in the list.	As Expected

Table 2: Unit Testing for Public Module

S. N.	Test Conditions	Expected Result	Test Result
1.	Add new Request enter customer's request with address submitted.	New Request is added successfully message box is displayed	As Expected
2.	If Vehicle type is not chosen.	Warns customer to fill the items in the list	As Expected
3.	If the customers email has no @ in it	Warns customer to fill the items in the list with @ validation.	As Expected
4.	If all fields not empty	Warns customer to fill the items in the list	As Expected

Table 3: Edit service list

S. N.	Test Conditions	Expected Result	Test Result
1.	Click edit button on which client request in recorded.	Open a editable information dialog box of client request.	As Expected
2.	Assign job to mechanic which you choose and submit	Update the request with mechanic assigned for work.	As Expected
3.	If no fields are empty than click update button	Updated Patient information message dialog box will be displayed	As Expected

As the piece of framework testing, we execute the program with the purpose of finding mistakes and missing tasks and furthermore a total check to decide if the goals are met and the client prerequisites are fulfilled. A definitive point is quality confirmation. Tests are completed and the outcomes are contrasted and the normal record. On account of mistaken results, troubleshooting is finished. Utilizing definite testing procedures, a test plan is completed on every module. The different tests performed are unit trying, joining testing, and client acknowledgment testing.

8. SYSTEM CONFIGURATION :

A significant component in building a framework is the segment of viable programming since the product in the market is encountering mathematical movement. Chosen programming ought to be adequate by the firm and one client as well as it ought to be doable for the framework. This report gives a nitty gritty portrayal of the product prerequisite determination. The investigation of prerequisite detail is cantered uncommonly around the working of the framework. It permits the engineer or investigator to comprehend the framework, capability to be done the presentation level to be acquired and relating connection points to be laid out. The Framework to be tried is the necessity documentation of the principal model of the board Framework. This model spotlights on the certain and the upkeep time cards and the introduction of the run framework succession. This may be a great imitative for the country whose economy seeks assistance from foreign donation [31 &32].

9. CONCLUSION :

This undertaking has been a compensating experience in more than one manner. The whole task work has illuminated us in the various regions. It has actually read up the issues for the vehicle during ride. This addresses what is going on. This data set plan has been fortified. This is on the grounds that to produce the last reports of data set planning must be appropriately followed. Booking an undertaking makes areas of strength for using time productively. Feeling of single work has created and certainty of dealing with reality, the project has expanded generally. In the event that we in a real sense suggest it, all things considered, it would be useful to the clients, a specialist organization.

The effectiveness of any framework is intended to suit the clients reliable collaboration during the execution stage and furthermore adaptability of the framework to adjust to the association. Vehicle Upkeep framework has been created to conquer the issues with the manual visit to the carport by the arrangement of on the spot. Benefits over conventional manual frameworks are on the web access throughout the system gives easy access to service with optimal time and minimized cost. As this system works with centralization, it helps to keep the customers details safely and helps as per the requirements.

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