United International **University**

Auto-Care System

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AutoCare System

Introduction

Why we are doing, this System is intended to help vehicle owners maintain and service their vehicles. Many vehicle owners go through a lot of trouble to keep track of their vehicle servicing. Sometimes they face difficulty with their vehicles because they did not service it timely. This is where our system comes in. Our system will keep track of what and when a vehicle was serviced. Also which part of the vehicle has been serviced. Based on that our system will let the owner know when the vehicle should be checked again. Also the owner can browse parts by themselves from the vendor database should the owner decides to change a particular vehicle part. There are also some features for the owners to enhance their experience with the system.

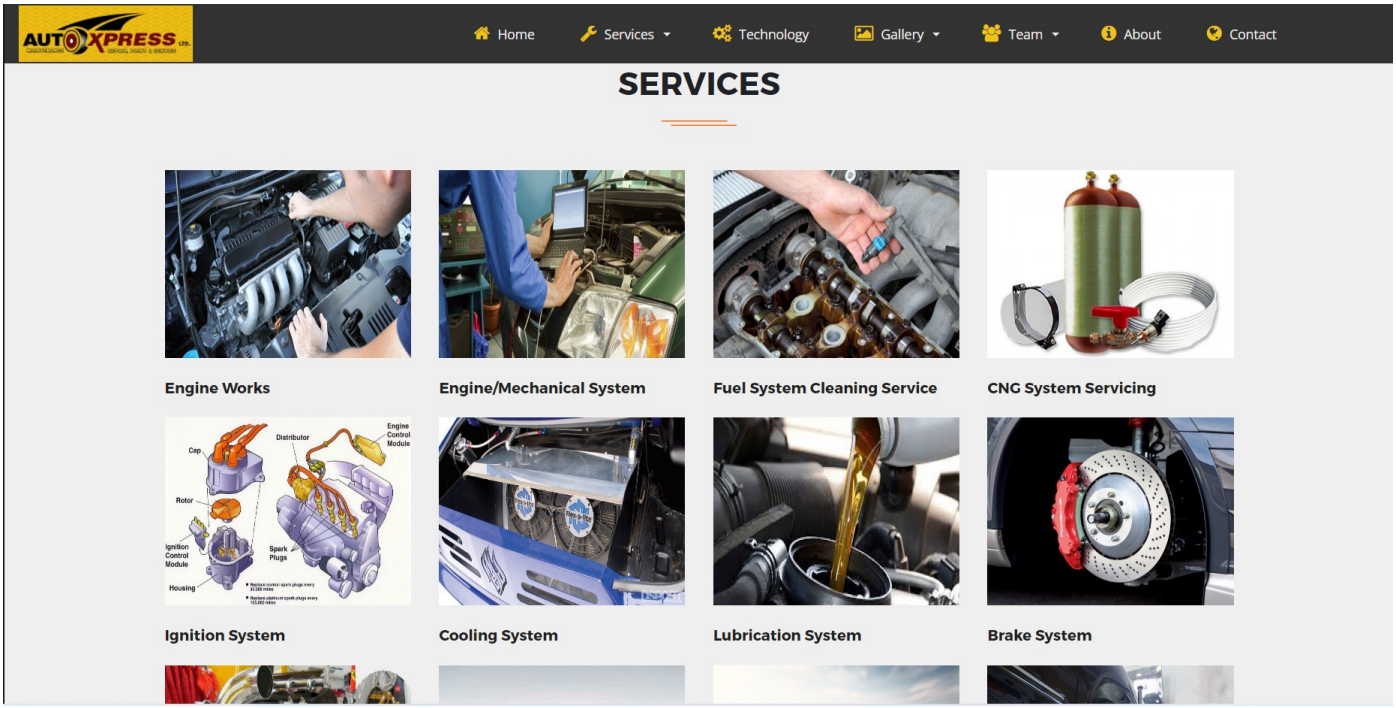
Motivation

At today's day and age almost everyone owns a personal vehicle, sometimes multiple. And every vehicle requires a timely maintenance to stay in tip top condition. Everyone has their specific maintenance needs of their vehicles. This is why it's a hassle for car owners to do repairing and reconditioning of their cars. AutoCare system is here to fix that problem. It acts as a bridge to the car owners and the service providers. It helps the owners get what they need and when they need. And the best part is they can get their services at their doorsteps if they want.

Information Gathering

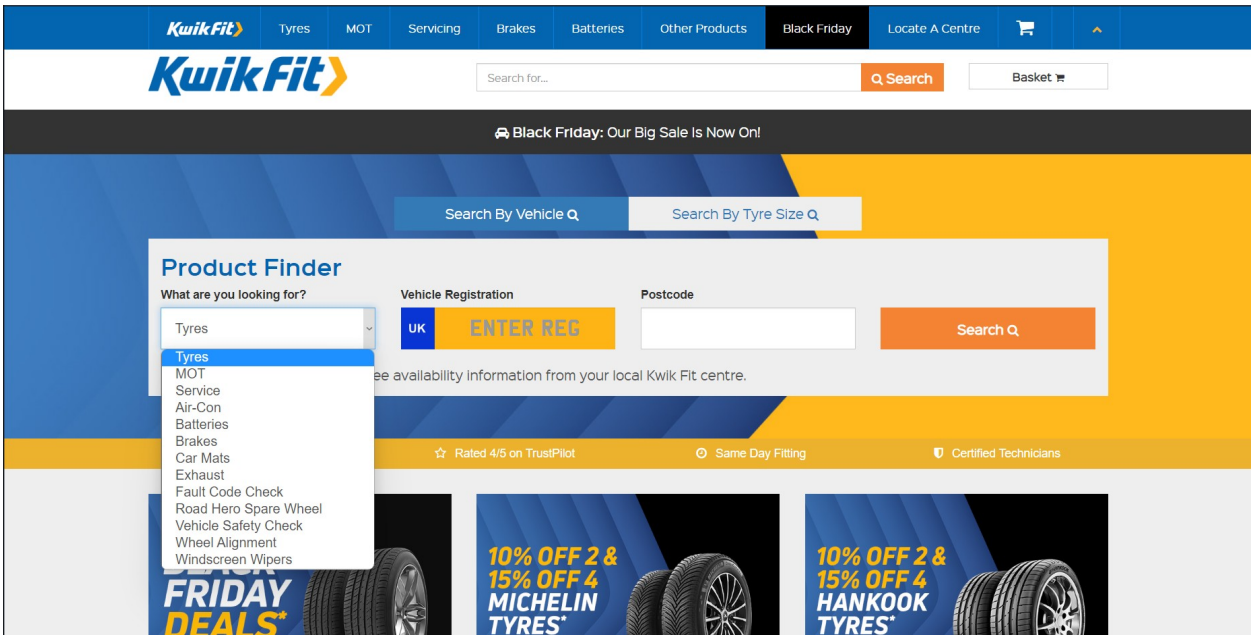
3.1 Benchmark Product Analysis:

Autoxpress:



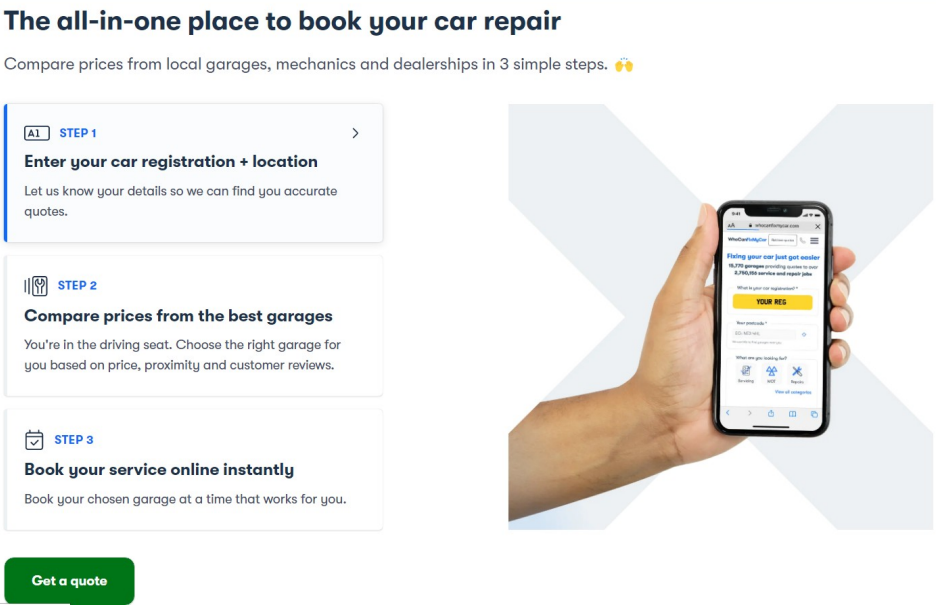
- Providing various car maintenance services e.g: car wash, brake pedal replacement, fuel system cleaning
- ASE certified technicians
- Scheduled maintenance service
- Option for multiple car servicing
- Customized services for clients
- Providing various car parts
- Providing a modern paint booth for custom paint jobs
- Computerized maintenance equipment

Kwik Fit(UK):



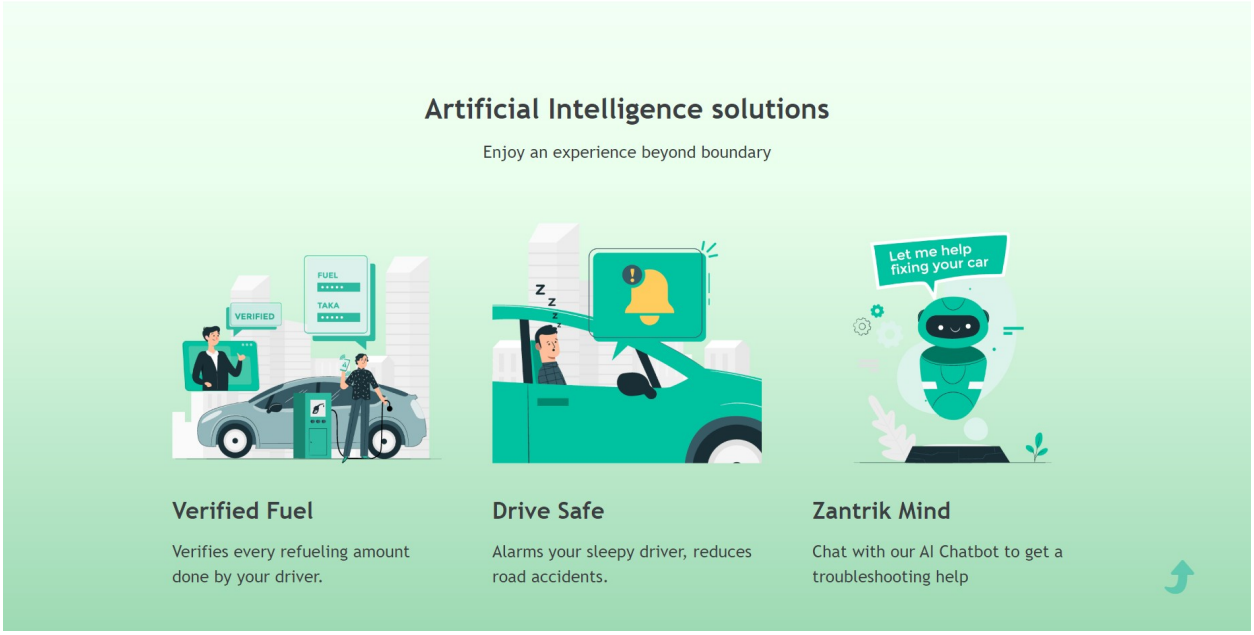
1. Providing various car maintenance services e.g: brake pedal replacement, fuel system cleaning
2. Exclusive Electric vehicle servicing
3. Package system for vehicle servicing
4. Detailed prices for each package and services displayed in the system
5. Vehicle service reminder
6. Online service booking
7. Option for multiple car servicing
8. Providing MOT test to vehicles
9. offer a genuine equivalent to dealership servicing
10. Providing various car parts

WhoCanFixMyCar(UK):



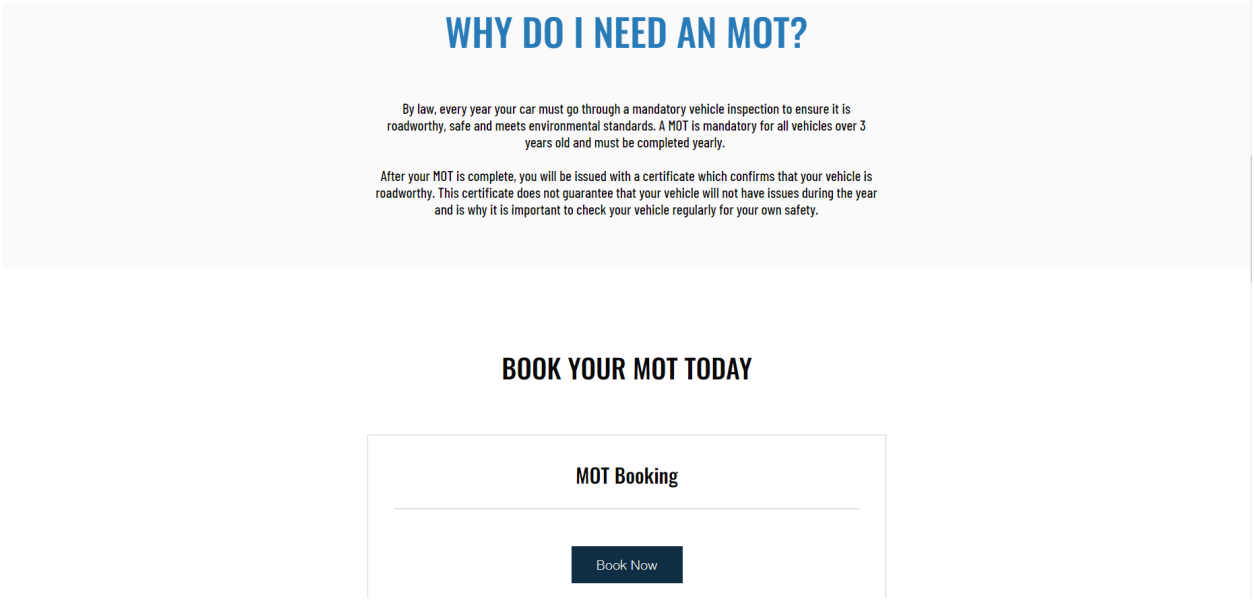
- Providing various car maintenance services e.g: brake pedal replacement, fuel system cleaning
- Exclusive Electric vehicle servicing
- Home service/Roadside assistance for certain car maintenance
- Online booking for services
- Service providers' price comparison
- User profile for individual vehicle owners
- Online service booking
- Easy to find vehicle owners to needs services for service providers

Zantrik



- Providing various car maintenance services e.g: brake pedal replacement, fuel system cleaning
- Online service booking
- Home service/Roadside assistance for certain car maintenance
- Artificial Intelligence solutions
- Customized maintenance schedule for vehicle owners
- Calculate cost using price chart

Sure Vehicle Center:



Providing various car maintenance services e.g: brake pedal replacement, fuel system cleaning
Providing MOT test to vehicles
Online service booking
Built in marketplace for used vehicles

FEATURES	Autoxpress	kwikfit	WhoCanFixMyCar	Zantrik	Sure Vehicle Centre
ADD VEHICLE	√	√	√	√	√
ADD MULTIPLE VEHICLE	√	√	√	√	√
USER ACCOUNT	X	√	√	X	√
ADD RECENT SERVICES	X	X	X	X	X
FIND SERVICES	√	√	√	√	√
FIND VEHICLE PRODUCTS	√	√	X	√	√
FIND SERVICING MERCHANTS	X	X	√	√	X
SCHEDULE SERVICING	√	√	√	√	√
MOBILE	X	X	√	√	X

SERVICES					
BECOME A VENDOR	X	X	√	√	√
SET TIMING FOR AVAILABLE SERVICES	√	√	√	√	√

3.2 On site observations :

On site observation of Navana workshop ltd.

Questionnaire:

- Does this system provide home delivery service?
- Is there any price difference between online and offline services?
- Does this system provide hybrid or electric car specialists?
- Does this system import genuine spare car parts?
- Does this system provide same day service?
- Is there an option for online appointments?
- Does this system provide 24/7 service?
- Does this system provide express services?

Output based on the questionnaire

Provides home delivery	√
Price differences in online vs offline	X
Hybrid or electric car specialist online/home	√
Imports Genuine Spare Parts	X
Same day service delivery	√
Online appointment	√
24/7 service	X
Express services	√

3.3 Research Paper Study

2.2 Car servicing loyalty

Early investigations on customer loyalty solely focused on the behavioral aspect, e.g. by examining the factual repeat purchase behavior of customers. This behaviorist measurement approach was built on proportions or sequences of purchase assumed to reveal underlying brand preference. (Cunningham 1956, p. 116) Conventional wisdom suggests that the best predictor of future behavior is factual behavior a customer performed in the past once or in terms of repeat purchases. (Kumar *et al*. 2003, p. 667) This approach was criticized for its lack of explanatory power and its isolated focus on factual behavior neglecting attitudinal aspects of customer loyalty. According to Jacoby and Chestnut (1978) attitudinal loyalty encompasses beliefs, affections and intentions. Concretizing these emotions, Oliver (1999, p. 34) defines customer loyalty as: "a deeply held commitment to

Impact of Connected Remote Services on Car Servicing Loyalty

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Vol.10, No.8, 2018

For the survey, conducted during the period of April and May 2017 in Germany, customers of four different brands, were addressed while waiting at the service counter or in the waiting lounge of the dealership. As a prerequisite, the participants should have owned and used a version of CRS in the past 6 months. The

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WEBSITE AND MOBILE APPLICATION FOR AUTOMOBILE SERVICE CENTER

1. Notification services to serve user better at the communication and acknowledgement end in order to provide timely report.
2. Garage information and its different aspect like expected time and money requirement for different services available.
3. Navigation system using GPS for pick and drop services.
4. Special request section like request for towing services.

International Journal of Engineering Applied Sciences and Technology, 2020 Vol. 5, Issue 1, ISSN No. 2455-2143, Pages 782-784 Published Online May 2020 in IJEAST (http://www.ijeast.com)

Thus, it is time saving as well as cost efficient application. So, we can conclude that it can be used to reduce human efforts and luxuriate human lives, hand in hand, with the modern technology.

IMPROVING VEHICLE SERVICE SCHEDULES AT AN AUTOMOBILE COMPANY

A. Lombard1, T.S. Hattingh1* and E. Davies

When a vehicle is booked in, if the parts needed for a specific service or repair are not available, the job on the vehicle cannot be completed which can result in inefficient technician utilisation and customer inconvenience. Not all parts are stocked at the dealerships, due to inventory policies and although the OEM manages fast-moving parts, this can become a concern for vehicle repairs where required parts cannot always be predicted or for older or rare vehicle models. The available information on vehicles scheduled for servicing is therefore not always compared with the dealer's parts availability, which adds to delays and therefore inefficiencies.

3.4 Online Articles:

3.5

Here's a different way to get your car an oil change: You make an appointment online, a mobile mechanic drives to your home or office to do the work, you receive an emailed invoice and you pay online.

Customers who have used this service have told the provider that it saves them the time that would have otherwise been spent at the shop and reduces the inconvenience of being without their vehicle while it's getting serviced.

This option is offered by OOROO Auto, an auto repair and maintenance provider with three shops in Arizona, in order to make car care compatible with people's schedules and lifestyles.

Survey:

Not applicable

■ Gap Analysis:

We've read a significant number of articles related to our project to learn more about vehicle service & maintenance. We discovered a lot of user's data as well as gaps between them. In this part, we addressed the flaws in our literature review.

1.There is no option for adding multiple vehicles for one owner on any platform.
2.There is no functionality in any application that automatically recommends the services based on the customer's vehicle condition.
3.None of the Application has the feature of keeping track of the latest service done to the vehicle.
4.There is no option for making a custom list of required replacements/services according to user response on any platform.

■ Final Feature List

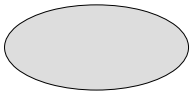
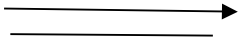
1. Vehicle user can open individual accounts
2. User can add multiple vehicles
3. Vendor can open accounts to list their products/services

4. Can suggest user for regular changes required
5. Keep logs of latest servicing Keeps data of new parts installed
6. Keeps data of parts that need replacement
7. Can make a custom list of required replacements/services according to user response

Context Diagram:

The Context Diagram shows the system under consideration as a single high-level process and then shows the relationship that the system has with other external entities (systems, organizational groups, external data stores, etc.).
Process Name is written in first letter in capital form. The external entities are represented as Squares,rectangles and written in capital letters. Line between the process and entities shows the data flow.

Rules to draw a context diagram:

Symbol	Meaning
	Single process: A circle is used to represent the entire system.
	External entity: A square or rectangle represents any person or organization that sends data or receives data from the system.
	Data flow: An arrow is used to represent the data between the process and external entities.

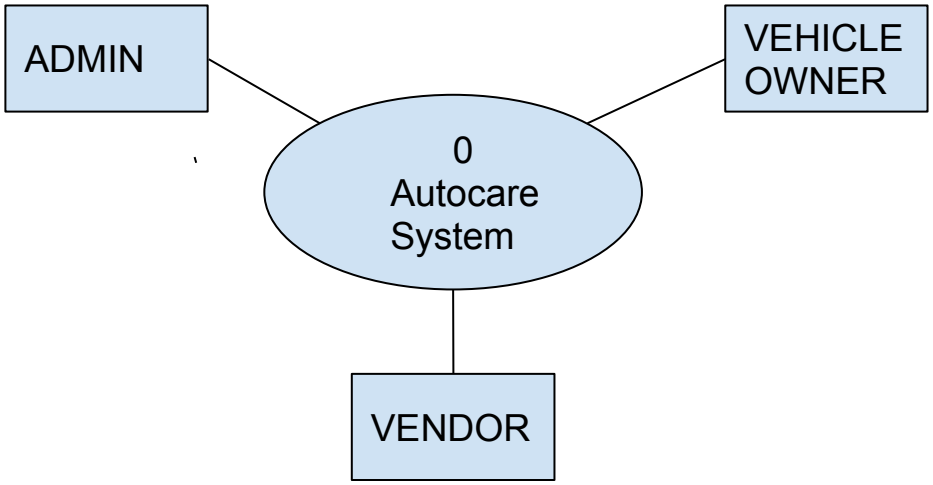
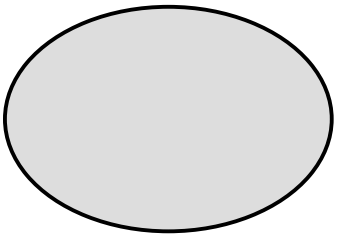


Fig: Context Diagram

Use case Diagram:

A use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses. The actors are often shown as stick figures.

Four major symbols of use case diagram:

Term and Definition	Symbol
An actor: ■ Is a person or system that derives benefit from and is external to the system. ■ Is labeled with its role. ■ Can be associated with other actors by a specialization/superclass association, denoted by an arrow with hollow arrowhead. ■ Is placed outside the system boundary.	
A use case: ■ Represents a major piece of system functionality. ■ Can extend another use case. ■ Can use another use case. ■ Is placed inside the system boundary. ■ Is labeled with descriptive verb-noun phrase.	
A system boundary: ■ Includes the name of the system inside or on top ■ Represents the scope of the system.	
An association relationship: ■ Links an actor with the use case(s) with which it interacts.	

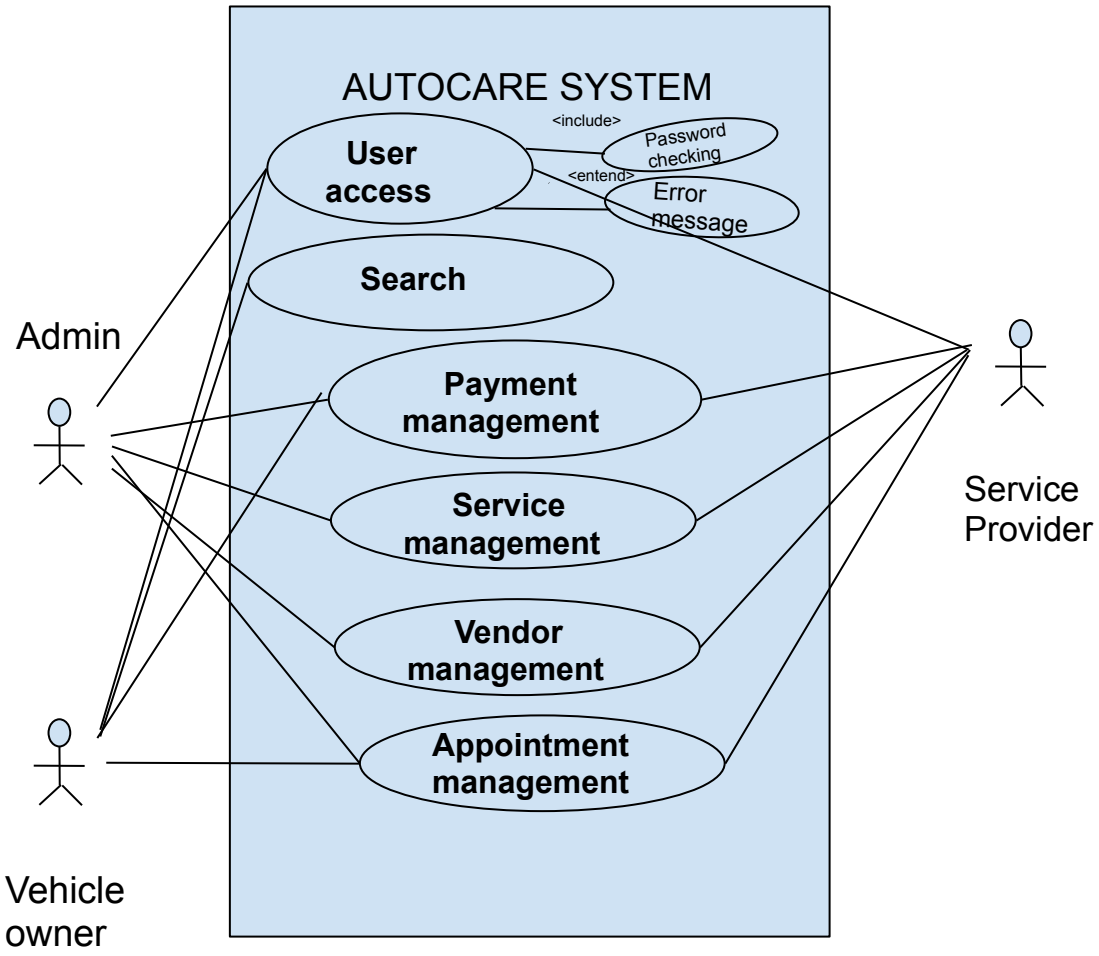


Fig: Use Case Diagram

Use Case Description:

A text-based use case description can be used to provide additional information to support the use case definition. This description can contribute significantly to the use case's value. The description text can be captured in the model as a single or multiple comments.

Descriptive form of Use Case:

1. Use case number and name
2. Primary Actor
3. Stakeholders and Interests
4. Preconditions-the conditions that must hold for the use case to begin.
5. Success Scenario
6. Alternate Scenario-the scenarios that are less frequent or other than nominal. The exception flows may reference extension points and generally represent flows that are not directly in support of the goals of the primary flow.
7. Post-conditions-the conditions that must hold once the use case has completed.

Descriptive form of Use Case

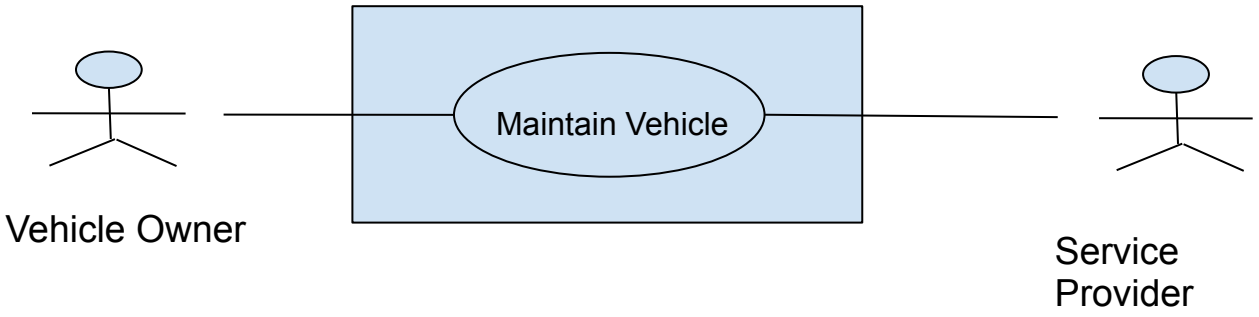


Fig: Descriptive use case

Maintain vehicle - Descriptive Form

Primary Actor : User / Vendor
Stakeholders and Interests:

Customer/ Users : Wants fast and proper services
Workshop/Vendor owner : Wants to sell more services online by giving home delivery.
Platform: Wants to get commission on every sales of services by vendors.

Preconditions: Workshops are verified and authenticated.

Success Scenario:

8. User register in the platform and adds vehicle(s)
9. Vehicles added with proper information of maintenance.
10. User browses services.
11. User orders their required service.
12. User set appointments for themselves.
13. Vendor accepts service orders.
14. Vendor schedules service for customer/ sends home services.
15. User selects payment method.
16. Platform generates receipt.
10. User provides rating to the service.

Alternative Scenario:

1. **At any time, user wants to delete placed order**

i. User clicks on cancel order within a specified time.
ii.Vendors are notified about cancellation.
iii.User selects the reason for cancellation.

2.User wants to change order

i.Selects order and clicks on changes.
ii. Selects changes.
iii.Vendors are notified.

3. Vendors unable provide services (too many orders)

i. Pause receiving orders
Ii. Notify user about unavailability of service.

4. Clashing of scheduled appointments.

i. Notify user about unavailability of slot
Ii. Provide refund if payment already made.
Iii. Provide next immediate slot if customer wants.
Iv. Provide a discount due to inconvenience.

Post-conditions: Users receive proper services. Bill is correctly generated. Vendors successfully provide services. Platform receives commission.

Activity Diagram:

Activity diagrams are graphical representations of workflows of stepwise activities and action with support for choice, iteration and concurrency.activity diagrams primarily show the overall flow of control, they can also include elements showing the flow of data between activities through one or more data stores.
Activity diagrams are constructed from a limited number of shapes, connected with arrows. The most important shape types:

11. Ellipses represent actions,
12. Diamonds represent decisions
13. Bars represent the start (split) or end (join) of concurrent activities
14. A black circle represents the start (initial node) of the workflow
15. An encircled black circle represents the end (final node).

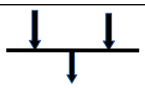
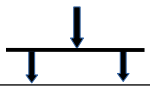
Definition	Symbol
Start	
End	
Activity	
Connector	
Joint/Synchronization	
Fork	
Decision	

Fig: Data Flow Diagram

Swim Lane Diagram:

A swimlane diagram is a type of flowchart that delineates who does what in a process. Using the metaphor of lanes in a pool, a swimlane diagram provides clarity and accountability by placing process steps within the horizontal or vertical "swimlanes" of a particular employee, work group or department. It shows connections, communication and handoffs between these lanes, and it can serve to highlight waste, redundancy and inefficiency in a process.

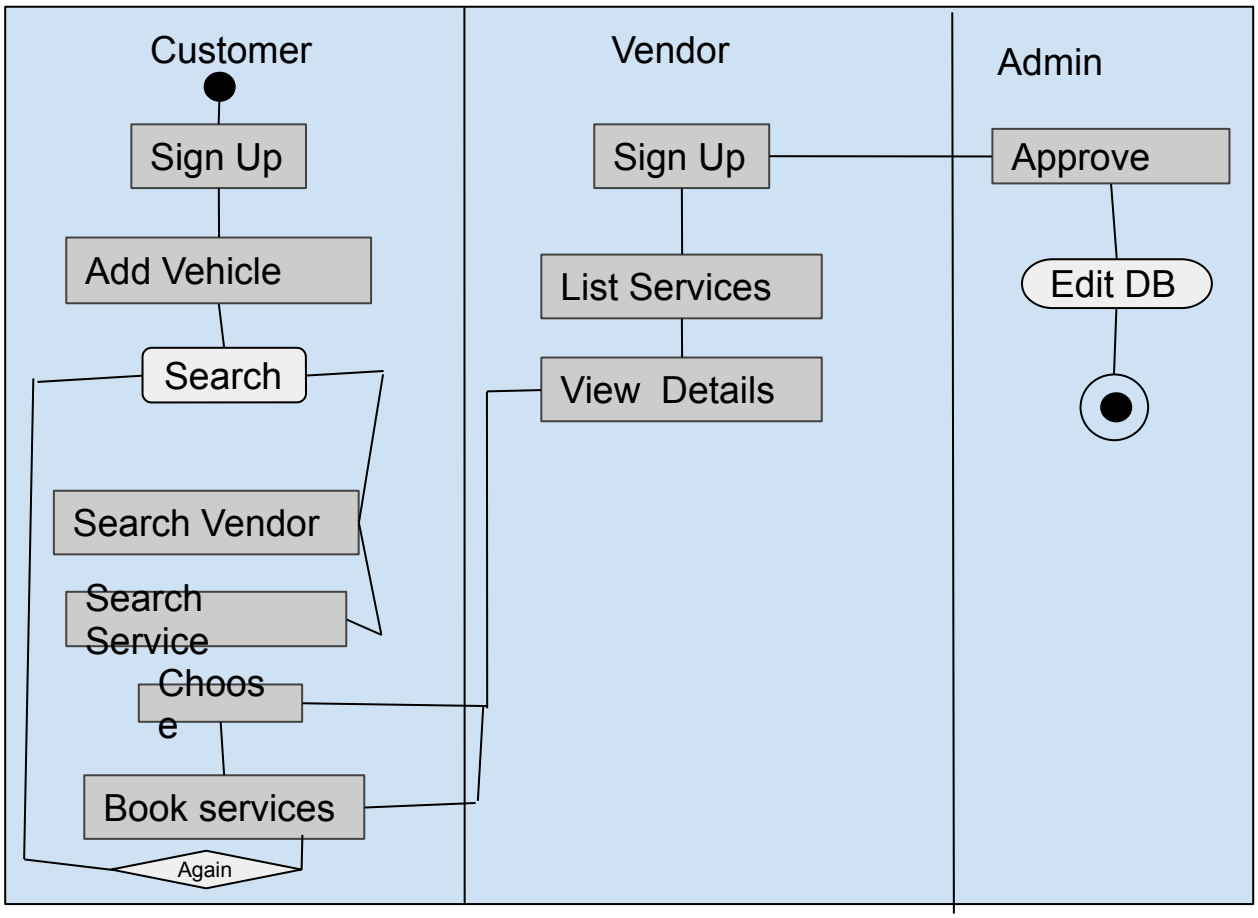


Fig: Swim lane Diagram

Data Flow Diagram:

Data Flow Diagram is a way of representing a flow of data through a process or a system. DFD provides information about the outputs and inputs of each entity and the process itself. DFD has no control flow, there are no Decision rules and no Loops.

DFD Symbols

Rules of DFD:

- Four Symbols: Process, External Entity (EE),Database(DB)/Table, Data Flow
- Database/DataStore, External Entities: ALL Capital letters
- Process naming: First letter of each Word in Capital letter
- DFD starts from Top-Left and ended at Bottom-Right
- No connection: DB to DB, DB to EE, EE to EEEach Process and Sub Process must have Name and Number

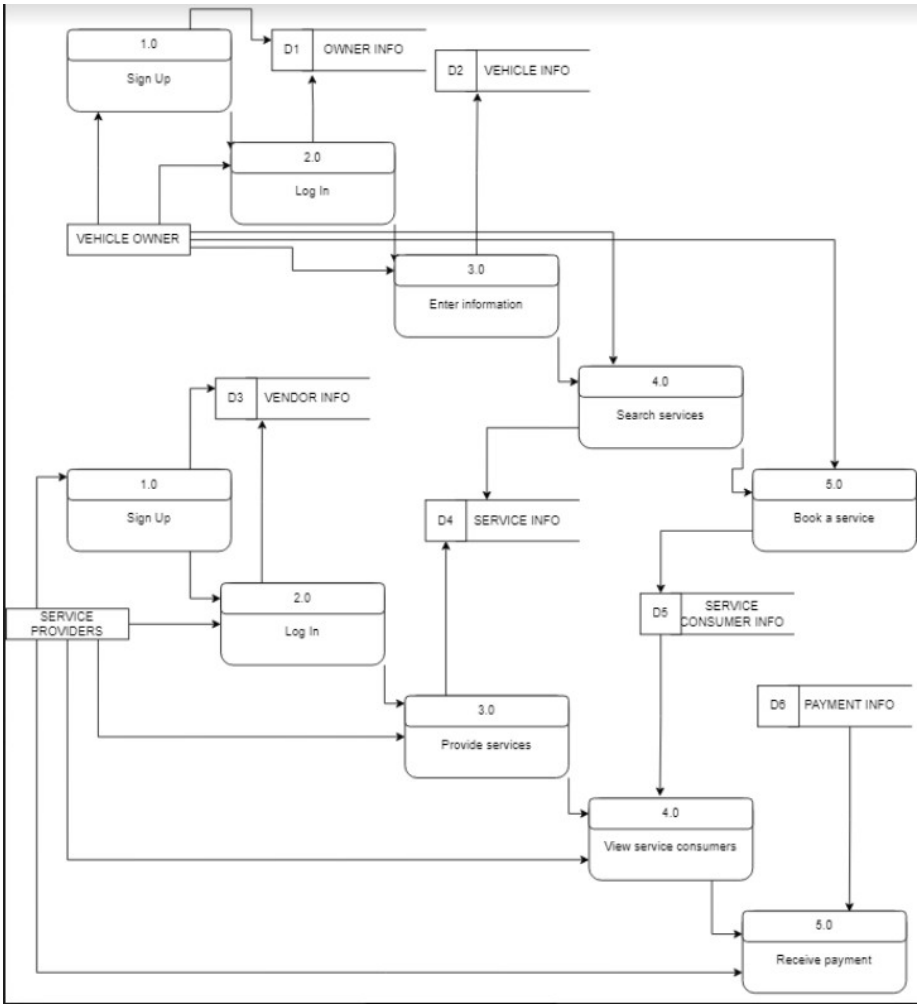


Fig: Data Flow Diagram

Feasibility Analysis

Feasibility Analysis: Feasibility study assesses all significant project-related variables, such as the project's timeline, economic, technological, and legal components, all of which contribute to predicting the chance of success.
The goal of a feasibility analysis, also referred to as a feasibility study, is to fairly and logically weigh the advantages and disadvantages of a current or proposed business, potential risks, the resources needed to carry out operations, and ultimately the likelihood that the venture will succeed.

There are 3 types of feasibility analysis:

1. Economical
2. Technical
3. Behavioral

Economical Feasibility:

This assessment typically involves a cost/ benefits analysis of the project, helping organizations determine the viability, cost, and benefits associated with a project before financial resources are allocated. It also serves as an independent project assessment and enhances project credibility—helping decision-makers determine the positive economic benefits to the organization that the proposed project will provide.

Technical feasibility:

This assessment focuses on the technical resources available to the organization. It helps organizations determine whether the technical resources meet capacity and whether the technical team is capable of converting the ideas into working systems. Technical feasibility also involves the evaluation of the hardware, software, and other technical requirements of the proposed system. As an exaggerated example, an organization wouldn't want to try to put Star Trek's transporters in their building—currently, this project is not technically feasible.

Behavioral feasibility:

People are inherently resistant to change, and computers have been known to facilitate change. An estimate should be made of how strong a reaction the user staff is likely to have toward the development of a computerized system. [t is common knowledge that computer installations have something to do with turnover, transfers, retraining, and changes in employee job status. Therefore, it is

understandable that the introduction of a candidate system requires special effort to educate, sell, and train the staff on new ways of conducting business.

SWOT analysis: SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT analysis is a technique for assessing these four aspects of your business.

1. Strength: We have understanding between ourselves, Our team is creative, Our team has the potential to work hard.

2. Weakness: Our team has no experience, We are not skilled in programming languages/API/Frameworks.

3. Opportunity: We have a huge market before us. The number of vehicle services needed to be made more sustainable where we have the scope to do well. The amount of vehicles in the market available needs repair service every month so we have customer.

4. Threat: There are many big companies with experience and good quality service. Pricing sometimes can be unsustainable. Matching up with market maybe difficult.

Cash Flow Analysis

	Year 0 (present)	Year 1	Year 2	Year 3	Year 4	Year 5
Expenses (NPV)	50000	30000	25000	20000	20000	15000
Revenue (NPV)	0	10000	19000	25000	27000	25000
Cash Flow = Rev. – Exp.	50000	20000	6000	5000	7000	10000
Accumulating Cash Flow	50000	70000	76000	81000	88000	98000

NPV Calculation

	Year 1	Year 2	Year 3	Year 4	Year 5
Future Cash Flow	50000	60000	80000	70000	40000
$\frac{(Cash\,Flow)}{(1+Interest\,rate)^{TimePeriod}}$	$\frac{50000}{(1+0.08)}$	$\frac{60000}{(1+0.08)^2}$	$\frac{80000}{(1+0.08)^3}$	$\frac{70000}{(1+0.08)^4}$	$\frac{40000}{(1+0.08)^5}$
Present Value of future cash Flow	46296.29	51440.33	63506.58	51452.09	27223.33