

AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

FACULTY OF SCIENCE & TECHNOLOGY DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE: SOFTWARE ENGINEERING

FALL 2023-2024

Section: C

Group - 05

Supervised By

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PROJECT PROPOSAL ON

Online E- Parking and Rent Management System

SUBMITTED BY:

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Date of submission: 17-12-2023

<u>Lab-1:</u>

Title: Online E- Parking and Rent Management System.

Background Description:

Parking congestion is a massive issue in urban centers across the globe. The continuous urban expansion and the surge in vehicle ownership have intensified the challenge of locating accessible parking spots, causing immense inconvenience for drivers. Conventional parking management systems have proven to be ineffective in mitigating this problem, resulting in heightened traffic congestion, elevated air pollution levels, and substantial time and fuel wastage. To tackle this pressing urban challenge, we present the concept of a Smart E-Parking and Rent Management System.

This innovative system is designed to alleviate parking woes by optimizing parking space utilization, delivering real-time parking availability information, and curbing environmental concerns arising from prolonged searches for parking. It is envisioned as a comprehensive solution to improve the urban parking experience for drivers while simultaneously addressing the adverse impacts of inefficient parking management on our cities.

Moreover, the system integrates vehicle rental services, offering a wide range of transportation options from various providers. Users can easily compare available vehicles, make bookings, and manage rentals through the same platform, streamlining the entire rental process.

Problem Domain / Root Cause:

The Online E-Parking and Rent System emerges as a comprehensive solution within a problem domain that stems from the evolving dynamics of urbanization and modern transportation challenges. Within this domain, several fundamental root causes converge, necessitating the development of this innovative system:

- 1. **Parking Space Shortage:** Rapid urbanization has led to a severe shortage of parking spaces, as the number of vehicles continues to outpace the available parking infrastructure. This scarcity causes frustration for drivers and exacerbates congestion.
- 2. **Traffic Congestion:** The lack of parking spaces forces vehicles to circle aimlessly in search of spots, contributing to traffic congestion, increased fuel consumption, and elevated emissions. This inefficiency impacts both urban mobility and the environment.
- 3. **Inefficient Resource Utilization:** Many parking spaces remain underutilized, while others are overused, resulting in inefficient allocation of valuable urban real estate and wasted resources.
- 4. **Complex Rental Processes:** Traditional vehicle rental services often involve cumbersome paperwork and manual procedures, deterring potential users and limiting the growth of shared mobility options.
- 5. **Environmental Degradation:** The proliferation of personal vehicles and inefficient parking practices contribute to air pollution and environmental degradation in urban areas.
- 6. **Lack of Real-time Information:** Drivers often lack access to real-time parking availability data, making it challenging to plan efficient routes and minimize time spent searching for parking.
- 7. **Idle Vehicle Assets:** Privately-owned vehicles frequently sit idle for extended periods, representing an untapped resource for individuals seeking temporary transportation.
- 8. **Fragmented Services:** The absence of an integrated platform that seamlessly combines parking and vehicle rental services creates fragmentation and inconvenience for users.

Objectives:

The Online E-Parking and Rent System is designed with clear and multifaceted objectives to address the complex challenges of urban mobility, parking management, and vehicle rentals. These objectives are aimed at enhancing convenience, efficiency, sustainability, and overall user experience:

- 1. **Optimize Parking Space Allocation:** The system's primary goal is to efficiently allocate available parking spaces, reducing the time and frustration associated with finding parking spots and minimizing traffic congestion.
- 2. **Streamline Rental Services:** Facilitate seamless and user-friendly vehicle rentals, simplifying the process from searching and booking to vehicle pickup and return, promoting shared mobility options.
- 3. **Reduce Traffic Congestion:** By providing real-time parking availability information, the system helps reduce traffic congestion, minimizing the environmental impact of unnecessary circling and idling vehicles.
- 4. **Promote Sustainable Mobility:** Encourage shared transportation options, such as carpooling and bike rentals, to reduce the number of private vehicles on the road and lower carbon emissions.
- 5. **Enhance User Convenience:** Offer a one-stop platform for parking and vehicle rental services, making it easy for users to plan their journeys, reserve parking, and access rental vehicles with a few clicks.
- 6. **Provide Real-time Information:** Deliver accurate, up-to-the-minute data on parking availability, enabling users to make informed decisions and reduce the time spent searching for parking.
- 7. **Improve Resource Utilization:** Ensure optimal use of parking spaces and vehicles, reducing underutilization and promoting efficient use of urban infrastructure.
- 8. **Enhance Environmental Responsibility:** Contribute to environmental sustainability by reducing air pollution, minimizing fuel consumption, and encouraging eco-friendly transportation choices.
- 9. **Increase Accessibility:** Make parking and vehicle rental services more accessible to a wider range of users, including those with mobility challenges, through digitalization and user-friendly interfaces.
- 10. **Facilitate Integration:** Foster a cohesive ecosystem where parking and rental services seamlessly interact, benefiting users, providers, and the urban environment alike.

Solution / User Benefits:

The Smart E-Parking and Rent Management System proposes a comprehensive solution to address the objectives outlined above:

- 1. **Parking Space Sensors:** Install IoT-based sensors in each parking space to detect occupancy status in real-time. These sensors will transmit data to a central server.
- 2. **Mobile Application:** Develop a user-friendly mobile application that allows users to:

- Check real-time parking availability.
- Reserve parking spaces in advance.
- Simplifies the vehicle rental process.
- Make contactless payments through the app.
- Receive navigation guidance to the selected parking spot.
- 3. **Centralized Management Dashboard:** Create a centralized dashboard accessible to parking facility operators. This dashboard will provide real-time data on occupancy, revenue, and user activity, enabling efficient management and decision-making.
- 4. **Reduced Traffic:** Traffic flow increases as fewer vehicles are required to drive around in search of an open parking space.
- 5. **User Education:** Promote the use of the system through educational campaigns and user support, ensuring that both residents and visitors are aware of the benefits and functionality of the system.
- 6. **Time Savings:** Users can quickly locate available parking spaces through the mobile application's real-time occupancy data, reducing the time spent searching for a parking spot.
- 7. **Streamlined Rentals:** The system simplifies the vehicle rental process, allowing users to browse available options, compare prices, and make bookings effortlessly, promoting shared mobility.
- 8. **Reduced Congestion**: With real-time navigation to parking spaces, users can avoid circling around congested areas, minimizing traffic congestion and associated stress.
- 9. **Convenient Reservations:** Users have the option to reserve parking spots in advance, ensuring they have a guaranteed space upon arrival, especially during peak hours or special events.
- 10. **Contactless Payments:** The system allows for contactless payments through the mobile app, eliminating the need for physical cash or cards and streamlining the payment process.
- 11. **Environmental Impact:** Users contribute to reducing emissions and air pollution by spending less time idling in search of parking, supporting sustainability and cleaner air in urban areas.
- 12. **Enhanced Safety:** The presence of surveillance cameras and access control measures improves the safety and security of both users and their vehicles within parking facilities.
- 13. **Cost Savings:** Efficient parking management may lead to cost savings for users, as they can choose from a variety of pricing options and potentially take advantage of discounts during off-peak hours.

Basic Functionalities:

The Online E-Parking and Rent System encompasses a range of essential functionalities that make it a comprehensive and user-friendly solution for urban mobility and parking management. Here are the basic functionalities of the system:

- 1. **Parking Space Reservation:** Users can search for available parking spaces in their desired locations, view details such as pricing and amenities, and reserve spots in advance.
- 2. **Real-time Parking Availability:** The system provides real-time information on parking space availability, helping users make informed decisions and reducing the time spent searching for parking.

- 3. **Vehicle Rental Services:** Users can access a variety of rental vehicles, including cars, bikes, and scooters, from multiple providers, streamlining the rental process.
- 4. **Booking and Payment:** Users can make bookings for parking spaces and rental vehicles directly through the platform, with convenient digital payment options.
- 5. **User Profiles:** Users can create and manage profiles, storing their payment information and rental preferences for quick and hassle-free transactions.
- 6. **Navigation Integration:** The system can integrate with navigation apps to provide directions to reserved parking spaces or rental vehicle pickup points.
- 7. **Notifications:** Users receive notifications regarding their reservations, including booking confirmations, reminders, and payment receipts.
- 8. **Review and Ratings:** Users can leave reviews and ratings for both parking spaces and rental providers, enhancing transparency and user trust.
- 9. **Accessibility Features:** The system may include accessibility options for users with disabilities, ensuring inclusivity.
- 10. **Data Analytics:** Operators can collect and analyze data on parking space utilization, vehicle rental demand, and user behavior to optimize services and infrastructure.
- 11. **Reporting:** The system can generate reports for parking space owners and rental providers, offering insights into usage and revenue.
- 12. **Security:** Robust security measures protect user data and financial transactions, ensuring a safe and reliable experience.
- 13. **Customer Support:** Users have access to customer support channels for assistance with reservations, payments, and inquiries.

Target Users:

The Online E-Parking and Rent System is designed to cater to a diverse range of target users, offering a versatile solution that addresses the needs of various stakeholders in urban transportation and parking management. The primary target users include:

- 1. Individual Vehicle Owners: These users seek convenient parking solutions in urban areas, where finding a parking spot can be a challenge. They can benefit from real-time parking availability information and streamlined parking reservations.
- **2.** Commuters: Daily commuters who rely on their vehicles to travel to work or other destinations can save time and reduce stress by using the system to secure parking spaces in advance.
- **3.** Tourists: Travelers visiting unfamiliar cities can use the system to find and reserve parking spaces near tourist attractions, hotels, and popular destinations.
- **4.** Vehicle Rental Companies: Rental providers can utilize the platform to list their vehicles, manage bookings, and reach a wider customer base, improving the efficiency of their rental services.
- **5.** Parking Space Owners: Owners of parking facilities, such as garages and lots, can list their spaces on the platform to attract more customers and optimize space utilization.
- **6.** Shared Mobility Enthusiasts: Users who prefer shared mobility options like bike rentals, scooters, and car-sharing services can access a variety of transportation choices through the system.

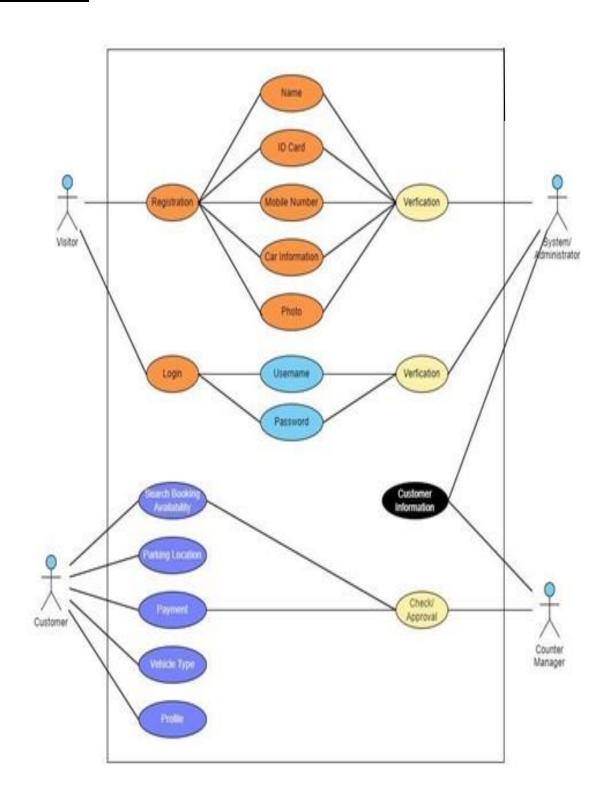
- **7.** Businesses: Companies with fleets of vehicles can use the system to manage their vehicles more efficiently and provide employees with easy access to rental vehicles.
- **8.** City Planners and Administrators: Urban planners and government agencies can leverage the data generated by the system to make informed decisions about transportation infrastructure and parking policies.
- **9.** Environmental Advocates: Individuals and organizations dedicated to reducing carbon emissions and promoting sustainable transportation can use the system to encourage shared mobility and reduce the number of privately owned vehicles on the road.
- **10.** Users with Mobility Challenges: The system can incorporate accessibility features to accommodate users with disabilities, ensuring that transportation services are inclusive and equitable.

In conclusion, the Smart E-Parking and Rent Management System is a solution to the growing problem of parking congestion. By providing real-time information, optimizing space utilization, and reducing environmental impact, this system aims to improve the overall urban experience for drivers while benefiting parking lot operators and the environment.

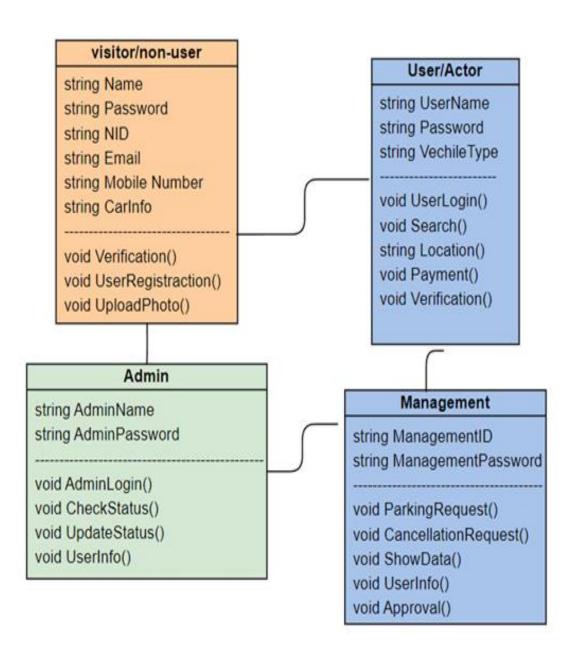
References:

- Parking Lot Project Proposal Template | Template by ClickUpTM
- (PDF) The Smart Parking Management System (researchgate.net)
- Smart parking systems: comprehensive review based on various aspects ScienceDirect
- <u>Project Proposal Project Proposal PROJECT PROPOSAL SMART PARKING COVERING COLOMBO DISTRICT, Studocu</u>
- (PDF) ONLINE CAR RENTAL SYSTEM | IJCSMC Journal Academia.edu
- (PDF) Car Rental System (researchgate.net)

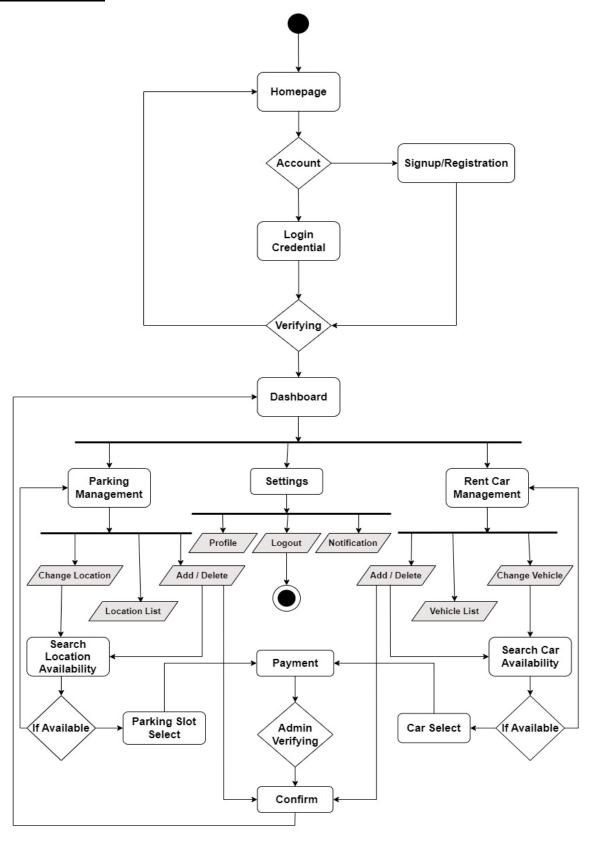
Lab-2:
<u>Use Case Diagram:</u>



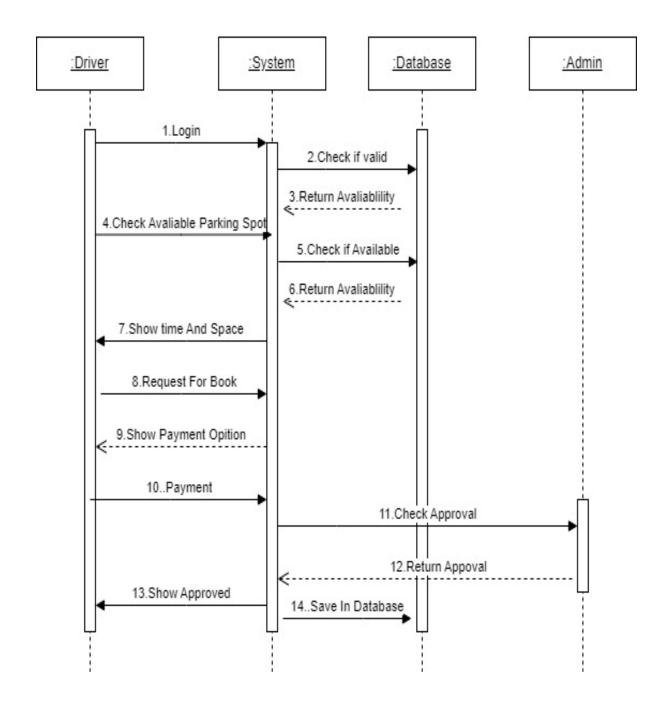
Class Diagram:



Activity Diagram:



Sequence Diagram:



Lab-3:

Software Process Model:

We have chosen The Agile Software Development Model for developing this software.

Argument for Using Agile:

The Smart e-parking and car rental industry, characterized by rapid technological shifts, changing customer preferences, and evolving regulations, benefits immensely from the Agile methodology. Agile's adaptability facilitates quick responses to emerging trends, while its customer-centric approach ensures software aligns with user needs. Incremental development enables early essential feature releases, aiding competitiveness. Agile's focus is on risk mitigation and quality assurance safeguards user safety and business operations. Its speed-to-market advantage proves crucial in a competitive landscape, and its support for regulatory adaptation ensures compliance. Collaborative teamwork and continuous improvement further enhance its suitability for thriving in this ever-changing industry.

- A developer is a person who creates the code. This is one of the most important roles in Waterfall teams. Waterfall programmers must avoid bugs during their work because one single defect may be a reason to run the entire project from the very beginning.
- The role of a tester is also extremely important. In Waterfall projects, tests are usually conducted at the final stages of their realization. That is why testers must find all bugs in final products and return the software to the developers so that they can fix all defects.
- **A business analyst** is a person responsible for making the software product popular in the digital market. His main task is to write business strategies.
- A project manager is the main person in every Waterfall team. He is responsible for the quality of final software. His main task is to manage the projects and to subdivide tasks among other team members.

Lab-4:

Functional Requirements:

1. Users: Registration:

- 1.1) The system will ask for the user to give their full name, phone number, email, area, and car details.
- 1.2) If all the information of the data is provided on the system, the page will redirect the user to another page for providing username and password for their account.
- 1.3) If the username and password field is filled with appropriate data, the system will save the user information and login data to the database of the system.
- 1.4) In the username and password field is not filled with appropriate data, the system will request to re-enter the data again.
- 1.5) If all the information of the data is not provided on the system, the system will request to enter all data with highlight which field is empty.

Priority Level: High

Pre-condition: Connection with the database.

2. Users: Search and View Categories:

- 2.1) Users can view the search criteria's for finding a suitable car.
- 2.2) Can be able to see different types of parking spaces that are available within the area.
- 2.3) View the items that match the users search parameters.
- 2.4) Can be able to select parking space according to the taste of the users.

Priority Level: Medium

Pre-condition: Connection with the database.

3. Users: Request Submission:

- Based on the user's requirement, the system will search for the appropriate parking space.
- 3.2) The results will be shown to the user.
- 3.3) Users can select their choice of car parking space.
- 3.4) When the user chooses the appropriate car parking space or car for their needs, the web application will send a request to the server and notify the system admin and appropriate parking share owner.
- 3.5) The data of the parking choice will be added to the database.

Priority Level: Medium

Pre-condition: The system needs to be connected to the server and database. The user needs to be logged in as well.

4. User: Payment Section:

- 4.1) The payment details will be shown on this page of the current purchase session.
- 4.2) Users can choose their payment method from a variety of options.
- 6.3 Necessary payment information will be taken by the payment page and pass it to the payment service provider's API/Plug-in.
- 6.4 If the payment service provider responds that the transaction was successful, the page will show that the payment was successful.
- 6.5 If the payment service provider responds that the transaction was not successful, the page will show that the payment was unsuccessful, and the error message will the show that was received from the payment service provider.

Priority Level: Medium

Pre-condition: The system needs to be connected to the server and database. The user needs to be logged in as well.

NON-Functional Requirements:

1. Performance:

- **Response Time:** The system should respond to user requests within a defined maximum time limit (e.g., 2 seconds) to ensure a smooth user experience.
- **Throughput:** The system should support a certain number of concurrent users or transactions per second to handle peak loads.
- **Scalability:** The system should be able to scale horizontally or vertically to accommodate increasing load and user base.

2. Availability:

- **Uptime:** The system should be available and operational 24/7 with minimal scheduled downtime for maintenance.
- **Fault Tolerance:** The system should continue to operate in the presence of hardware or software failures.
- **Backup and Recovery:** Regular backups should be performed, and a robust recovery mechanism should be in place in case of data loss.

3. Security:

- Authentication and Authorization: Users should be authenticated securely, and access
 control should be implemented to ensure that only authorized users can perform specific
 actions.
- **Data Encryption:** Data transmission and storage should be encrypted to protect sensitive information.
- **Audit Trails:** A comprehensive audit trail should be maintained to track user activities and system changes for security and compliance purposes.

4. Usability:

- **User Interface (UI)**: The user interface should be intuitive, user-friendly, and accessible to a wide range of users, including those with disabilities.
- **Accessibility**: The system should comply with accessibility standards to ensure it can be used by individuals with disabilities.

5. Maintainability:

- Code Maintainability: The software code should be well-structured and well-documented to facilitate maintenance and future enhancements.
- **Modularity:** The system should be designed in a modular fashion to allow for easier updates and modifications.

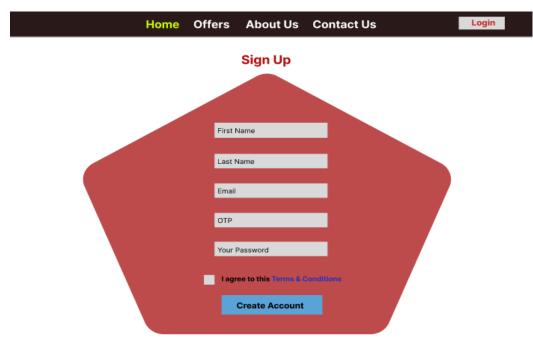
Lab-5:

Wireframes:

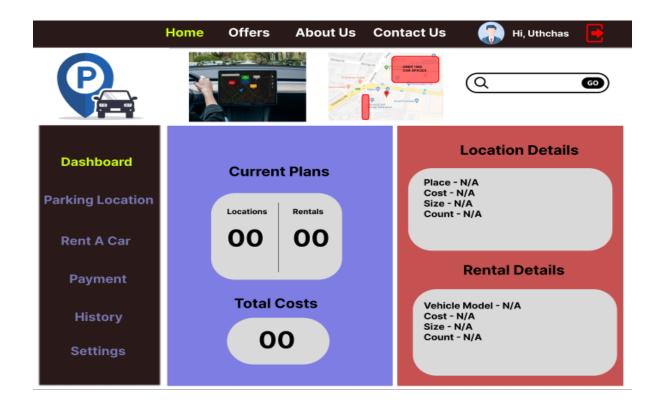
Login:



Registration:



Dashboard:



Final Lab-6(TEST CASE):

Project Name: Online E- Parking and Rent Management System.	Test Designed By: F. M SHARIAR
Test Case ID: FR_01	Test Designed Date: 05.11.2023
Test Priority: High	Test Executed By:
Module Name: User Registration	Test Execution Date:

Test Title: Verification of registration process

Description: Ensuring the registration process is going properly or not

Pre-condition: Connection with the database

Test Steps	Test Data	Excepted Results	Actual Results	Status
1.Visit all the fields whether they're properly filled or not. 2.Enter full name, email, password, number, and type. 3.Click Create an Account	First Name: Ayon Last Name: Ghosh Password:1234 Email: Useremail@u ser.com Type: Premio Number: 2003	1.Registration will be accepted if all the fields are properly labeled. 2.If all the fields are properly filled out, then it'll redirect to another Page & save the user Info. 3.If the data isn't given appropriately.	The system displays an error message, "Registration failed. Please remove special characters from the username field and try again."	fail

Post condition: User needs to save data.

Project Name: Online E- Parking and Rent Management System.	Test Designed By: SHAHRIAR HOSSEN
Test Case ID: FR_02	Test Designed Date: 05.11.2023
Test Priority: High	Test Executed By:
Module Name: Search and Result	Test Execution Date:

Test Title: Verify show search results

Description: Search Location for parking

Pre-condition: User must stay logged in

Test Steps	Test Data	Excepted Results Actual Results		Status
 1.Visit website. 2.Enter location name. 3.Enter the start time of when the user needs parking. 4.Enter the end time of when the user will leave the parking lot. 5.Click 'Search'. 	Location: Kuril Starting Time: 10:30 AM Ending Time: 12:00 PM	The Application will show results according to the provided input and the available parking space based on the location, starting time, and ending time.	The search results do not correspond accurately to the provided search query. Users are presented with irrelevant or outdated information that does not align with the entered search terms, leading to confusion and frustration.	fail

Post condition: None

Project Name: Online E- Parking and Rent Management System.	Test Designed By: RABIUL ISLAM BIPUL
Test Case ID: FR_03	Test Designed Date: 05.11.2023
Test Priority: High	Test Executed By:
Module Name: Request Submission	Test Execution Date:

Test Title: Request submission

Description: Test the request submission to verify proper request

Pre-condition: The system needs to be connected to the server and database. The user needs to be logged in as well.

Test Steps	Test Data	Excepted Results	Actual Results	Status
1. Click on the available button. 2. Many parking spots will be shown to the user. 3. User can select parking space on his or her preference. 4. After selecting the parking space by the user, the parking request will be added.	Location: Kuril Starting Time: 05:30 PM Ending Time: 03- 05-2023 06:30 PM	The system has successfully provided parking spot request.	The request is not processed, and users do not receive any confirmation or ticket number, hindering their ability to track the progress of their requests.	fail

Post condition: The user can request for a parking spot and the request will be stored in the database.

Project Name: Online E- Parking and Rent Management System.	Test Designed By: AKASH KUMAR GHOSH
Test Case ID: FR_04	Test Designed Date: 05.11.2023
Test Priority: High	Test Executed By:
Module Name: Payment Method	Test Execution Date:

Test Title: Verify payment system.

Description: Test the request submission to verify proper request.

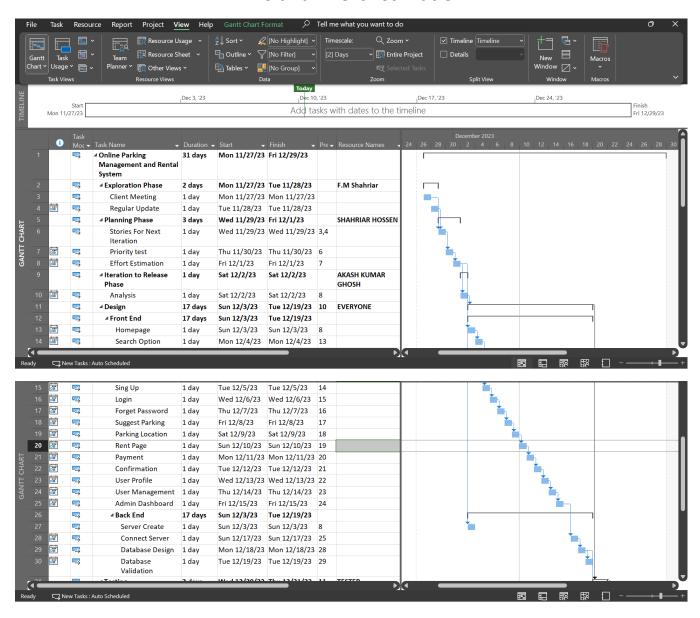
Pre-condition: The system needs to be connected to the payment server and database. The user needs to be logged in as well. This section will only open after Car parking Booked is completed.

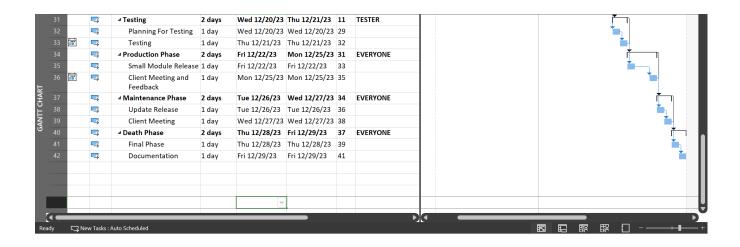
Test Steps	Test Data	Excepted Results	Actual Results	Status
 Enter the payment page. Enter card number, name. Enter Expiry date and CVV. 4Click proceed to payment 	Full name of Card: Visa Card Number: 40517071 Expiry date: 28-12-27 CVV: 533	The system has successfully made the payment	The payment transaction does not go through, and users do not receive any order confirmation or transaction receipt, hindering their ability to complete purchases.	fail

Post condition: Payment details will be stored in the database.

Lab-7:

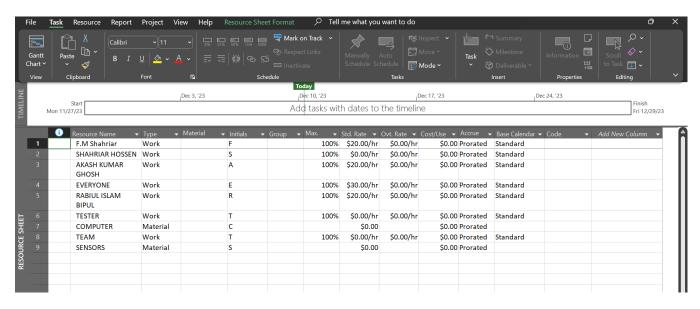
WBS and Effort Estimation





Lab-8:

Resource Allocation



Lab-9:

Risk Assessment:

	Risk Assesment							
	Projct Name	E-Parking And Rental system		Last Updated	10-12-23			
SL No-	Origin	Risk Description	Probability	Impact	Risk Ratting	Risk Minimization Strategy	Status	
1	Project Manager	Size estimate may be significally low	High	Medium	Severe	Open Communication and Precise Estimates	Open	
2	Feedback	Larger number of users than planned	Low	Very low	Sustainable	Continuous monitoring of user metrics	Open	
3	Finance Lead	Funding will be lost	Medium	High	Moderate	Transparent communication with funders	Closed	
4	Client or Customer	Delivery deadline will be tightened	Low	Very low	Sustainable	Evaluating the impact on project scope	Open	
5	(HR) Department	Lack of training on tools	Low	Medium	Moderate	Identifying training needs and commitment	Closed	
6	Product Design Team	User experience issues	Low	High	Severe	Conduct more usability testing and fostering	Open	
7	Customers or Clients	Payment disputes	High	Very High	Critical	Import well-defined contractual agreements	Open	
8	Data Controllers	Privacy issues	Very low	Medium	Sustainable	Prioritize robust data protection measures	Open	

			Probability	Impact		
			Very High	Very High		
			High	High		
			Medium	Medium		
			Low	Low		
Risk I	Matrix		Very low	Very low		
Im	pact	Very low	Low	Medium	High	Very High
_	Very High	Moderate	Severe	Severe	Critical	Critical
Probability	High	Sustainable	Moderate	Severe	Critical	Critical
par	Medium	Sustainable	Moderate	Moderate	Severe	Critical
£	Low	Sustainable	Sustainable	Moderate	Severe	Critical
	Very low	Sustainable	Sustainable	Sustainable	Moderate	Severe