Software Requirements Specification

for

Bicycle Sharing System

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Revision History

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Chapter 1

Introduction

1.1 Purpose

The purpose of this Bicycle Sharing System is to establish a user-friendly and efficient platform that enables seamless bicycle rental and management in urban environments. The software aims to provide a sustainable and convenient transportation solution by offering users the ability to easily locate, rent, and return bicycles through a mobile application and associated kiosks. By offering a cost-effective and eco-friendly mode of transportation, the system seeks to reduce traffic congestion, promote healthier lifestyles, and contribute to cleaner air quality within cities. The system's primary goals are to optimize the availability and distribution of bicycles across docking stations, enhance user experience through intuitive interfaces, and enable effective monitoring of system performance and bicycle utilization. This document outlines the specific requirements and features that will support the achievement of these goals, ensuring a reliable and user-centric Bicycle Sharing System.

1.2 Intended Audience

This SRS document is designed to address a diverse range of stakeholders involved in the development, deployment, and maintenance of the software system. The primary audience includes software developers, system architects, designers, and quality assurance teams who will utilize the document as a reference for designing, implementing, and testing the software. Additionally, project managers and business analysts will rely on this document for project tracking and management. Clients, end-users, and other stakeholders seeking an understanding of the software's functionality and scope will also find this document valuable. Furthermore, technical writers will use it as a basis for creating user documentation and guides. Regulatory authorities and compliance auditors may refer to this document to ensure industry standards and regulations are met. As the software evolves, future maintenance and enhancement teams will use the document to maintain alignment with the original requirements.

1.3 Intended Use

The software system described in this SRS document is intended to address the management of inventory and sales for retail businesses. It is designed to facilitate real-time tracking of products, automate order processing, and generate comprehensive sales reports. The software is intended to be used by retail managers, sales staff, and inventory personnel to streamline operations and improve overall efficiency in inventory management and sales transactions. The primary goal of the software is to enhance inventory accuracy, reduce manual workload, and optimize sales performance, thereby enabling businesses to make informed decisions and improve customer satisfaction. The software's scope encompasses modules for product catalog management, order processing,

sales analytics, and user authentication to ensure a holistic solution for retail management. The document provides a comprehensive understanding of the software's intended application, guiding its development, testing, and maintenance phases to meet the specified objectives.

1.4 Product Scope

The Bicycle Sharing System is designed to provide a comprehensive solution for managing bicycle rentals and facilitating convenient transportation options in Jahangirnagar University. The system will include the following key functionalities:

1. **User Registration and Authentication:** Users will be able to create accounts, log in securely, and manage their profiles, including personal information and payment details.
2. **Bicycle Rental and Return:** Users can view available bicycles, reserve them, unlock them via a mobile app, and return them to designated docking stations.
3. **Location Services:** The system will offer real-time bicycle and docking station location tracking, enabling users to easily locate nearby bicycles and stations through a mobile app.
4. **Transaction Management:** Users can initiate and complete rental transactions, receive payment receipts, and view transaction history.
5. **Availability and Maintenance:** The system will monitor bicycle availability, ensuring that docking stations are adequately stocked. It will also facilitate maintenance requests and track the status of bicycles for repair.
6. **User Support:** Users will have access to customer support through the mobile app or website for inquiries, assistance, and issue resolution.
7. **Administrative Dashboard:** System administrators will have a dedicated dashboard for managing user accounts, monitoring system performance, generating reports, and resolving operational issues.

The product scope also includes integration with payment gateways for secure transactions, data encryption for user privacy, and a user-friendly mobile application compatible with both Android and iOS platforms. The system will not include features related to bicycle manufacturing, physical docking station installation, or extensive hardware maintenance.

This section delineates the core functionalities and features that the Bicycle Sharing System will encompass, ensuring a clear understanding of the system's intended capabilities and limitations.

1.5 Risk Definition

The development and deployment of the Bicycle Sharing System may involve certain risks and challenges that could affect its successful implementation and operation. These risks include:

1. **Operational Challenges:** Unforeseen technical issues, system downtime, or network disruptions could lead to service interruptions and impact user experience.
2. **User Adoption:** Low user adoption rates could hinder the system's effectiveness and financial viability.
3. **Privacy and Security Concerns:** Inadequate data protection measures could lead to unauthorized access, data breaches, and privacy violations.
4. **Regulatory Compliance:** Non-compliance with local regulations and transportation laws could result in legal challenges and penalties.

5. **Technical Integration:** Integration challenges with third-party services (e.g., payment gateways, mapping APIs) could lead to functionality gaps or data inconsistencies.
6. **Bicycle Theft and Vandalism:** Theft and vandalism of bicycles and docking stations could lead to inventory losses and system disruptions.
7. **Weather and Environmental Factors:** Adverse weather conditions and environmental factors could impact bicycle availability and usage patterns.
8. **Financial Viability:** Insufficient revenue generation or high operational costs could impact the long-term financial viability of the system.

By identifying these risks, we aim to ensure a comprehensive understanding of potential challenges and to guide the development and operation of the Bicycle Sharing System effectively.

Chapter 2

Overall Description

2.1 User Classes and Characteristics

The Bicycle Sharing System is designed to serve various user classes, each with distinct characteristics and needs:

1. **Regular Users:** Individuals who frequently use the system for daily commuting or short-distance travel. They are tech-savvy and value quick access to available bicycles through the mobile app.
2. **Tourists and Occasional Users:** Visitors to the city who require temporary transportation. They may need user-friendly interfaces and bicycle availability near tourist destinations.
3. **Administrators and Maintenance Staff:** Responsible for system oversight and maintenance. They require access to administrative dashboards for user management and system monitoring.
4. **Customer Support Representatives:** Assist users in resolving inquiries and technical issues. They need access to user data and transaction histories for efficient support.
5. **Local Authorities and Regulatory Bodies:** Require access to system data for monitoring compliance with regulations and evaluating the system's impact on the community.

The system should provide user-friendly interfaces, multilingual support, and address the diverse needs of these user classes, ensuring an inclusive and satisfying experience for all users.

2.2 User Needs

The Bicycle Sharing System is designed to meet the following user needs:

1. **Easy Bicycle Availability:** Users require a user-friendly mobile application and kiosk interfaces to quickly locate and rent available bicycles.
2. **Efficient Rental Process:** Users need an intuitive process for reserving and unlocking bicycles, with secure payment transactions.
3. **Real-time Tracking:** Users expect accurate, real-time information on bicycle and docking station availability through the mobile app.
4. **User Account Management:** Users should be able to create accounts, log in securely, and manage profiles and payment methods.

5. **Flexible Payment Options:** Users need various payment choices, including cards and digital wallets, for convenience.
6. **User Support and Assistance:** Users require responsive customer support for inquiries, technical issues, and assistance during interactions.

By addressing these user needs, the Bicycle Sharing System aims to provide a user-centric experience that facilitates convenient and efficient bicycle rentals for various user classes.

2.3 Operating Environment

The Bicycle Sharing System is designed to operate within the following key aspects of its environment:

1. **Physical Environment:** The system will be deployed in urban areas, utilizing strategically placed docking stations at transportation hubs, commercial centers, and tourist attractions.
2. **Network Infrastructure:** Reliable and high-speed internet connectivity is essential for accurate bicycle tracking, payment processing, and real-time communication between user devices and the central system.
3. **Mobile Devices:** Users will interact with the system through mobile applications on Android and iOS platforms, requiring devices with GPS capabilities for location-based services.
4. **Server Infrastructure:** The central system will operate on robust server hardware with ample processing power, memory, and storage to manage real-time interactions and transaction processing.

Understanding and accommodating these aspects of the operating environment will ensure the reliable and efficient operation of the Bicycle Sharing System under various conditions.

2.4 Constraints

The development and operation of the Bicycle Sharing System are subject to the following key constraints:

1. **Budgetary Constraints:** The project must adhere to the allocated budget for system development, hardware procurement, software licensing, and ongoing maintenance.
2. **Regulatory Compliance:** The system must comply with local transportation regulations, privacy laws, and data protection requirements, influencing system design and operation.
3. **Technical Infrastructure:** The system's functionality relies on stable network infrastructure, internet connectivity, and compatibility with mobile devices. Technical constraints related to hardware performance and scalability should be considered.
4. **Environmental Considerations:** The system's physical components should be designed to withstand various weather conditions, impacting the durability and placement of bicycles and docking stations.

By addressing these constraints, the Bicycle Sharing System can be developed and operated in a manner that aligns with budgetary, regulatory, technical, and environmental considerations.

2.5 Assumptions

The development and operation of the Bicycle Sharing System are based on the following key assumptions:

1. Users are assumed to be familiar with using mobile applications on Android or iOS platforms for tasks such as location tracking and digital payments.
2. Stable and reliable internet connectivity is assumed to be available for seamless communication between the mobile app, kiosks, and the central system.
3. Network infrastructure, including cellular data coverage and Wi-Fi access points, is assumed to be accessible to facilitate real-time interactions between user devices and the central system.
4. Legal and regulatory requirements related to data protection, user privacy, and transportation regulations are assumed to be communicated and supported by relevant authorities.
5. Adequate maintenance personnel are assumed to be available for routine servicing of bicycles, docking stations, and kiosks to ensure system reliability and user safety.

By recognizing these assumptions, the Bicycle Sharing System can be developed and operated in a manner that aligns with the anticipated user behaviors, technical capabilities, and regulatory context.

Chapter 3

Requirements

3.1 Functional Requirements

1. **User Registration:**
   As a user,
   I need to create an account by providing my personal details and contact information,
   So that I can access the Bicycle Sharing System and enjoy its services.

   ### Confirmation:

   Success - After filling out the registration form and submitting it:

   - I receive a confirmation email with a link to activate my account.
   - Clicking the activation link verifies my email and allows me to log in.

   Failure - During registration:

   - If I submit an email address in the wrong format, the system displays an error message: "Email address in wrong format."

2. **User Authentication:**

   As a registered user,
   I need to log in with my credentials,
   So that I can access my account and reserve bicycles.

   As a registered user,
   I need to log in with my credentials,
   So that I can access my account and reserve bicycles.

   ### Confirmation:

   Success - After entering correct credentials:

   - If I tick "Remember me," my login details are stored as a cookie for automatic login next time.
   - If I don't tick "Remember me," I'm required to log in again on my next visit.

   Failure - When logging in:

   - If I enter an incorrect user name, the system displays the message: "Incorrect user name, please try again."

- If I enter an incorrect password, the system displays the message: "Incorrect password, please try again."
- If the service is unavailable, the system displays the message: "Service unavailable – please try again later."
- If my account has expired, I'm directed to the account renewal page with the message: "Account has expired – refer to account renewal page."

3. **Bicycle Search and Reservation:**

   As a registered user,
   I need to search for available bicycles and reserve one,
   So that I can plan my ride and ensure a bicycle is available.

   ## Confirmation:

   Success - After searching and reserving a bicycle:

   - The system displays a list of available bicycles based on my search criteria.
   - I can select a bicycle and reserve it for a specified duration.

   Failure - During bicycle search and reservation:

   - If no bicycles match my search criteria, the system informs me appropriately.
   - If there's an issue during reservation, I receive a relevant error message.
     "As a Admin ,I will Improvise the Cycle."

4. **Holding Reservation:**

   As a user I cannot hold my reservation after certain time until I make payment or ride my bicycle.

   I have to newly reserve for bicycle if countdown is over before i reach my ride.

   ## Confirmation:

   Success - It starts countdown as soon as i reserve my bicycle

   Failure - System deals with the error if countdown doesn't work

5. **Bicycle Access Control:**

   As a user with a reserved bicycle,
   I need a secure way to access the reserved bicycle,
   So that I can start my ride without delays.

   ## Confirmation:

   Success - After reserving a bicycle and accessing it: The bicycle's lock mechanism unlocks using a secure access code provided in the app.

   Failure - During bicycle access: If I enter an incorrect access code, the system displays an error message.

   "If a massage or access code get deleted,I can Request Admin to Resend me the code or massage."

   "If a cycle is not working due to damage,Admin will inspect the cause and Pay the whole Amount to the user."

"If the bicycle's lock can't unlock due to locking system problem, Admin will Return money within 30 minutes."

6. **Rental Management:**

   As a user with a reserved bicycle,
   I need to manage my ongoing rental session,
   So that I can track my ride and ensure accurate billing.

   ### Confirmation:

   Success - During a rental session:
   The system provides real-time information about the rental duration and charges.

   Failure - If there are any discrepancies or errors in rental information,
   The system handles them gracefully.

7. **Station Management:**

   As a system administrator,
   I need to manage bicycle stations and their availability,
   So that users can find and return bicycles conveniently.

   ### Confirmation:

   Success - After managing stations: The system accurately displays the availability of bicycles at each station.

   Failure - If there are any issues with station management, the system handles errors appropriately.

8. **Payment Integration:**

   As a user making a payment,
   I need a secure and efficient way to complete transactions,
   So that I can pay for my rides and services.

   ### Confirmation:

   Success - After making a payment: The payment process completes successfully, and I receive a confirmation.

   Failure - If the payment fails: The system displays an error message with relevant information about the issue.

   If the payment got stuck in middle, Admin will reset the payment system.

9. **Analysis and Reporting:**

   As an administrator or analyst,
   I need access to data analysis and reporting tools,
   So that I can make informed decisions and optimize system performance.

   ### Confirmation:

   Success - After accessing analysis and reporting tools: The system presents data visualizations and reports that provide insights into user behavior, bicycle usage, and system performance.

Failure - If there are any issues with data analysis or reporting: The system handles errors gracefully and provides relevant feedback.

By adhering to this user story format and providing detailed confirmation criteria, you ensure that the implementation of each feature aligns with the intended functionality and user experience.

10. **change initial number of bikes:**

    As an administrator, i want to have reports on overall bike movements. I want to install more bikes at particular stations according to the reports.

    ### confirmation:

    Success - After reviewing analysis and reporting tools: new updated available bikes must me displayed in the system for users to view.

    Failure- If there are any issues with data analysis or reporting: The system handles error and provide relevant feedback.

3.2 Non Functional Requirements

1. **Identity:** All cycles must have a unique ID.
2. **Usability:** The user interface should be user-friendly and accessible on different devices and screen sizes. Response times for users should be fast and provide a seamless experience.
3. **Security:** User data, including personal information and payment details, should be securely stored and transmitted using encryption protocols. User authentication and authorization mechanisms should be implemented to ensure data privacy and prevent unauthorized access.
4. **Performance:** The system should handle concurrent user requests efficiently, ensuring smooth operations during peak usage periods. Response times for searching bicycles, making reservations, and processing payments should be minimal.
5. **Reliability:** The system should be available and accessible to users without frequent downtime or disruptions. Data backups and recovery mechanisms should be in place to prevent data loss in case of system failures.
6. **Sustainability and Environmental Impact:** The system should promote sustainable practices by encouraging users to use bicycles as a eco-friendly mode of transportation. The organization running the system should adopt eco-friendly policies, such as using renewable energy sources for charging stations and minimizing waste generation.
7. **Internationalization and Localization:** The system should be designed to support internationalization, allowing it to be easily adapted for use in different countries and regions. Localization features should enable customizing aspects like date formats, currency symbols, and language translations for each location.

3.3 User-Story

1. As a user, I want to be able to register for an account so that I can access the bicycle sharing system.
2. As a user, I want to use multiple language in this system.
3. As a user, I want to search for available bicycles near my location and view their details before making a reservation.

4. As a user, I want to be able to reserve a bicycle for a specific duration and receive a confirmation of my reservation via email.
5. As a user, I want to access bicycle by access card or code.
6. As a user, I will have a monthly summery on my overall interaction with the app
7. As a user, I want to be able to extend my rental period if the bicycle is not reserved by another user.
8. As an admin, I want to add new bicycle stations and update their details, including location and capacity.
9. As an admin, I want to track the availability of bicycles at each station and receive notifications if any station runs out of bicycles.
10. As a user, I want to make secure payments for my bicycle rentals using my preferred payment method.
11. As an admin, I want to get the analytical report of the system.

Appendices

Appendix A

Glossary