American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

TRAIN TICKET RESERVATION SYSTEM

A Software Engineering Project Submitted
By

Semester: Summer_21_22		**Section:**	**Group Number:**	
SN	Student Name	Student ID	Contribution (CO3+CO4)	Individual Marks
1.	MD.SHAIFUL ALAM	22-46576-1		
2.	SHAHRIAR RAHMAN DIPTO	22-46622-1		
3.	TALHA HOSSAIN SIFAT	22-46344-1		
	FEZAUL HAQUE SHAJU	22-46584-1		

The project will be Evaluated for the following Course Outcomes

CO3: *Select* appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5 Marks]	
Evidence of Argumentation regarding process model selection	[5Marks]	
Evaluate the sustainability of the developed software in terms of both society and the environment (Impact identification)	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]	
CO4: *Develop* project management plan to manage software engineering projects following the principles of engineering management and economic decision process	Total Marks	
Develop the project plan, its components of the proposed software products	[5Marks]	
Identify all the activities/tasks related to project management and categorize them within the WBS structure. Perform detailed effort estimation correspond with the WBS and schedule the activities with resources	[5Marks]	
Identify all the potential risks in the specific project and prioritizing/categorizing those to overcome the risk factors.	[5Marks]	

Description of Student's Contribution in the Project work

Student Name: MD. SHAIFUL ALAM
Student ID: 22-46576-1
Contribution in Percentage (%):25%
Contribution in the Project:
Process Model
Schedule/WBS
Package Daigram
Prototype Design

_____
Signature of the Student

Student Name: SHAHRIAR RAHMAN DIPTO
Student ID: 22-46622-1
Contribution in Percentage (%):25%
Contribution in the Project:
Class Diagram
Architectural Diagram
Maintenance Plan
Prototype Design

_____
Signature of the Student

Student Name: TALHA HOSSAIN SIFAT
Student ID: 22-46344-1
Contribution in Percentage (%):25%
Contribution in the Project:
Project Description
Problem Statement
Proposed Solution

_____
Signature of the Student

Student Name: FEZAUL HAQUE SHAJU
Student ID: 22-46584-1
Contribution in Percentage (%):25%
Contribution in the Project:
Project Risks
Project Requirements
Process Model

_____
Signature of the Student

Rubric for Project Assessment (CO3)

Criteria	Marks distribution (Max 4X5= 20)				Acquired Marks
	Missing/ Incorrect (0-1)	**Inadequate (2)**	**Satisfactory (3-4)**	**Excellent (5)**	
Selection of Software Engineering Models	Does not articulate a position or argument of choosing appropriate model. Does not present any evidence to support the arguments for the choice of the model.	Articulates a position or argument for choosing models that is unfocused or ambiguous. Presents incomplete/vague evidence to support argument for model choice.	Articulates a position or argument of choosing models that is limited in scope. Does not present enough evidence to support the argument for the choice of the model	Clearly articulates a position or argument for the choosing software engineering models. Presents sufficient evidence to support argument for the model selection	
Role identification and Responsibility Allocation	The project has poor project management plans for identifying roles and assigning the responsibilities	Identify few roles in the project management where some of the roles are left alone with any project responsibilities	Identify most of the roles in the project management and assign their responsibilities	Well planned project with proper role identification and responsibility allocation in the project management activities	
Impact identification	Student vaguely discuss the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student provided with partial relevance to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student fairly provided the analysis to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	Student comprehensively provided the analysis to the impact of societal, health, safety, legal, cultural, or environmental issues in their project	
Formatting and Submission	Project report is not complete and Several errors in spelling and grammar. Present a Confusing organization of concepts, supporting arguments, and real-life example. Sentences rambling, and details are repeated.	Some errors in spelling and grammar. Some problems of organizing the answer in a logical order of defining, elaborating, and providing real-life examples.	Few errors in spelling and grammar. Presents most of the details in a logical flow of organization in definition, details, and example.	Project report is complete and No errors in spelling and grammar. Consistently presents a logical and effective organization of definition, details, and real-life example of the topic.	
				Acquired marks:	

CO Pass / Fail:	

Rubric for Project Assessment (CO4)

Marking Criteria	Marks Distribution (Maximum 3X5=15)				Acquired Marks
	Missing/ Incorrect (0-1)	**Inadequate (2)**	**Satisfactory (3-4)**	**Excellent (5)**	
Project Planning	Missing or incorrect project plan;	Insufficient project plan provided: project team, project tasks, goals etc. stated poorly.	Sufficient information provided : project team members, their tasks, project plan discussed in details.	Thorough and relevant project plan is provided; project plan is clear and easy to follow.	
Effort Estimation and Scheduling	Missing or incorrect effort estimation or schedules based on available project resources	Insufficient or poorly stated effort estimation or schedules based on available project resources	Correct or sufficient technique used for effort estimation or schedules based on available project resources	Project estimation was described using proper effort estimation or schedules based on available project resources	
Risk Management	Risk analysis activities were missing or inappropriate for the specific project: unidentified risks or wrongly categorized risks or not prioritized properly.	Risks are partially identified(insufficient) and not properly categorized or not prioritized properly.	Sufficient and critical risks are identified(insufficient) and properly categorized but not prioritized properly.	Sufficient and appropiate risks are identified, analyzed, and properly categorized or prioritized.	
				Acquired Marks:	
				CO Pass / Fail:	

1.Project Description

Forget the hassle of crowded stations and long queues! This Railway Reservation System revolutionizes your travel experience with its intuitive interface and comprehensive features. Whether you're a tech-savvy smartphone user or prefer the comfort of your computer, seamless booking awaits. Register and login with ease, then embark on a journey of exploration. Search for trains across the network, view real-time availability, and book your tickets in a flash. Secure payment gateways ensure a smooth transaction, while user-friendly cancellation options offer flexibility. Need travel information? Submit inquiries and get prompt answers.

This system doesn't just cater to passengers; it empowers administrators too. With a dedicated internal interface, authorized personnel can manage user accounts, ensuring smooth operation. Train schedules and station details are easily modifiable, keeping the system up to date. Moreover, performance monitoring tools provide valuable insights, allowing for constant improvement.

Accessibility is paramount. Our responsive web design ensures a flawless experience on any device, be it a laptop, tablet, or smartphone. For added convenience, dedicated Android and iPhone apps offer native functionality, putting the power of booking right in your pocket. Cross-platform compatibility is another feather in our cap, as the system works seamlessly with all major browsers, offering unmatched flexibility.

So, ditch the stress and embrace a new era of train travel. Book your tickets, manage your journey, and access vital information - all with a few clicks or taps. This online train booking system is your one-stop solution for a smooth and hassle-free travel experience.

Background of the problem:

1. Traditional train ticket reservation systems often present challenges for both passengers and administrators. These challenges can include:

- **Long queues and crowded stations:** People waste time waiting in line to purchase tickets, leading to frustration and inefficiency.
- **Limited accessibility:** Booking options might be restricted to physical stations or phone calls, making it difficult for people with busy schedules or limited mobility.
- **Outdated information:** Real-time availability might not be readily available, leading to passengers missing out on desired seats or wasting time on inquiries.
- **Inflexible booking management:** Difficulties in changing or canceling tickets can cause frustration and financial loss for passengers.
- **Inefficient data management:** Manual processes for administrators can be time-consuming and prone to errors.

2.This problem is important to consider because efficient and user-friendly train ticket reservation systems are crucial for:

- **Improved customer satisfaction:** Easier and faster booking processes can significantly enhance the travel experience for passengers.
- **Increased efficiency:** Online systems can reduce wait times and streamline ticket sales, saving time and resources for both passengers and railway staff.

- **Enhanced accessibility:** Online and mobile options allow people to book tickets from anywhere, at any time, regardless of location or mobility limitations.
- **Accurate and up-to-date information:** Real-time availability and clear information about schedules and fares empower passengers to make informed decisions.
- **Improved data management:** Automated systems can improve data accuracy and facilitate easier tracking and reporting for railway companies.

By addressing these challenges, a modern train ticket reservation system can significantly benefit both passengers and railway companies.

2. Problem statement:

The existing state of train ticket reservation systems is filled with inefficiencies that hinder operational effectiveness and irritate passengers. For tasks like buying tickets, making changes to reservations, and asking about schedules, many systems still use outdated techniques that require passengers to physically visit stations. Long lines, lost time, and an overall feeling of annoyance result from this.

Moreover, many systems have no online booking functionality at all, which restricts accessibility and requires travelers to go through a laborious physical procedure. Even individuals with internet access might struggle with outdated user interfaces that are hard to use and feature-poor. This inhibits online booking and puts up a barrier for travelers of all technological skill levels, which might influence revenue and slow system adoption.

The challenges extend beyond the passenger experience. Train administrators often struggle with outdated systems that lack a centralized and user-friendly platform for managing train information, station details, and user data. This can lead to cumbersome processes, inefficiencies, and potential errors.

Solution to the Problem

Objective: This project aims to develop a web and mobile application train reservation system to address the inefficiencies of traditional methods. By offering real-time availability, online booking, and user-friendly interfaces for both passengers and administrators, the system seeks to eliminate long queues, improve accessibility, and streamline data management, ultimately creating a smooth and hassle-free travel experience.

3. Proposed Solution:

The current state of train ticket reservation systems is plagued by inefficiencies that frustrate passengers and hinder operational effectiveness. We propose a solution: the train ticket reservation system mobile application, a modern train ticket reservation system designed to revolutionize the booking experience for both passengers and administrators.

Transforming the Passenger Experience:

- **Effortless Online Booking:** Eliminate the need for physical queues. Through the user-friendly app, passengers can simply purchase tickets, check timetables, and amend bookings at any time, from any location.

- **Real-Time Seat Availability:** Gain immediate insight into available seats for different trains and routes, allowing informed booking decisions.
- **Secure Payment Processing:** Seamlessly integrate secure payment gateways for safe and convenient online transactions.
- **Intuitive User Interface:** The app boasts a clean and intuitive interface, making it easy to navigate and use for travelers of all technological backgrounds.

Empowering Train Administrators:

- **Centralized Management System:** Equip administrators with a user-friendly platform to efficiently manage train schedules, station details, and user data, eliminating cumbersome processes and improving operational efficiency.
- **Data-Driven Insights:** Gain valuable insights from user data to optimize train schedules, allocate resources effectively, and enhance the overall travel experience.

Our train ticket reservation system is not just an app; it's a bridge to a modern and efficient train reservation system. Passengers will enjoy convenience, accessibility, and time-saving features. Administrators will experience streamlined data management and improved operational effectiveness. Ultimately, this solution will contribute to increased customer satisfaction, improved revenue streams, and a more efficient railway system for everyone.

This train ticket reservation system mobile application is particularly appropriate for several reasons:

- **Addresses the root cause:** It directly tackles the reliance on traditional methods by offering online booking, real-time information, and mobile accessibility. This eliminates the limitations of physical stations and phone lines.
- **Benefits both passengers and administrators:** The app caters to both parties. Passengers enjoy convenience and flexibility, while administrators gain efficiency in managing bookings, schedules, and data.
- **Improved user experience:** The focus on a user-friendly interface and secure payment processing makes it easy and safe for everyone to use.
- **Data-driven approach:** The ability to gather insights from user data allows for optimizing train schedules and resource allocation, improving the overall travel experience.

Feasibility of the solution:

This solution is feasible for meeting the business objective based on the following:

- **Technology readily available:** Mobile app development tools and secure payment gateways are widely available, making development achievable.
- **Scalability:** The system can be scaled to accommodate a growing user base and train network.
- **Addresses business needs:** The app directly addresses the inefficiencies mentioned, leading to increased customer satisfaction, improved revenue streams through efficient operations, and a more modern railway system.

Overall, the mobile train ticket reservation system is a well-suited solution to the problem. It offers a feasible approach that can significantly improve the train travel experience for both passengers and railway companies.

Basic functionalities of our proposed solution, deep insights, and creative solution to the real-life problem:

This train ticket reservation system mobile application goes beyond simply automating the ticketing process. It leverages state-of-the-art technology to create a significant impact across various societal aspects. Here's a breakdown of its functionalities and potential influence:

Functionalities:

- **Real-time seat availability and booking:** Utilizes cloud-based databases and APIs to provide passengers with immediate information on available seats across the network. This empowers informed decision-making and eliminates the frustration of sold-out tickets discovered upon arrival.
- **Advanced recommendation algorithms:** Integrates machine learning algorithms to suggest optimal travel options based on user preferences, past booking history, and real-time data on delays or congestion. This personalization enhances user experience and travel efficiency.
- **Seamless integration with mobile wallets and digital payment platforms:** Leverages existing secure payment infrastructure like Apple Pay or Google Pay to streamline transactions and eliminate the need for cash or credit card details within the app, improving security and convenience.
- **Advanced data analytics for administrators:** Provides dashboards and reports generated from user data. This allows administrators to identify peak travel times, popular routes, and user demographics. This data can be used to optimize train schedules, allocate resources effectively, and potentially introduce targeted promotions or discounts, ultimately improving overall system efficiency and passenger satisfaction.
- **Accessibility features:** Integrates features like text-to-speech and screen readers for visually impaired users and offers multi-language support for a broader reach. This promotes inclusivity and caters to a wider range of passengers.

Impact:

- **Societal:** Reduces traffic congestion and environmental impact by encouraging a shift towards train travel, which is typically more fuel-efficient than cars. Additionally, the app's accessibility features promote social inclusion for people with disabilities.
- **Health:** By promoting train travel, the app could potentially contribute to a healthier lifestyle by reducing reliance on personal vehicles and encouraging a more active commute to train stations (walking, cycling).
- **Safety:** Real-time information on delays and disruptions can help passengers make informed decisions and avoid safety risks associated with missed connections or overcrowded stations.
- **Legal:** Secure payment gateways and data encryption ensure user privacy and adhere to relevant data protection regulations.
- **Cultural:** Encourages exploration and travel by making train journeys more accessible and convenient. This fosters cultural exchange and understanding between different communities.

Creative Solution:

This app goes beyond just replicating existing online booking systems. By integrating advanced recommendation algorithms, real-time data analysis, and accessibility features, it creates a user-centric and data-driven approach to train travel. This fosters a more sustainable, inclusive, and efficient railway system with a positive ripple effect across various societal aspects.

Target group of users and their benefits:

The target group of users for the proposed train ticket reservation system mobile application includes both passengers and train administrators. Each group will benefit differently from the solution:

1. **Passengers:**

    - **Convenience:** Passengers can book train tickets effortlessly from anywhere, eliminating the need to wait in physical queues.
    - **Real-Time Information:** They can check seat availability instantly and make informed decisions about their bookings.
    - **Flexibility:** Passengers can easily amend bookings or check train timetables on the go.
    - **Secure Transactions:** The integration of secure payment gateways ensures safe and convenient online transactions.
    - **Intuitive Interface:** The app's user-friendly interface caters to travelers of all technological backgrounds, enhancing accessibility.

Overall, passengers benefit from a seamless booking experience that saves time and provides flexibility, contributing to increased satisfaction with the railway service.

2. **Train Administrators:**

    - **Efficient Management:** Administrators gain access to a centralized platform to efficiently manage train schedules, station details, and user data.
    - **Data Insights:** They can derive valuable insights from user data to optimize train schedules, allocate resources effectively, and improve overall service quality.
    - **Operational Streamlining:** Cumbersome manual processes are eliminated, leading to improved operational efficiency.

Train administrators benefit from enhanced data-driven decision-making, streamlined operations, and improved resource allocation, ultimately leading to a more efficient and effective railway service.

Contribution of our project to the development of scientific results:

The Railway Reservation System contributes to scientific development through several key areas:

1. **Efficient Transport Management:** Optimizes train scheduling and resource allocation, reducing operational costs and enhancing service quality.

2. **Data Analytics and Decision-Making:** Utilizes user data for insights into booking patterns and preferences, advancing research in transportation analytics.
3. **User Experience and HCI:** Provides an intuitive interface and responsive design, contributing to studies in human-computer interaction.
4. **Security and Transaction Processing:** Integrates secure payment gateways, contributing to research in online transaction processing and e-commerce security.
5. **Cross-Platform Compatibility:** Showcases advancements in technology integration across devices and browsers, aiding research in software engineering.

Overall, the system's impact on operational efficiency, user experience, and technology integration contributes to documented scientific results in transportation logistics, data analytics, HCI, security, and technology integration. This comprehensive approach enhances understanding and innovation in the field of transportation systems and information technology.

4. Process model:

Nature and Environment of the Software

Our project is a mobile application for a train ticket reservation system. Here's the analysis of its nature and environment:

- **Mobile Application:** The software is a mobile app, requiring a user-friendly interface, responsiveness to various devices (smartphones with different screen sizes and operating systems), and potential integration with device features like GPS.
- **Real-time features:** The app needs to display real-time seat availability and process transactions efficiently.
- **Security:** The app handles sensitive user data (personal information and payment details) requiring robust security measures.
- **Scalability:** The system needs to accommodate a growing user base and transaction volume.
- **Evolving Requirements:** New functionalities and features might be added based on user feedback and future needs.

Selection of Development Methodology

Based on the analysis above, the most suitable development methodologies for our project are:

1. **Agile Model (with Iterative Approach):**
    - **Arguments:**
        - **Flexibility:** Agile allows for adapting to changing requirements or user feedback during development.

        - **Rapid Prototyping:** Users can provide feedback on early prototypes leading to a more user-friendly final product.
        - **Focus on Functionality:** Agile prioritizes delivering core functionalities iteratively, ensuring the app has a usable version early.
        - **Teamwork:** Agile fosters collaboration between developers and stakeholders, crucial for a complex system.
    - **Evidence:** Real-time features and potential future functionalities suggest a need for adapting to changing requirements. Agile allows for continuous deliveries and feedback loops, ensuring the app meets evolving needs.

2. **Iterative Model:**
    - **Arguments:**
        - **Phased Development:** The iterative model breaks down development into smaller, testable phases, allowing for early bug detection and course correction.
        - **User Feedback**: Iterative development allows incorporating user feedback after each iteration, refining the user experience**.**
        - **Risk Management:** Early identification and mitigation of risks throughout development cycles.
    - **Evidence:** The need for a user-friendly interface and potential complex functionalities like real-time seat availability benefit from user feedback and iterative refinement.

Why these methods are the best choice:

- **Adaptability:** Both Agile and Iterative approaches are flexible and adaptable, allowing for adjustments to changing requirements. This is crucial for a mobile app where user needs and technology advancements can evolve quickly.
- **User-Centric Design:** Both methods emphasize user feedback and iterative testing, resulting in a user-friendly and intuitive app.
- **Reduced Risk:** Early bug detection and risk mitigation strategies within iterative cycles minimize development risks.
- **Faster Time to Market:** Agile development promotes early delivery of core functionalities, allowing the app to reach the market faster.

Other Models Considered but Rejected:

- **Waterfall Model:** This rigid, sequential model doesn't suit projects with evolving requirements like our application.
- **V model:** Similar to Waterfall, the V model doesn't allow for easy adaptation to changes.

- **RAD Model:** While RAD emphasizes rapid prototyping, it might not be as flexible as Agile in incorporating user feedback throughout development.
- **Spiral Model:** This risk-driven model might be overkill for a mobile app development project with a clear scope.
- **Prototype Model:** While useful for initial user interface design, a complete development methodology is needed for building and deploying the entire application.

By combining Agile and Iterative approaches, our application can be developed efficiently, meeting user needs, evolving functionalities, and delivering a user-friendly experience for both passengers and administrators.

Project Role Identification and Responsibilities

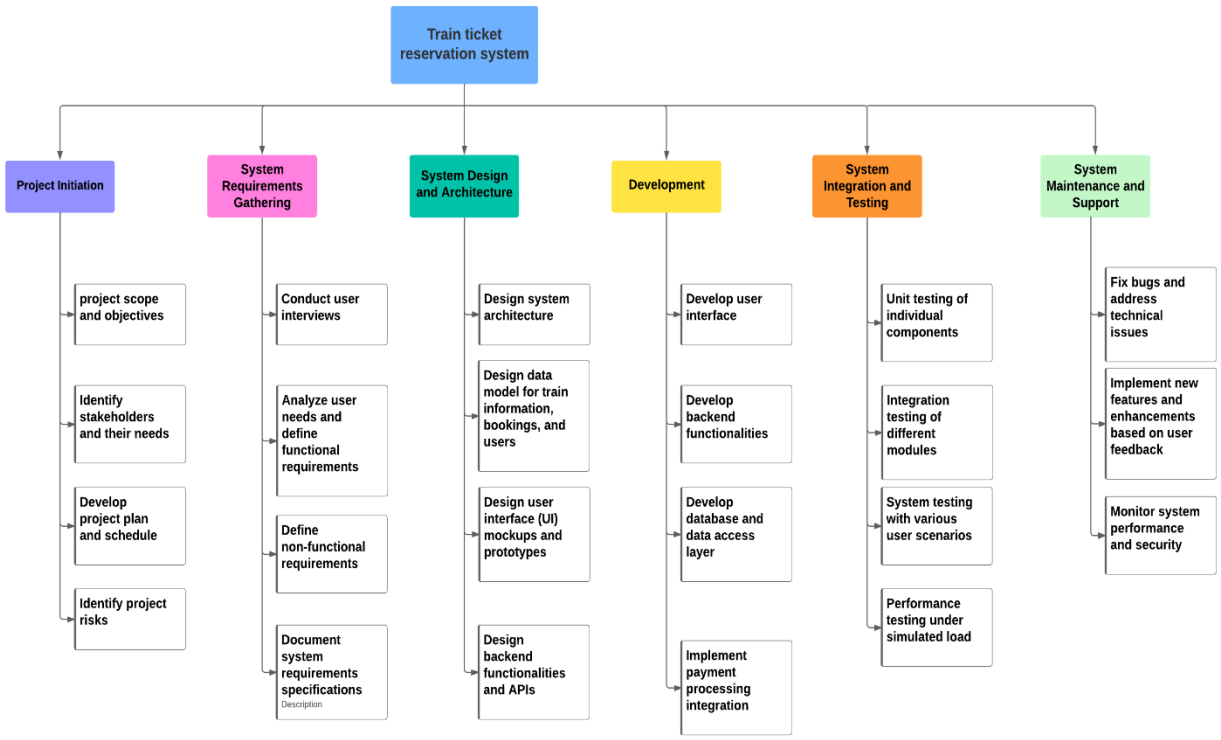
1. **Project Manager**:
    - Responsibilities:
        - Overall planning, coordination, and management of the software project.
        - Defining project scope, goals, and deliverables.
        - Resource allocation and task assignment.
        - Monitoring project progress, timelines, and budgets.
        - Risk management and issue resolution.
        - Communication with stakeholders and project team members.
2. **Product Owner**:
    - Responsibilities:
        - Represents the interests of stakeholders and customers.
        - Defines and prioritizes product features and requirements.
        - Works closely with development teams to ensure product vision is realized.
        - Provides feedback and approves deliverables.
        - Manages product backlog and sprint planning.
3. **Software Developer/Engineer**:
    - Responsibilities:
        - Designs, codes, tests, and maintains software applications.
        - Implements features based on specifications and requirements.

- Collaborates with other team members (e.g., designers, testers) to deliver high-quality software.
- Participates in code reviews and debugging activities.
- Keeps up-to-date with technological advancements and best practices.

4. **Quality Assurance (QA) Engineer/Tester**:
    - Responsibilities:
        - Designs and executes test plans and test cases.
        - Identifies and reports software defects and issues.
        - Ensures software meets quality standards and specifications.
        - Collaborates with developers to resolve issues and improve software quality.
        - Automates testing processes to improve efficiency and reliability.
5. **UI/UX Designer**:
    - Responsibilities:
        - Designs user interfaces and experiences for software applications.
        - Creates wireframes, mockups, and prototypes.
        - Ensures usability, accessibility, and visual consistency.
        - Collaborates with developers to implement designs.
        - Conducts user research and gathers feedback for iterative design improvements.
6. **System Architect/Designer**:
    - Responsibilities:
        - Designs software architecture and system components.
        - Defines technical specifications and requirements.
        - Ensures scalability, reliability, and performance of software systems.
        - Chooses appropriate technologies and frameworks.
        - Collaborates with development teams to implement architectural designs.
7. **Technical Lead**:
    - Responsibilities:
        - Provides technical guidance and mentorship to development teams.
        - Leads code reviews and enforces coding standards.
        - Makes technical decisions and resolves complex issues.

- Coordinates with other stakeholders to align technical solutions with business goals.
- Ensures adherence to best practices and standards.

5. Schedule/WBS:



6. Risk:

- **Lack of system experience:** The lack of prior experience developing systems similar to this might make it difficult for the project team to understand the complexities of train ticket reservation systems and to effectively carry out the functionality.
- **Lack of understanding of the user's needs:** The development team may produce a system that is challenging to use or doesn't satisfy their demands if they don't have a sufficient understanding of the needs of the users (admins and passengers).
- **Lack of understanding of the system's functionality:** Understanding the functionality of the system in detail is essential to its effective development. Any gaps in this understanding might result in the final system lacking certain features or functionalities.

some additional risks:

- **Integration challenges:** The system might need to integrate with other existing systems, such as railway databases or payment gateways. These integrations can be complex and pose challenges.

- **Performance issues:** strong traffic volumes may be too much for the system to handle, particularly during periods of strong booking demand. System failures or slow reaction times might result from this.
- **Scalability issues:** The system might not be easily scalable to accommodate future growth in the number of users or transactions.
- **Testing challenges:** Thoroughly testing all the functionalities and edge cases of the system can be challenging and time-consuming.

Project Risk, Impact, Risk level						
Date of last review:						
ID	**Description of Risk**	**Impact**	**Risk Reponse**	**Risk Level**	**Risk owner**	**Notes**
1	Schedule Risk	Could lead to missed deadlines for deployment and launch.	Regular monitoring of project milestones, agile methodology to adapt to changes, and allocation of additional resources if necessary.	Moderate	Project Manager	Buffer time should be allocated for unexpected delays.
2	Budget Risk	Could lead to financial constraints and affect project scope. uthorized access to user data, payment information	Continuous monitoring of expenditures, proactive cost-cutting measures, and seeking approval for budget revisions if needed.	High	Finance Manager	Regular budget reviews and strict adherence to financial guidelines are essential.
3	Programmatic Risks	Disruption in service availability and functionality.	Implementing fallback mechanisms, identifying alternative providers, and regular communication with service providers.	Moderate	Technical Lead	Regular testing and monitoring of external dependencies.
4	Quality Risks	Loss of customer confidence and increased support overhead.	Comprehensive testing at each stage of development, prioritizing quality assurance activities, and implementing a robust feedback loop.	High	Quality Assurance Manager	Continuous improvement through user feedback and rigorous testing protocols.
5	Cost Risks	Budget overruns and resource shortages.	Regular cost analysis, exploring cost-effective alternatives, and negotiating favorable contracts.	Moderate	Procurement Manager	Continuous monitoring of market trends and proactive cost management.
6	Stakeholder Risks	Scope creep, project delays, or dissatisfaction	Regular stakeholder engagement, clear communication of project objectives and constraints,	High	Project Manager	Establishing a robust communication plan and

		among stakeholders.	and effective change management processes.			managing stakeholder expectations throughout the project.

7. Project Requirements:

Functional Requirements:

- **User:**
    - View train schedules (source station, destination station, departure time, arrival time).
    - Search for trains based on various criteria (date, origin, destination, etc.).
    - Check seat availability for a specific train.
    - Book tickets for available seats (including specifying passenger details).
    - View and modify booking details (passenger information, travel date, etc.) for booked tickets.
    - Register for an account and manage profile information (name, contact details, etc.).
- **Admin:**
    - View and modify train information (schedules, stops, fares).
    - View and modify station information (names, locations).
    - View and modify user information (account details, bookings).
    - Manage user accounts (add, update, delete).

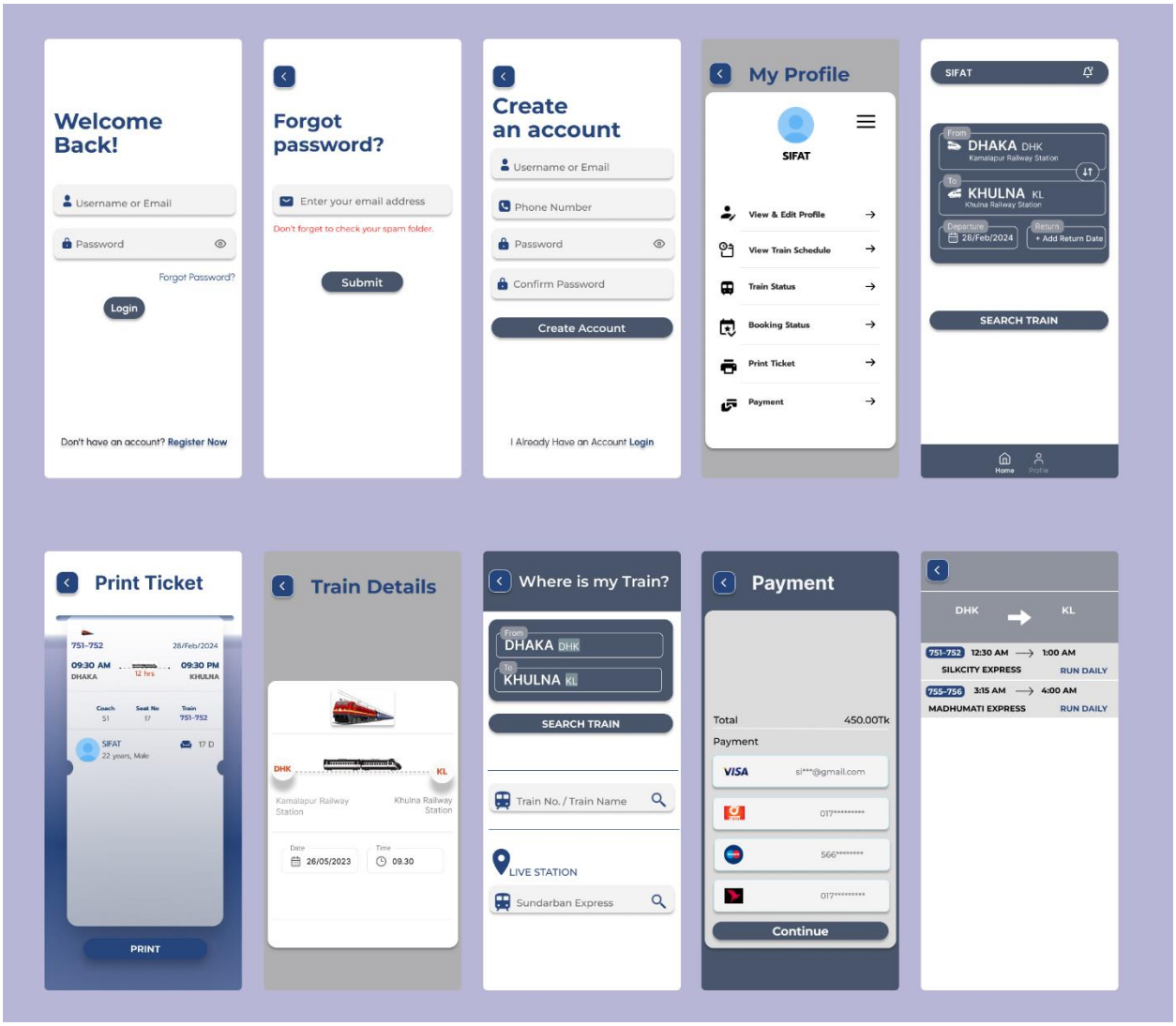
Non-Functional Requirements:

- **Performance:**
    - The system does respond to user actions quickly (e.g., searching for trains, booking tickets) and handles multiple concurrent users efficiently.
- **Security:**
    - The system protects user data (e.g., passenger information, payment details) from unauthorized access.
- **Reliability:**
    - The system is highly available with minimal downtime.

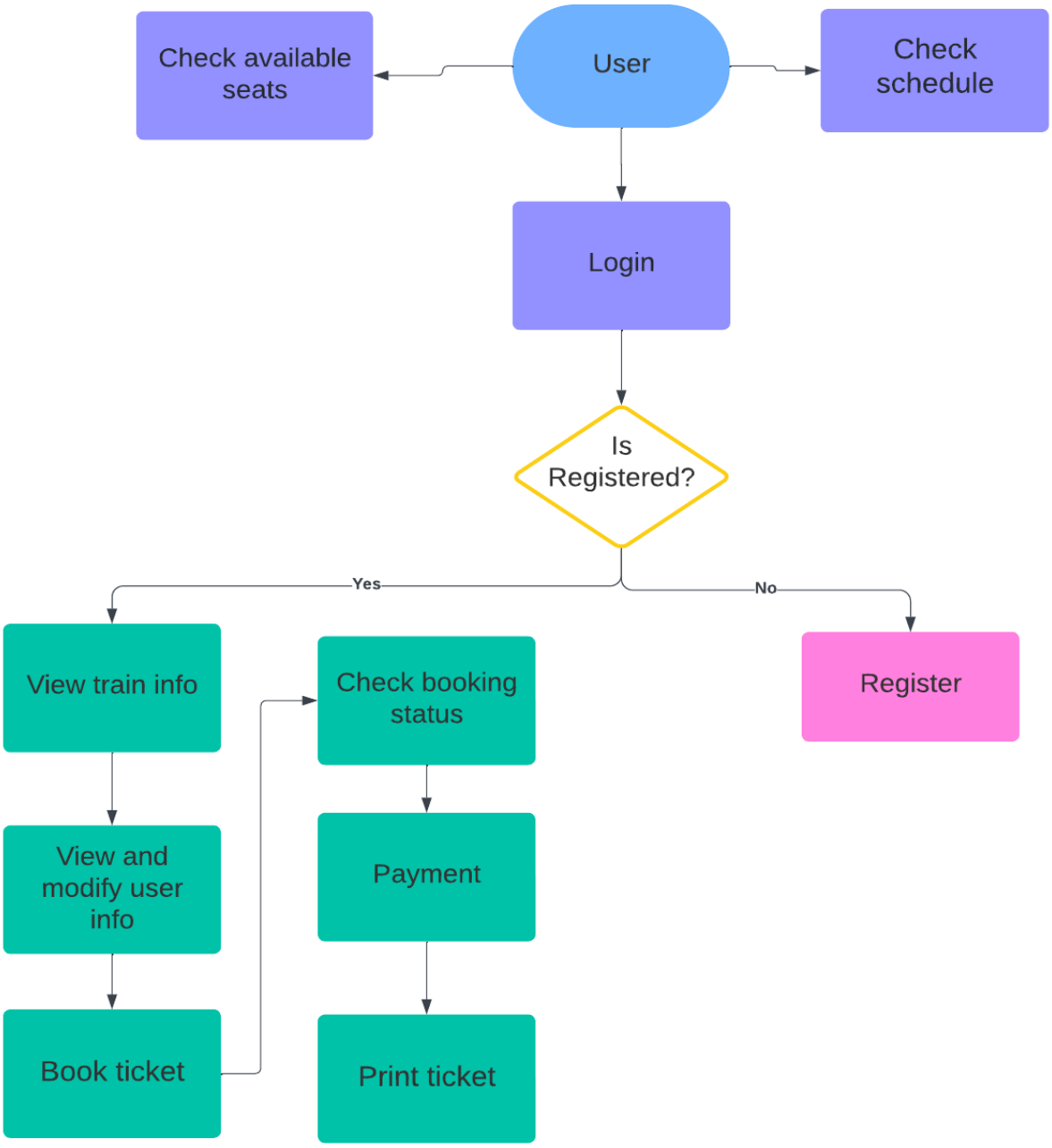
- The system can recover from errors and failures gracefully.

- **Scalability:**
  - The system is able to accommodate a growing number of users and transactions.
- **Usability:**
  - The user interface isintuitive and easy to navigate for users with varying levels of technical expertise.
  - The system can provide clear instructions and error messages.
- **Maintainability:**
  - The system is designed for easy maintenance and modification.

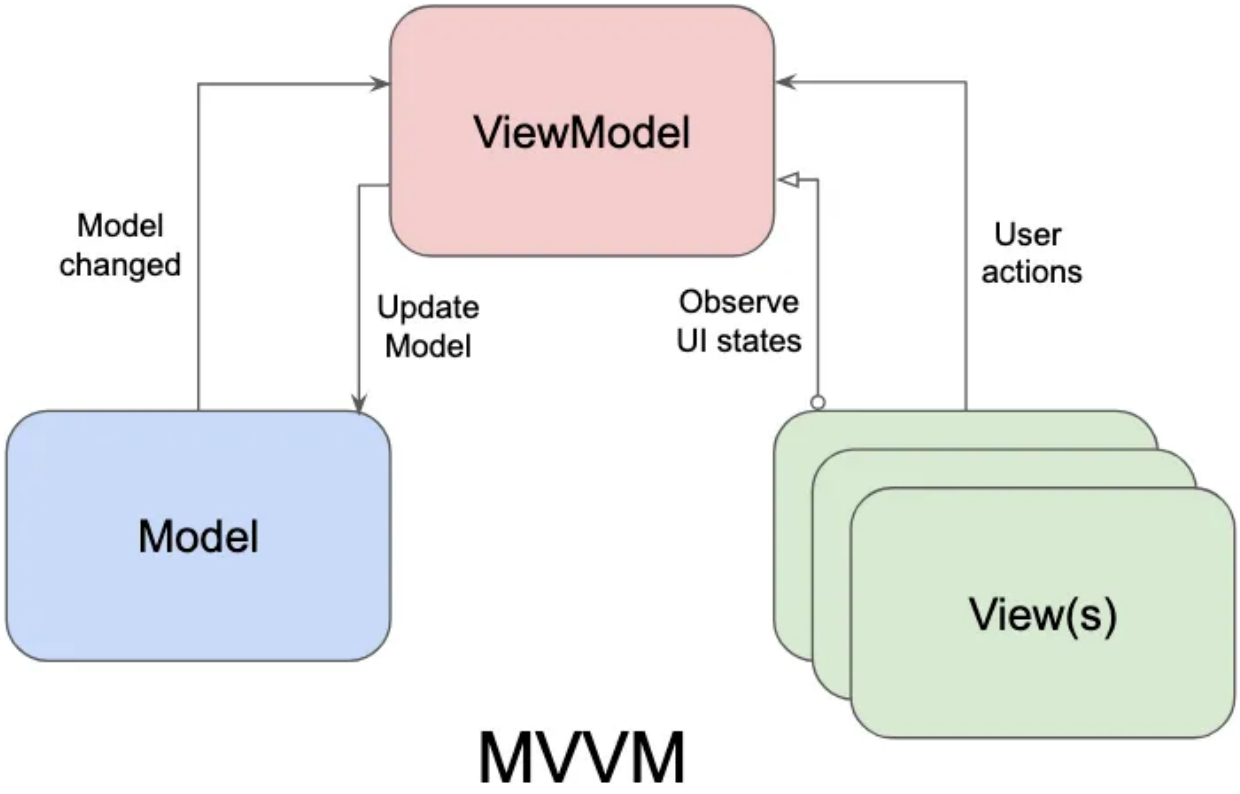
8. Prototype design:



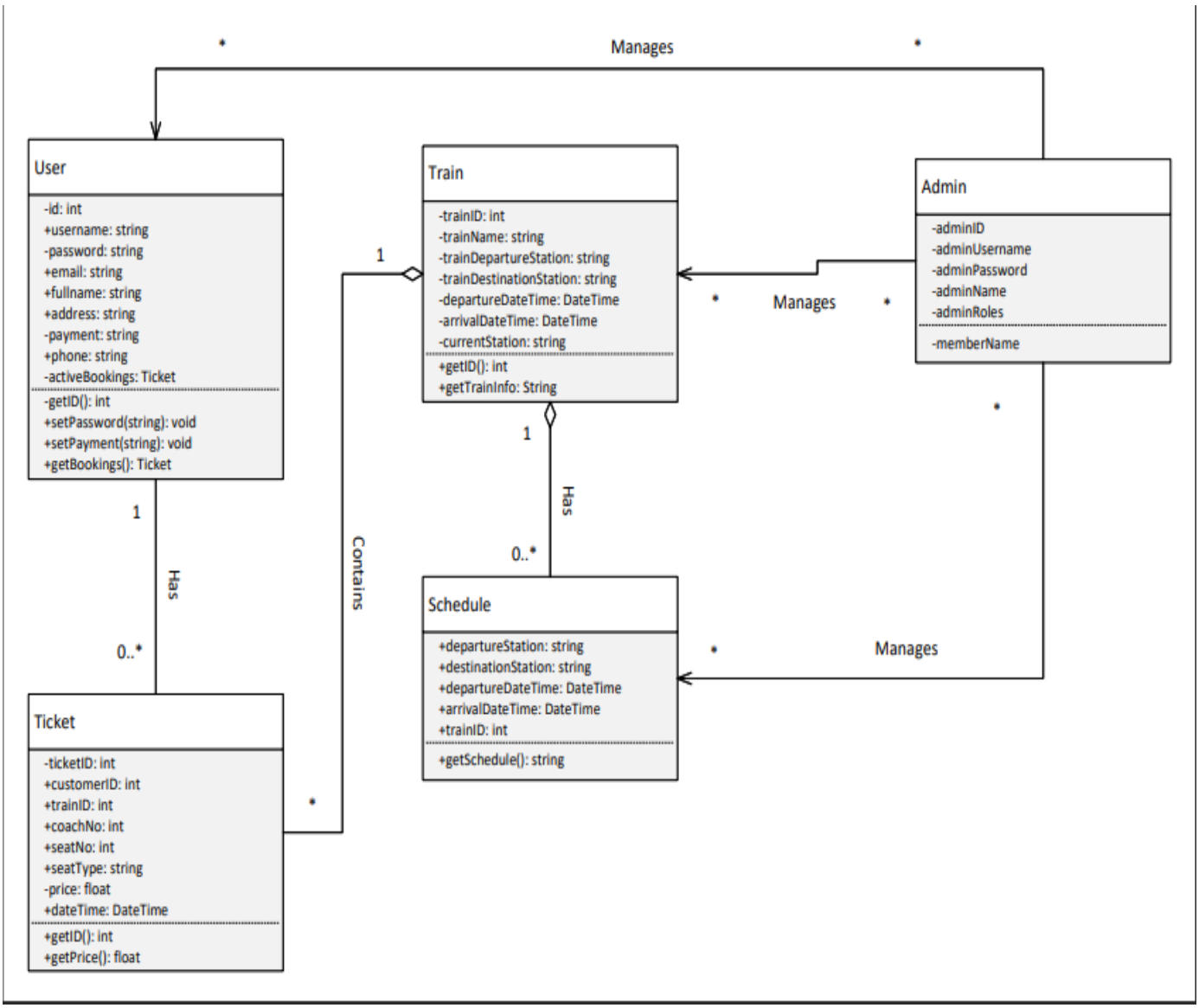
Process diagram:



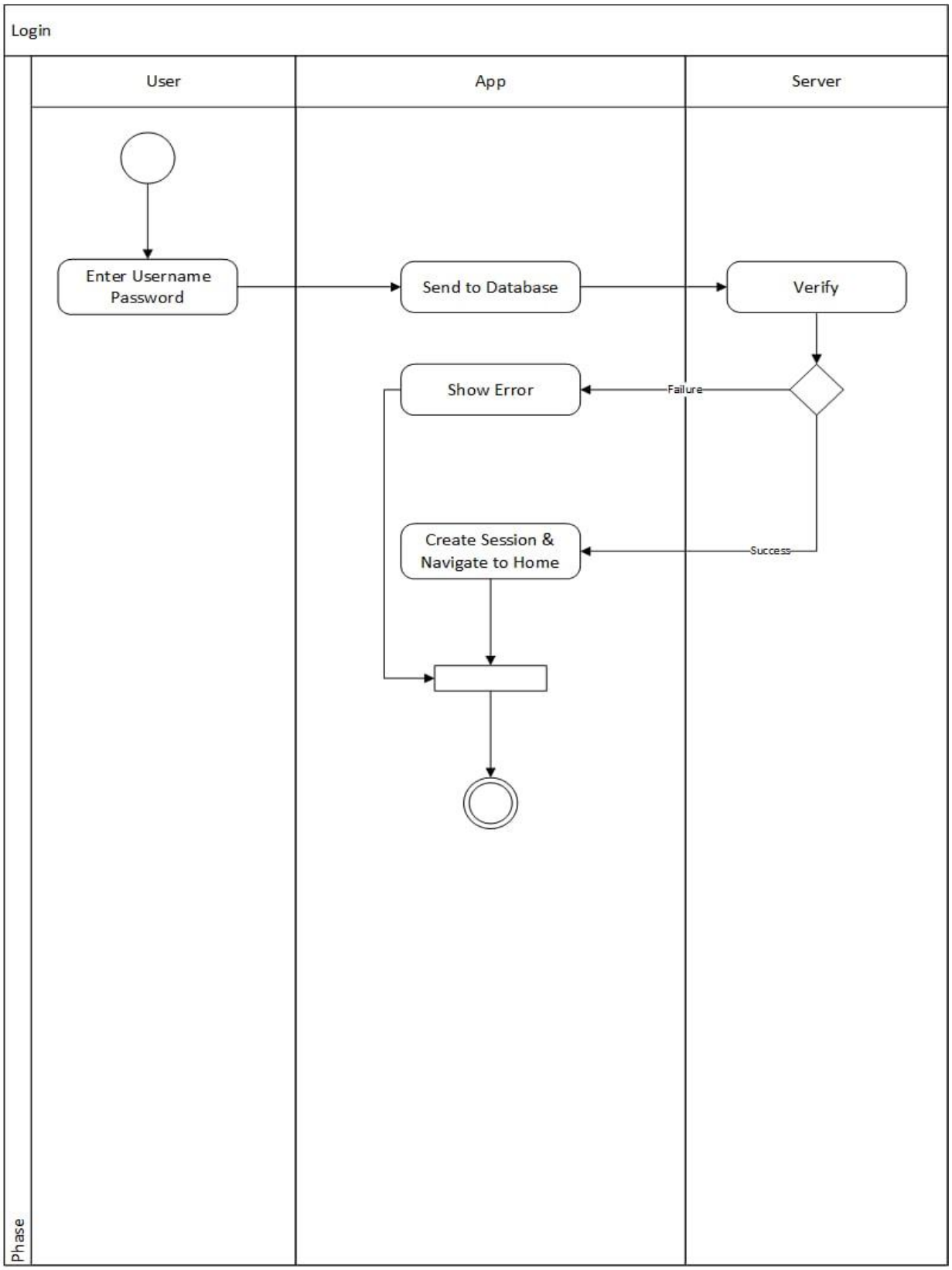
9. Architectural Diagram:

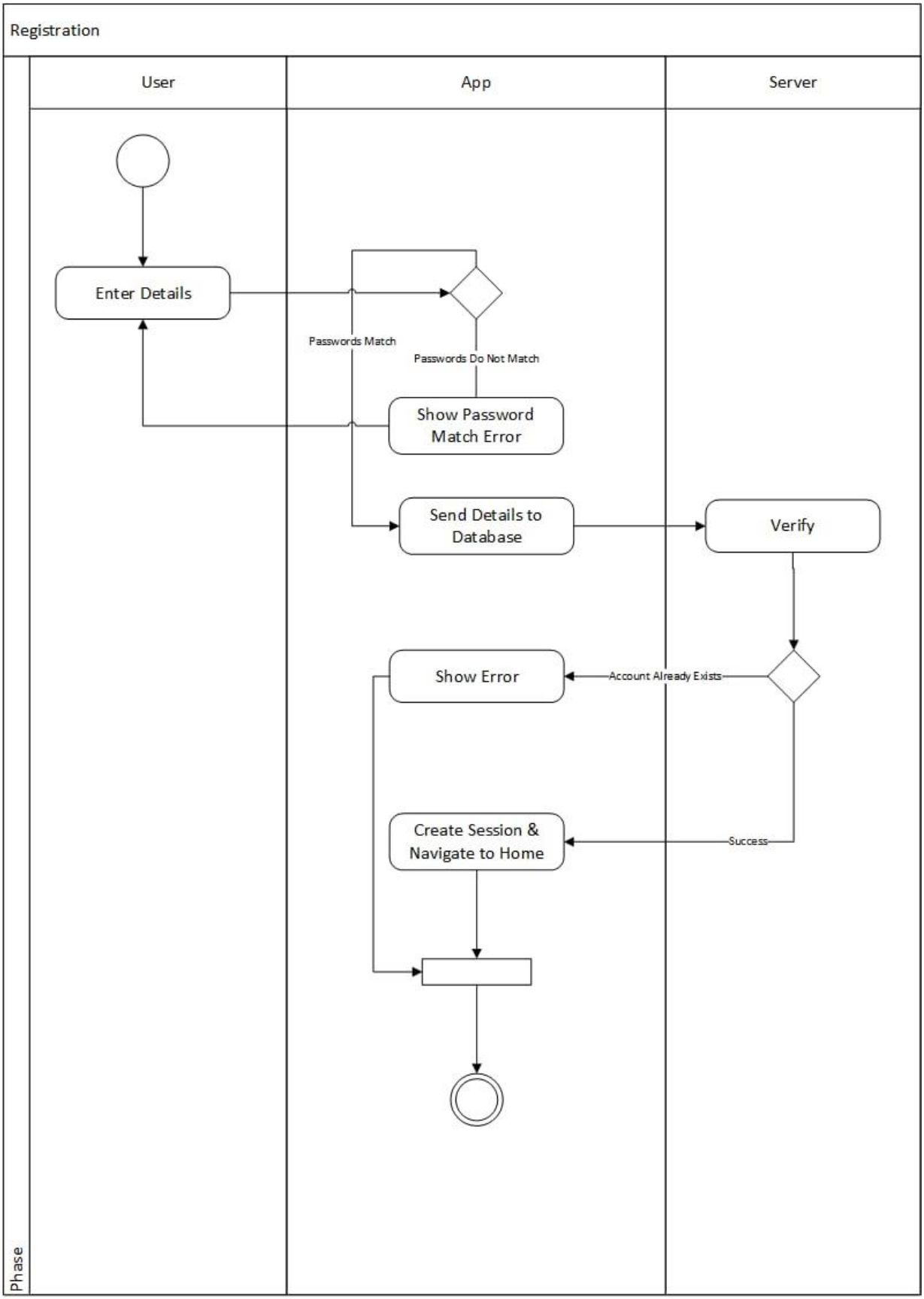


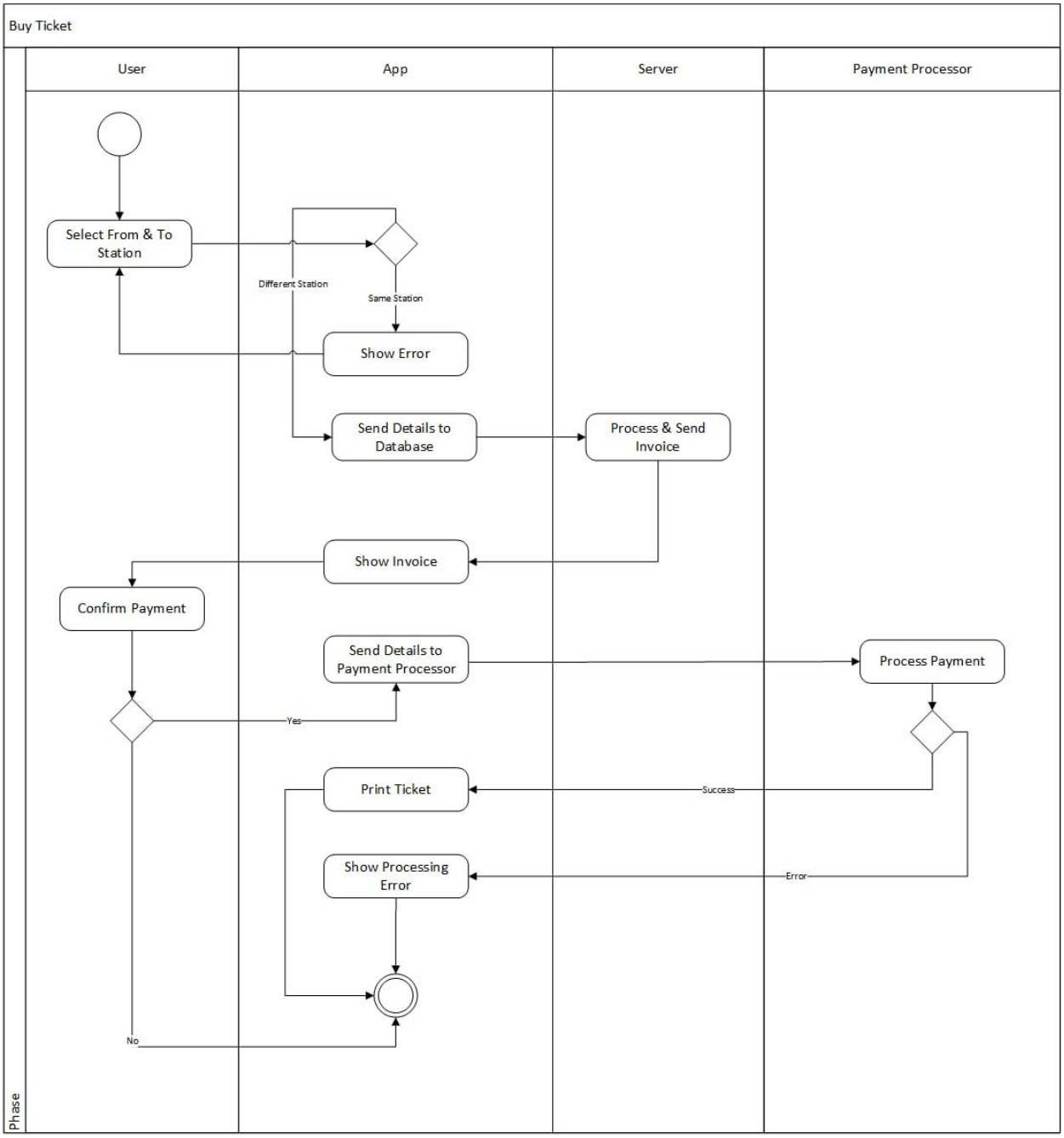
10. Class diagram:



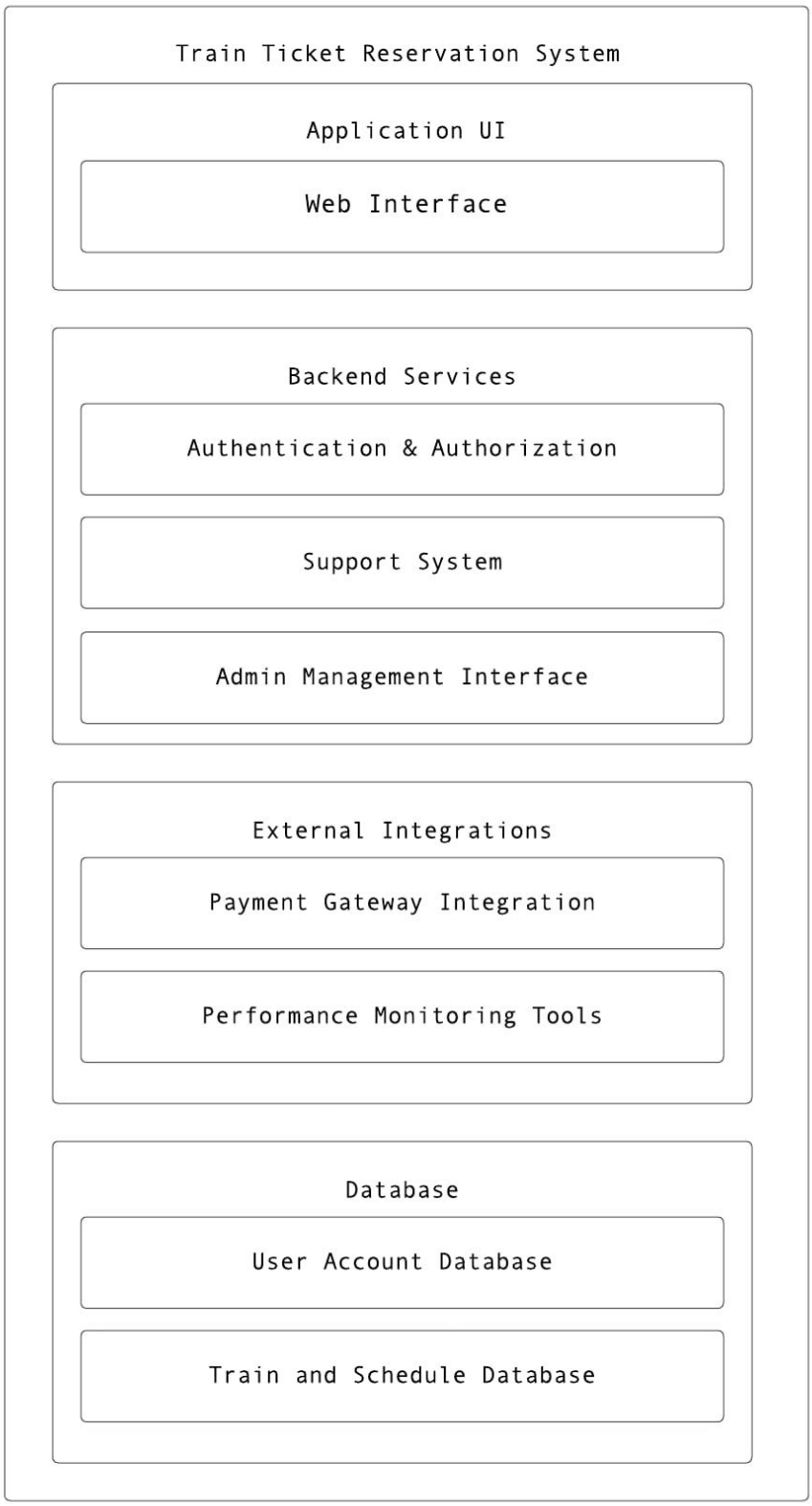
11. Activity diagram:




Registration
User
App
Server
Enter Details
Passwords Match
Passwords Do Not Match
Show Password Match Error
Send Details to Database
Verify
Show Error
Account Already Exists
Create Session & Navigate to Home
Success
Phase


Buy Ticket
User
App
Server
Payment Processor
Select From & To Station
Different Station
Same Station
Show Error
Send Details to Database
Process & Send Invoice
Show Invoice
Confirm Payment
Send Details to Payment Processor
Process Payment
Yes
Print Ticket
Success
Show Processing Error
Error
No
Phase

12. Package Diagram



13. Test Cases:

Test Case ID	BD_01	Test Case Description	Test the User Registration		
Created By	SHAIFUL	Reviewed By	DIPTO	Version	2.1

QA Tester's Log

Tester's Name	SHAIFUL	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	Access to internet
2	App interface is accessible
3	User is not registered
4	

S #	Test Data
1	user
2	pass
3	test@email.com
4	

Test Scenario Verify User Registration

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Click register button	Show registration form	As Expected	Pass
2	Fill up registration form	Show form	As Expected	Pass
3	Press confirm	Show confirm message	As Expected	Pass

Test Case ID	BD_02	Test Case Description	Login functionality Test		
Created By	DIPTO	Reviewed By	SHAIFUL	Version	2.1

QA Tester's Log

Tester's Name	SHAIFUL	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	User is registered
2	
3	
4	

S #	Test Data
1	user
2	pass
3	
4	

Test Scenario Verify Login functionality using username/email and password

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Correct username/email and password	successfully logged in	As Expected	Pass
2	Incorrect username/email or password	Error message indicating invalid credentials	As Expected	Pass

Test Case ID	BD_03	Test Case Description	Test Search functionality		
Created By	SHAIFUL	Reviewed By	Fezaul	Version	2.1

QA Tester's Log

Tester's Name	DIPTO	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	User is logged in
2	
3	
4	

S #	Test Data
1	Chittagong
2	Dhaka
3	
4	

Test Scenario Verify Search functionality for train

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to search bar	Search bar is open	As Expected	Pass
2	Enter Departure and destination stations, date	List of available trains matching criteria	As Expected	Pass
3	Click sumbit	Show submitted	As Expected	Pass

Test Case ID	BD_04	Test Case Description	Test profile edit functionality		
Created By	Fezaul	Reviewed By	Talha	Version	2.1

QA Tester's Log

Tester's Name	SHAIFUL	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	User is logged in
2	User profile exists
3	
4	

S #	Test Data
1	New Name
2	
3	
4	

Test Scenario Verify profile edit functionality for user info

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to profile edit menu	Show edit option	As Expected	Pass
2	Update user details	Profile updated successfully	As Expected	Pass
3	Update email to an already registered email	Error message indicating duplicate email	As Expected	Pass

Test Case ID	BD_05	Test Case Description	Test payment functionality		
Created By	SHAIFUL	Reviewed By	DIPTO	Version	2.1

QA Tester's Log

Tester's Name	DIPTO	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	User is logged in
2	Train selected and tickets added
3	
4	

S #	Test Data
1	251
2	
3	
4	

Test Scenario Verify payment functionality

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to payment option	Show payment option	As Expected	Pass
2	Enter Payment details	Successful payment and booking confirmation	As Expected	Pass
3	Payment with insufficient balance	Error message indicating insufficient balance	As Expected	Pass

Test Case ID	BD_06	Test Case Description	Test session log out functionality		
Created By	Talha	Reviewed By	DIPTO	Version	2.1

QA Tester's Log

Tester's Name	Fezaul	Date Tested	1-April-2024	Test Case (Pass/Fail/Not Executed)	Pass

S #	Prerequisites:
1	User is logged in
2	
3	
4	

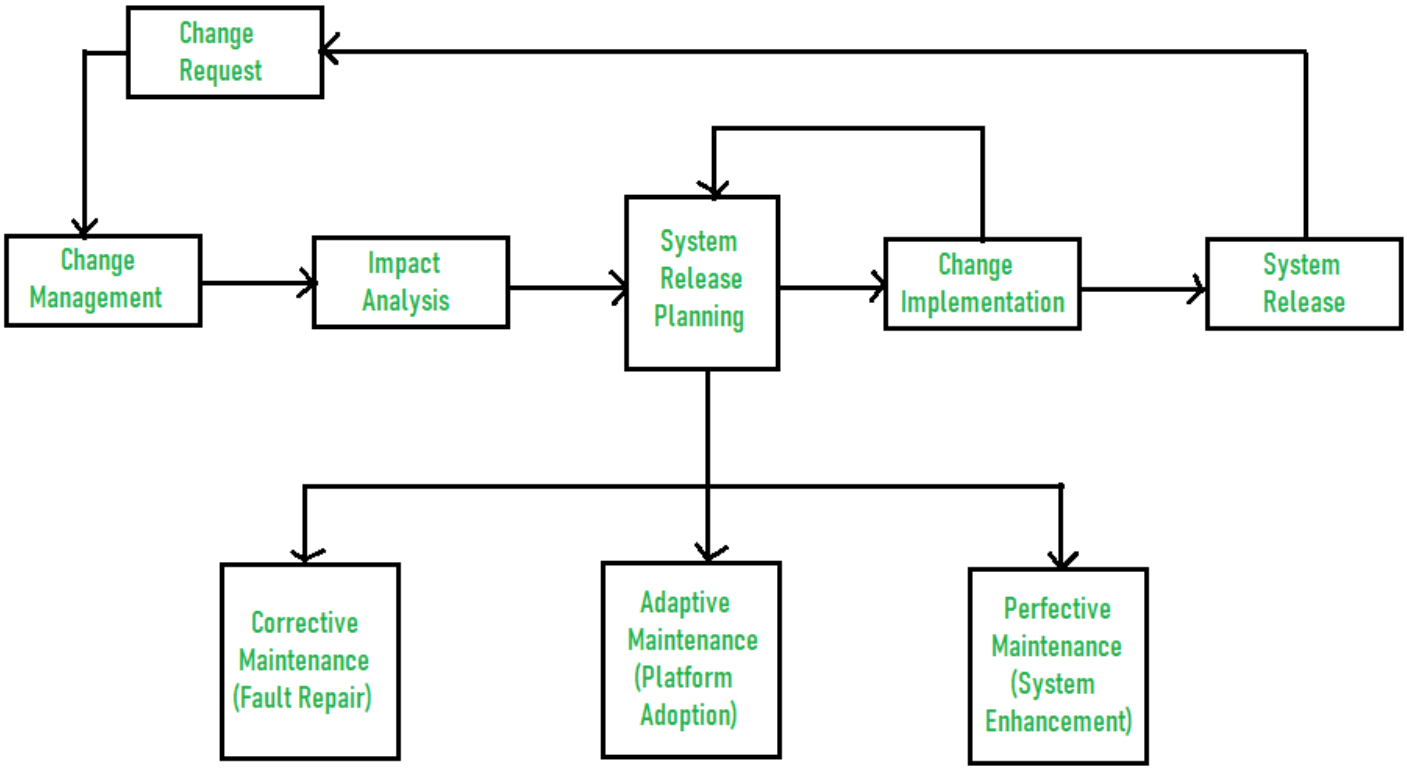
S #	Test Data
1	
2	
3	
4	

Test Scenario Verify session log out functionality

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to profile page	Show profile	As Expected	Pass
2	Press logout	Logged out and naviagted to login UI	As Expected	Pass
3	Restart app	User is still logged out	As Expected	Pass

14. Maintenance Plan

To ensure our software's longevity and performance, we have created a maintenance plan following this diagram. We will proactively monitor the system to identify bugs or areas for improvement. Once identified, we will analyze the changes needed and their impact. The plan outlines a clear process for implementing these changes, including thorough testing before releasing the updated software. This will ensure we address user needs, fix issues, and potentially add new features, all while maintaining a stable and secure system.



MAINTENANCE PROCESS