**iAutoRental**

**Rent or Reserve a car (Vehicles reservations)**

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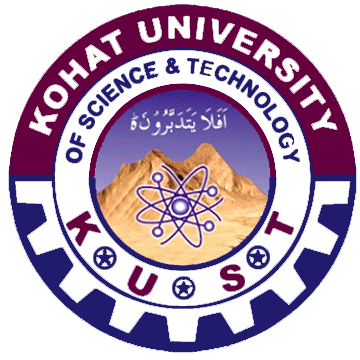
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**Institute of Computing**

**Kohat University of Science and Technology, Kohat-26000**

**Khyber Pakhtunkhwa, Pakistan**

**(August 2022)**

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Muhammad Bilal (CS091182051)

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A thesis submitted in partial fulfilment of the requirements for the degree of BSCS.

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Khyber Pakhtunkhwa, Pakistan

# Declaration

We certify that this project titled “***IAUTORENTAL****”* is our work. The work has not been presented elsewhere for assessment. The material that has been used from other sources has been properly acknowledged/referred to.

Muhammad Bilal (CS091182051) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Muhammad Haroon (CS091182032) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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All acclamation and appreciations for ALMIGHTY ALLAH, who bestowed us with sight to observe, mind to think, judge and power to achieve something. Peace and blessing of Allah be upon the Holy Prophet and his pure and pious progeny. Any project cannot be completed without the help and efforts of a lot of people. We extend our appreciation and gratitude to our parents they encourage us and boosted our morale at every stage of the project.

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# Dedications

This humble effort is dedicated to our **Parents**, relatives, advisor, friends, and family for their extreme support, love, and care who enable us to achieve the goal of success.

Muhammad Bilal (CS091182051)

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# Abstract

This application presents a data management system for a car rental company, allowing the administrator to oversee all customer information efficiently. This system enhances customer retention and streamlines vehicle and customer management processes. With its user-friendly interface, users will find it easy to navigate. Through this system, the admin can handle rental management, bookings, customer issues, and vehicle matters. The administrator has the ability to add new car rental information, as well as edit or delete existing entries. Transaction reports from the car rental system can be accessed promptly by the administrator as needed, ensuring swift availability of car information whenever required..

**Key Words:** *car, vehicle bookings, bookings, reserve, rent, iAutoRental, fyp.*

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CHAP­­TER 1:

INTRODUCTION

# INTRODUCTION

IAUTORENTAL (RAC) is a web-based system designed for a car rental company, facilitating the company's online presence and maintaining records of its services. In today's technologically advanced world, physical tasks have been digitized, and many activities are now conducted through computerized systems. This project focuses on the Car Rental System, reflecting the transformation of traditional car rental processes into digital operations. In the past, car rental services were utilized for various purposes such as personal travel, business trips, tours, vacations, and visits. Consequently, car rental plays a crucial role in facilitating travel and mobility for individuals across different contexts.

# PROJECT DEFINITION

As the internet enhances people's lives, it also provides access to previously inaccessible resources. The internet serves as a crucial communication tool in today's technologically advanced world, where almost every aspect of life has transitioned into digital formats. Individual activities have been replaced by information systems, with the car rental management system being a key focus of this project. Car rental services have been in existence for years, catering to individuals' diverse needs for travel, business trips, tours, and other occasions. Our IAUTORENTAL (car rental management system) is a web-based platform designed for organizations engaged in car rentals. This system enables the organization to offer its services to the public online while maintaining comprehensive records of its operations.

# PROBLEM STATEMENT

Observations suggest that some small companies utilize non-web-based car rental systems, limiting their ability to extend services to the public online. While these systems effectively store customer information, they lack the capability to enhance accessibility through the internet. Instead, these companies rely on traditional methods such as posters for advertising. To address these limitations, such companies can transition to web-based applications for their car rental systems. This transition would enable them to offer their services online, thereby expanding their reach and improving customer accessibility.

Additionally, phone call reservations, commonly used by these companies, lack many features compared to a web-based system. For instance, a customer may reserve a specific car over the phone, only to find upon arrival that they do not like the car. This dissatisfaction could have been avoided if the customer had access to sample pictures of the cars they intend to rent. Other issues associated with manual car rental include:

* Prospective renters must physically visit the nearest office to register with the car Rental Company. This requirement poses challenges for customers who have limited time.
* Cars that are difficult to rent out are typically advertised in local or national newspapers, involving extensive paperwork and time consumption.
* Managing customer data is a slow process with manual systems, especially when dealing with a large volume of clients.
* Keeping track of all rental cars becomes challenging without an efficient system in place.

# OBJECTIVES

Following are some of the KPI’s or objectives kept in mind during the development of the project.

* A web based system which will help the car rental companies to manage their day-to-day activities.
* To help in advertising the car rental services of a company, through the availability of the system online. Development of their proposed idea around the Software development Life Cycle (SDLC).
* To develop a simple and secure system that protects client information and confidential information of the organization.
* To design a user-friendly system that enables client check the availability of a vehicle and book or reserve that vehicle from the comfort of their home.
* A system which will allow the customers to pay their rent fare using an integrated payment gateway using their smartphone.
* To develop a system that stores bookings and reservations information as well as payment history to help the organization keep track of transactions.

# PROPOSED SOLUTION

The proposed solution to the aforementioned challenges is the development of a web-based system designed to manage car rental transactions efficiently. This system will allow clients or customers to check the availability of vehicles and make reservations online. By enabling customers to reserve cars from the comfort of their homes, they won't need to visit physical locations to secure vehicle bookings for their upcoming journeys. Additionally, businesses can increase their revenue by collecting car rental fees online at the time of booking. Unlike manual systems, which struggle to track transactions and manage customer data effectively, this proposed system will automate these processes, ensuring seamless transaction tracking and efficient management of customer information.

Figure : Proposed Solution Architecture diagram

# MOTIVATION

Given the historical development and current challenges facing car rental companies, this project aims to streamline processes by developing an effective and efficient car rental system. Inspired by the technological advancements adopted by developed countries to enhance customer experiences, our goal is to alleviate existing issues and constraints in similar systems. By addressing problems such as the lack of transaction history, difficulty in tracking customers and clients, and keeping businesses up to date, we aim to provide a solution that offers convenience and comfort to users. Through this web service, individuals will no longer need to physically visit rental locations for their next journey, marking a significant improvement over existing systems.

# SCOPE OF THE PROJECT

Over time, the scope of this project will expand to offer a variety of car rental-related services, catering to a wide range of needs. IAUTORENTAL aims to provide comprehensive assistance to individuals and businesses involved in vehicle rentals. As the platform gains traction, it will become a go-to resource for anyone seeking to reserve a car for business trips, road trips, or leisure travel, all from the convenience of their own homes. This web service will facilitate seamless transactions for both car owners and renters, enabling them to manage their business operations effectively and access their services round-the-clock. With this platform, businesses no longer need to rely on traditional advertising methods like banners and billboards; instead, they can leverage the power of the internet to reach a broader audience. Customers will find this service appealing due to its time-saving nature, user-friendly interface, and convenience. In summary, this web service will serve as a valuable tool for customers looking to rent a car for their upcoming journeys, as well as for rental businesses seeking to streamline their operations and enhance customer satisfaction without requiring physical presence.

CHAPTER 2:

BACKGROUND / LITERATURE

# ****EXECUTIVE SUMMARY****

Before the introduction of IAUTORENTAL (web service), individuals encountered numerous challenges when renting cars or managing rental businesses. Existing platforms failed to provide a satisfactory experience for both bargain owners and customers. Renters often had to physically visit rental locations, resulting in time-consuming and costly processes. Upon arrival, they would endure long waits and undergo tedious registration procedures at reception desks. Meanwhile, vehicle owners struggled to monitor customer activities, including transactions and rentals. In summary, renting cars posed various issues for individuals, while bargain and vehicle owners encountered challenges in managing their businesses effectively. However, with the introduction of this web service, businesses will transition to cloud-based operations, offering convenience and ease to both clients and owners alike.

# ****INTRODUCTION****

Since the official introduction and launch of IAUTORENTAL, individuals who previously encountered issues with car rentals now have access to a wide range of services with the platform's expansion. IAUTORENTAL has significantly improved the lives of many by offering convenience and ease in the car rental process. Prior to IAUTORENTAL, people relied on traditional methods to reserve cars for business tours or other purposes. Now, renting a car is more convenient than ever before, as individuals can do so from the comfort of their own homes without the need for physical visits, saving both time and money. With just a smartphone or PC and an active internet connection, reserving a car is as simple as a few taps on the screen. Users can create an account on IAUTORENTAL and book a car effortlessly, revolutionizing the car rental experience.

# ****SIMILAR EXISTING SOFTWARE APPLICATIONS****

The following software products may have similar services with IAUTORENTAL.

1. Avis Pakistan
2. Bookme.pk
3. Skycars.pk

# ****PROBLEMS WITH EXISTING SOFTWAREs****

As Google has become the leading search engine globally, it's generally easy to find educational resources using it. However, while the mentioned car rental platforms may offer similar services to IAUTORENTAL, their user-friendliness might vary. IAUTORENTAL stands out with its exceptionally user-friendly interface, catering even to individuals with limited internet proficiency. In the future, the IAUTORENTAL team plans to integrate AI capabilities, enabling the platform to make decisions on behalf of its clients, further enhancing the user experience and accessibility for all.

# ****PROPOSED SOLUTION FOR PROBLEMS****

IAUTORENTAL aims to address the challenges faced by both clients and rental business owners during the car reservation process. Clients will benefit from the time and cost savings associated with renting cars for their journeys. Meanwhile, rental business owners will experience increased productivity as their operations become available 24/7 online. With IAUTORENTAL, businesses will transition to a computerized system, eliminating the limitations of human fatigue and ensuring continuous operation.

# ****CONCLUSION****

The study reveals that all the variables (Customers, Clients and Bargains) are the core value of IAUTORENTAL. So it will try their best to make sure that the following

* + - 1. Brand trust
      2. Customer satisfaction and
      3. Brand loyalty

Are high, meaning that consumers have already believed and are satisfied with the website and services and are loyal to IAUTORENTAL.

Besides, it appears that brand trust and customer satisfaction may directly influence brand loyalty.

# SDLC Software development life cycle:

The Software Development Life Cycle (SDLC) is a structured process designed to produce software of the highest quality at the lowest cost and within the shortest time frame possible. It consists of a series of phases that guide organizations through the software development process, ensuring efficient and effective production of high-quality software.

The SDLC involves six phases as given below

* Requirement gathering or analyzing
* Planning
* Design
* Software development (Coding)
* Testing (Unit and Integrated testing)
* Deployment (Launching)

There are lots of SDLC models used but some of them become outdated for nowadays use because nowadays customers want flexible products, means that the product that can adopt changes with the future requirements.

Following are the well-known SDLC models.

* Waterfall model
* Incremental model
* Spiral model
* Agile model

In earlier life developers were using the waterfall model for developing software but it was not flexible and do not provide flexibility for developers. And nowadays developers face some problems using the waterfall model which is handling changes requests from the customer during development and the high cost and time required to make those changes. We don’t want to face these issues thus we decided to use the agile model for our project IAUTORENTAL.

# AGILE development model:

The Agile model was primarily designed to facilitate projects in adapting to change requests. Its main objective is to enable projects to easily accommodate changes during the development phase. By focusing on essential activities and removing those that are deemed unnecessary for the project, the Agile model helps save time and effort. This model decomposes the project into iterations or time-boxes, each of which is completed separately. After planning, development, and deployment, each iteration is handed over to the customer. Similar to other models, the Agile model consists of the following components:

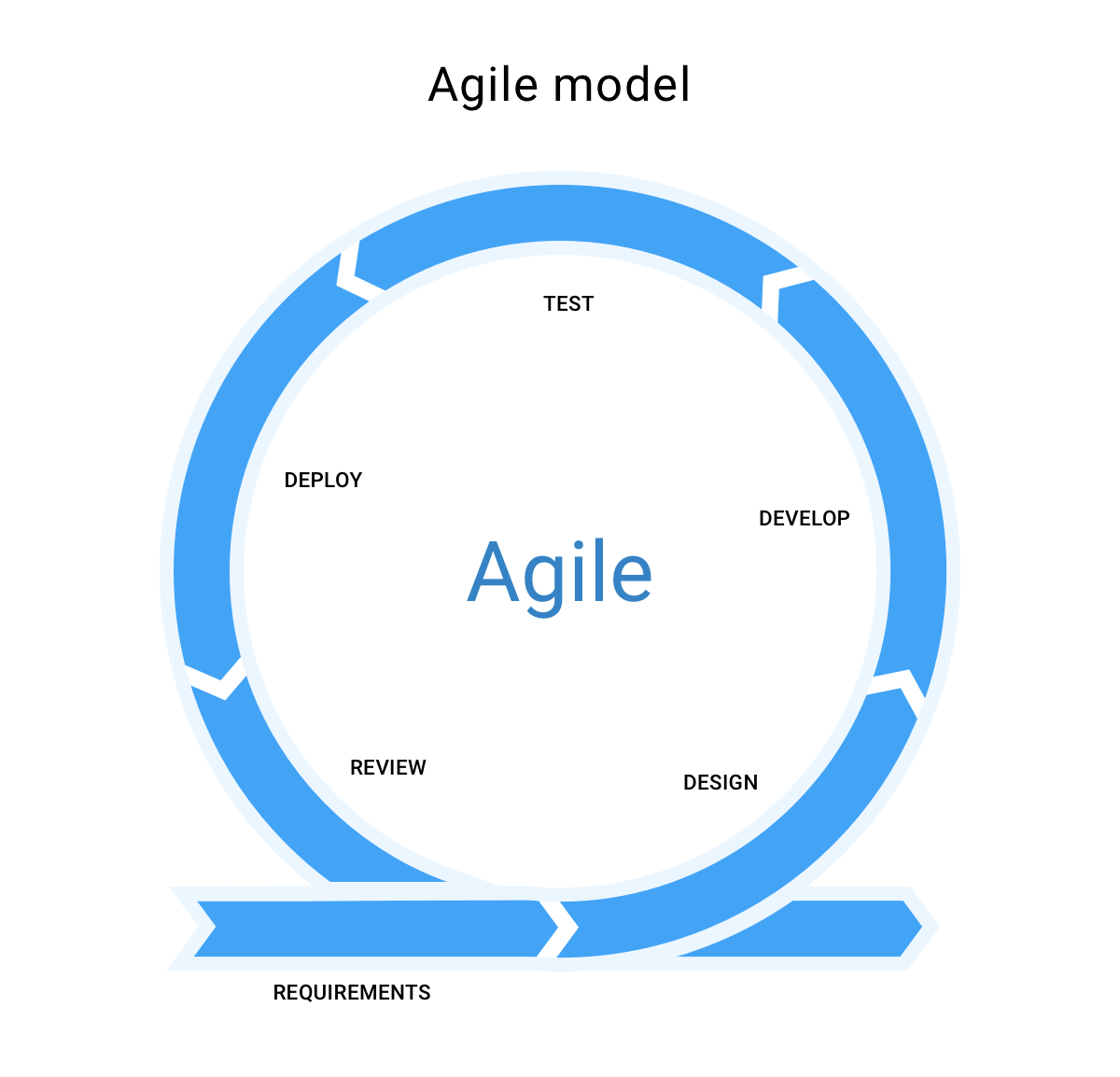
* Requirements
* Planning
* Design
* Development (Actual coding)
* Testing (Unit and Integrated testing)
* Deployment (Launching)
* Review

Figure : SDLC (Agile Development Model)

CHAPTER 3: REQUIREMENTS

# ****REQUIREMENTS GATHERING****

Requirements gathering is a critical aspect of any project, providing value across various levels. Despite its importance, requirements gathering often receives insufficient attention. It is a complex and exploratory process that entails researching and documenting the project's precise requirements from inception to completion. Effective requirements gathering and management are integral to project success and should commence at the project's outset.

The well-known two types of requirements are the (Functional requirements and non-functional requirements) which are as follows.

## ****FUNCTIONAL REQUIREMENTS****

Functional requirements specify the specific functions and features that a vehicle reservation service must perform or support, such as user registration, car reservation, payment processing, and reporting functionalities. Following are some of the functional requirements of iAutoRental.

### Content (VEHICLES) being registered by admin

Our first functional requirement will be how the system will respond to and accept the content (vehicles) being registered by admin. As there will be different types of vehicles, so the first focus will be on how the system will respond to these publications and it should happily accept things like these.

### Operations performed by each screen

The second thing that we need to put focus on is how each screen will perform its operation(s). Like if we have a registration page that will be used by new users/customer for registrations so we have to make sure that, that page works fine for getting user/customer details as a new user will provide. And same goes for every page and screen that will properly work for their respective task.

### Content approval and workflow process

As contents are everywhere and it is very important to have valid content. If you have lots of content present on your portal but they don’t have any valid meaning and do not help that portal to deliver its services effectively then it is very necessary to check them again and replace them with the specified contents. To accomplish that, IAUTORENTAL should also have the functionality of checking and verifying contents being provided by the users. IAUTORENTAL will approve those contents which are valid and have meaning to IAUTORENTAL that will improve this web service and will help provide services effectively. IAUTORENTAL should also focus on the workflow of the system like a user/customer cannot reserve a car if they aren’t registered. Or user/customer cannot reserve a car if it is already being reserved Etc.

## ****NON-FUNCTIONAL REQUIREMENTS****

Non-functional requirements refer to the conditions rather than specific behaviours. It is also known as the “quality attributes” of a system. While functional requirements are for what the system will do, non-functional requirements are for how the system will do that. Non-functional requirements are not that much necessary for a project but surely it adds more quality to a project and helps in making the workflow lots smoother and effective. Non-functional requirements may include:

### System Performance

Performance refers to how fast the system is while responding to a user request. In our case performance will be the time a page is taking while loading. You may not include this feature of being fast, it will work fine for the basic tasks but users love fast processing and it will add more value to your system if it is performing fast.

### Scalability

Scalability can be defined as, to grow as the users increase. This means that the system needs to be able of handling a large number of users’ data. And should be scalable if in future time the number of users or data increases. A system is said to be scalable if it is able of changing its behaviours over time and with the changes in data.

### Availability

The system availability is necessary it means that the system should be available and awake to provide its services to users. Availability should be as greater as you can and the downtime should be as less as you can. If a system uses to become available for some time and then go to sleep and then come available, the user will become bored and will start leaving that system and go away.

### Security

This contains the security of the contents and encryption. Its means that unauthorized user cannot access the content. Security also refers to show different content to different users. As there are many types of users so make sure to provide the user with the content they needed.

### User-friendly Interface

Visitors and users like a user-friendly interface where they can easily navigate among different things and features. Nowadays programmers work hard to make the interface also called UI as friendly as they can because everyone wants to have a large number of visitors and visitors love the user-friendly environment. So your system should be enough friendly to treat users and visitors in such a way that they wish to visit your system again and utilize the services.

# ****METHODS OF REQUIREMENTS GATHERING****

Requirements gathering begins with the idea of what and how the system will perform its tasks. As we need to collect requirements from different sources and places so there exists plenty of methods that can be used to gather requirements. Some of the common methods used for gathering functional and non-functional requirements are as follows:

## Interviews

The interview is the most common way of knowing the system requirements. Different interviews are held between the user and the client for the sake of knowing what the system is proposed to do. During the interview, the project manager or the programmer asks the clients about the problems they have been facing.

## Surveys

Surveys are used to collect information and requirements within a short time frame from a large user group. Surveys on different sites and places are done for collecting user problems and requirements.

## Questionnaires

Questionnaires refer to the interviewers, as they ask different types of system-related questions to collect more information. When the interview conduct between the programmers (software experts) and the client (to whom the project is going to be built) then the programmer or the project manager asks the client regarding problems they have been facing and notes down those problems to must-have solutions for these.

## Brainstorming

Subject specialists conduct different meetings and sessions to discuss different problems being faced by users before the proposed system and they do brainstorming to bring solutions to those problems and other complex issues. As we discussed earlier that in an interview the client asked different questions about the problems being faced by them but after the developer or the project experts also do brainstorming to add more features from their side as they are professionals and have more knowledge than the clients.

## Prototyping

Prototyping refers to making a prototype (not the actual system) of the system so that it will not be the actual system but will look like it and will help you understand the functions and requirements.

CHAPTER 4: DESIGN AND ANALYSIS

# ****DESIGN PHASE****

During the design phase, developers and technical architects create a high-level design of the software and system to fulfill each requirement. The architectural design selected outlines the components to be included, identifies third-party packages, determines user flow, and specifies how components communicate with the database. It also addresses the front-end representation and behaviors of various components. In this phase, the gathered requirements document is used to map the requirements into an architecture, defining components, interfaces, and behaviors. Design also encompasses UI (user interface) considerations, with developers and architects focusing on aligning elements and components to enhance the system's attractiveness and usability. During the design and analysis phase the following things are kept in mind.

## Components involve

Components are the building blocks of every software, they may be buttons, headings, links, etc. Designers and developers focus on all the components involved in software, along with their alignments and interaction with one another in the front-end.

## Third-party packages

Third-party packages are libraries and packages which have built-in functionalities to improve the software. Just like NODE JS uses express for routing and Mongoose for mongo database are the third-party packages. So it is the time of designing, designers and developers decide which third-party packages and libraries would be used for an upcoming project (software).

## User flow

The designer also keep eye on how the user flow will occur. It means first of all how the user will register themselves then what should be the next screen to show when a user got to register. How our application will interact differently with a different type of user etc.

## ERD (Entity Relationship Diagram)

Entity Relationship Diagram, also known as ERD. An ERD consists of different symbols and connectors for their connection those symbols and connectors visualize two important information: **All the important entities within that system**, and their **inter-relationships.**

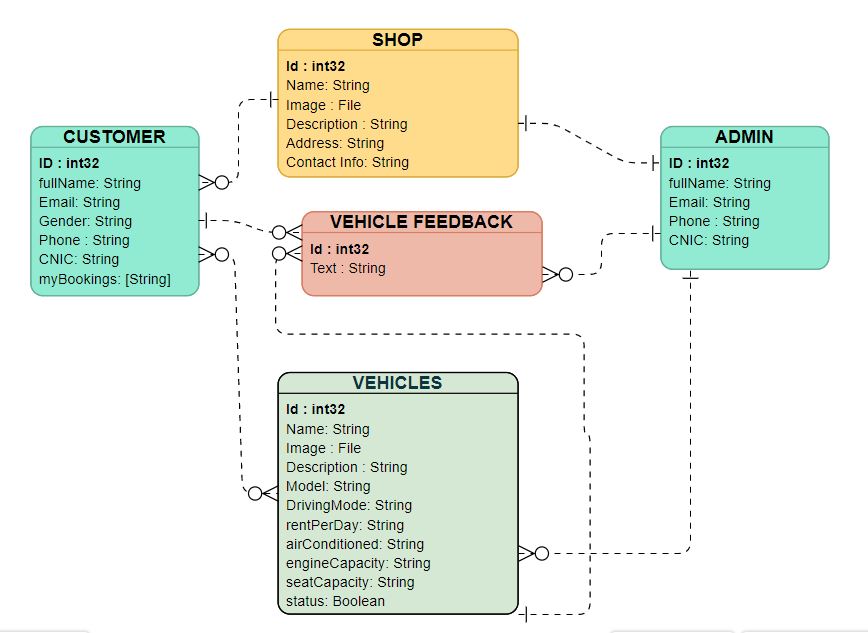
*Following is the* IAUTORENTAL *ERD.*

Figure : iAutoRental ERD (Entity relationship diagram)

## DFD (Data flow diagram)

DFD tells us about the flow of data among the different components of the software. It shows us how the data flow occurs and how different components of the system are communicating among themselves. DFD shows us what data these components or elements transfer with each other and how that flow occurs.

DFD has different levels and as IAUTORENTAL also have DFD so let’s have a look at the different level of DFD. Following are the different levels of DFD (data flow diagram) of IAUTORENTAL.

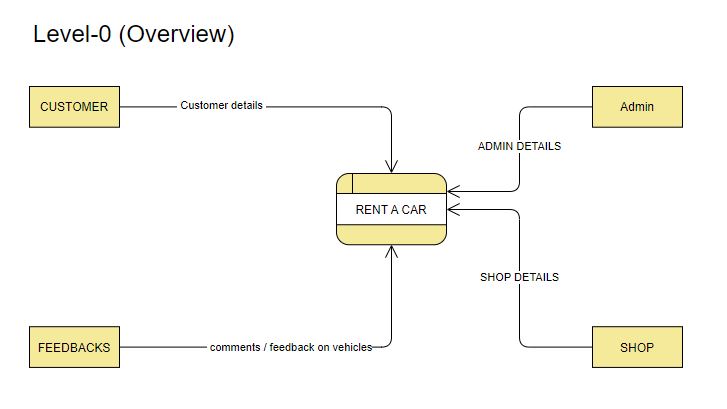


Figure : iAutoRental DFD Level 0

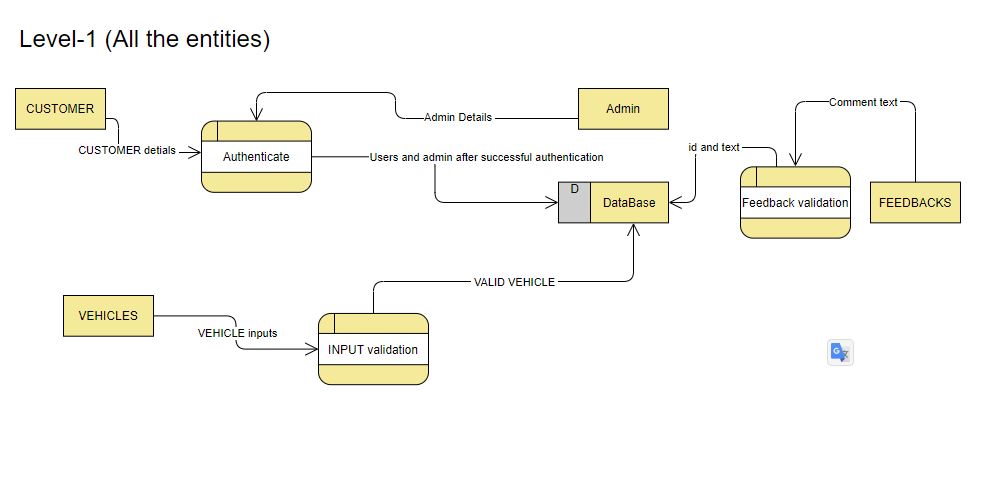


Figure : iAutoRental DFD Level 1

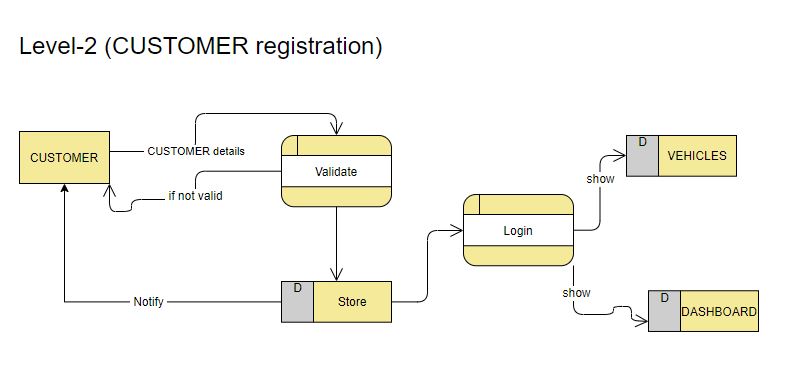


Figure : iAutoRental DFD Level 2

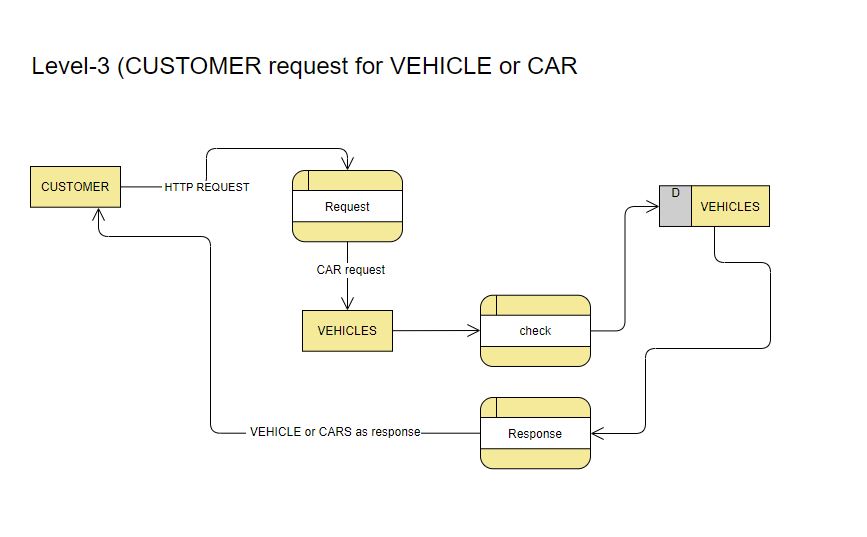


Figure : iAutoRental DFD Level 3

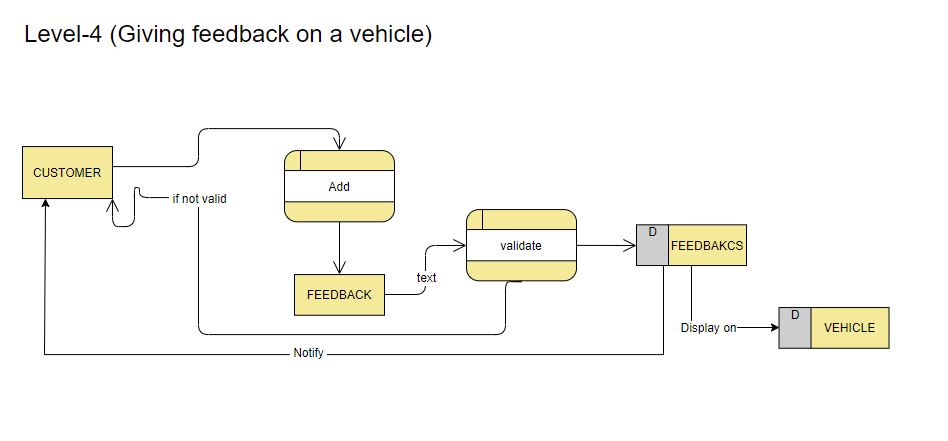


Figure : iAutoRental DFD Level 4

## Activity diagram

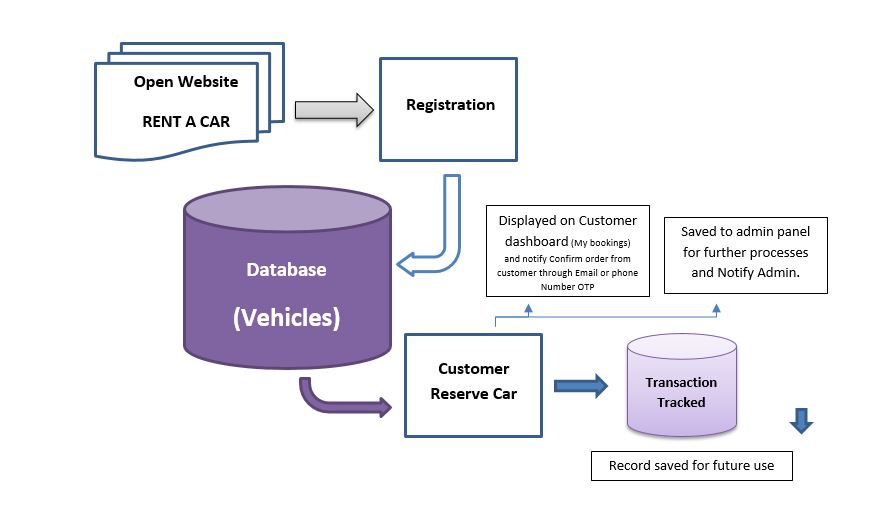
An activity diagram is used to represent the flow from one activity to another activity inside a system. The activity inside a system is an operation of that system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all types of flow control by using different elements.

Figure : iAutoRental Activity Diagram

## Use case diagram

Use a case diagram use to summarize the details of your system's users and tells about their interactions with the system. An effective use case diagram helps your team demonstrate the following.

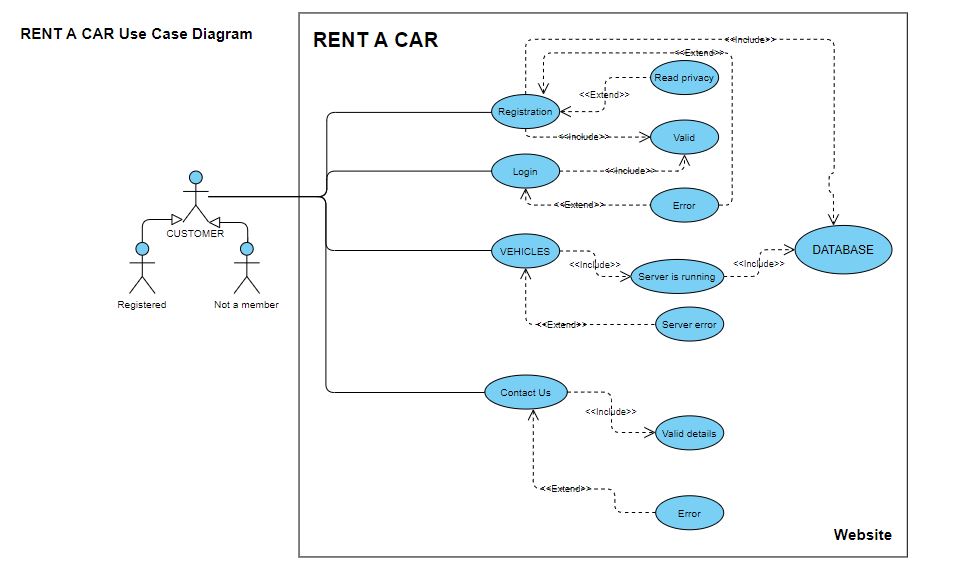
* Scenarios in which your system interacts with people, or external entities
* Goals that your system helps those entities to achieve etc.
* Below is the Use case diagram of IAUTORENTAL

Figure : iAutoRental Use Case Diagram

## Components interaction with DB

The database involves everywhere and it's the thing that keeps data for future use. Databases are the storage that saves application data somewhere on the disk or online. So it's also the responsibility of the designer to show how the application components will communicate and interact with the database, how data will come from the database to the front-end (in front of the user on-screen).

# ****ANALYSIS****

This process is also called discovery, in this phase, we discover and analyze all the requirements and relevant data. Our goal in this phase is to determine the specific ways of how you will get benefits from this application. In the analysis phase, we look after requirements and project expectations. The analysis phase consists of

## Gather requirements

We discussed earlier in the requirement phase that the first thing that we need is to analyze both the functional and non-functional requirements. Requirements are the expectation from the project (Application). This means that what the system will do. We also discover more relevant requirements in the analysis phase.

## Analyze gather requirements

It is also necessary to analyze and double-check already gather requirements for ambiguity, repetition, vulnerability. The main purpose of the analysis is to transform requirements into high-level requirements specified in the earlier phase into

* 1. Unambiguous: There should be no ambiguity (free of dauts)
  2. Testable: result well when tested.
  3. Complete: There should be no deficiency.
  4. Consistent: Consistency is the key, they should be consistent. Able to change over time mean should be adaptable over time.

In short, the analysis phase is all about gathering more specific requirements through questioners and asking and it’s about gathering information about

1. What should be inside the application (in our case in a web application)
2. What are the goals and objectives (what you want from the site to do for you)
3. What you want to communicate and whom you want to attract (your targeted audience).