ANALYSIS AND DESIGN OF THE XYZ TRAVEL TICKET BOOKING INFORMATION SYSTEM

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ABSTRACT

Travel XYZ is a ground transportation service provider that currently relies on conventional, paper-based methods for ticket booking, schedule management, and transaction recording. This situation leads to various systemic operational issues, including frequent seat double-bookings, a high risk of physical data loss or damage, and time inefficiencies in compiling managerial reports. This study aims to conduct a needs analysis and design a computerized ticket booking information system to address these problems. The research employs a descriptive-analytical approach focusing on the initial stages of the System Development Life Cycle (SDLC), with a scope limited exclusively to the analysis and design phases (excluding actual code implementation). System specifications are modeled using an object-oriented approach based on Unified Modeling Language (UML) standards. The study yields a comprehensive design blueprint, comprising Use Case Diagrams to map access rights (Customer, Admin, and Manager), Activity Diagrams to define real-time seat-locking logic that prevents double-booking, and Class Diagrams to structure the relational database architecture. The study concludes that the resulting conceptual design logically addresses the shortcomings of the existing system, thereby serving as a valid guideline for the software construction phase in future research.

Keywords: System Analysis, System Design, Ticket Booking, UML, System Development Life Cycle.

1 INTRODUCTION

In today's rapidly evolving era of digital transformation, information technology has shifted from a mere support system to the core backbone ensuring the continuity of various business sectors. This phenomenon compels business entities of all sizes to adapt and integrate technology into every aspect of their operations. The passenger transport and service industry is one sector experiencing the most significant impact of this paradigm shift. Rising public mobility—driven by business, educational, and tourism needs—demands that transport providers focus not only on fleet quality but also on the speed, accuracy, and convenience of the services offered to consumers. Modern customers expect every transaction process, from schedule searches to payments, to be instantaneous, transparent, and seamless.

Within the intercity ground transportation landscape, travel agencies have become a preferred choice for the public, offering the advantage of door-to-door service, which is considered more practical than other forms of public transport. Travel XYZ is one such company operating in this sector. Over time, as public trust has grown, Travel XYZ has experienced a significant surge in passenger numbers. While this rising daily transaction volume is a positive indicator of business growth, it has also exposed a fundamental weakness in the company's operational system: a lack of adequate technological infrastructure.

To date, Travel XYZ's core business processes—specifically passenger ticket booking, departure scheduling, and seat management—rely entirely on conventional or manual methods. Ticket booking generally takes place in one of two ways: customers either visit the ticket counter in person or make a phone call and exchange messages via WhatsApp. Once a customer specifies their desired route and schedule, administrative staff or counter personnel check seat availability by manually flipping through pages in a booking logbook. When seats are available, passenger details—such as names, phone numbers, pickup locations, and destinations—are

recorded manually using a pen. Similarly, proof of payment consists merely of standard printed paper receipts.

These manual operational practices have triggered a series of systemic issues that are gradually eroding the company's operational efficiency and diminishing customer satisfaction. The most frequent issue is double booking. Because staff must record and verify information manually, communication gaps often occur, leading to the same seat being inadvertently allocated to two different passengers for the same time slot. This results in strong customer complaints and damages the company's reputation. A second issue is the high risk of data loss, damage, and redundancy. Physical logbooks are highly vulnerable to water damage, loss, or misplacement, which can have disastrous consequences, such as the loss of records regarding passengers and transactions.

A third, equally critical issue is the inefficiency involved in generating managerial reports. At the end of each month, administrative staff must compile hundreds or even thousands of physical transaction records into report formats—a process that is extremely time-consuming, laborious, and highly susceptible to human error. Owners and management often receive delayed information regarding revenue, fleet load factors, and the most profitable routes, thereby hindering strategic decision-making.

Given these realities, it is evident that Travel XYZ requires a technological intervention in the form of a computerized ticket booking information system. However, within the discipline of Software Engineering, the software development process should not be rushed by jumping straight to the coding phase. Building an information system is akin to constructing a skyscraper; it requires a solid foundation consisting of in-depth requirements analysis and a precise design blueprint. Failure to design the system prior to implementation often results in software that fails to meet business needs (a mismatch), is difficult to scale for future growth, and features workflow logic that confuses users.

Therefore, this research focuses specifically on the two earliest and most pivotal stages of the System Development Life Cycle (SDLC): system analysis and system design. Requirements analysis is conducted to comprehensively map the actual needs of Travel XYZ stakeholders—ranging from ticket counter staff and drivers to management—and to determine how the new system will resolve existing operational issues.

Once the requirements have been identified, this research translates them into a visual design model using an object-oriented approach. The standard employed in this design is the Unified Modeling Language (UML), the most advanced and globally recognized visual modeling language in software development. To provide a comprehensive overview from various perspectives, the system design will be documented using three primary UML diagrams. First is the Use Case Diagram, which aims to map system boundaries, define the actors interacting with the application, and outline their respective access rights and functionalities. Second is the Activity Diagram, which visualizes the workflow or business process logic for each system feature—such as the logical progression of payment validation or seat selection from start to finish. Third is the Class Diagram, which represents the system's database structure; it illustrates the involved objects (e.g., Customer, Ticket, Schedule, and Fleet entities), their attributes and operations, and the structural relationships between these entities within the database.

It should be emphasized that the scope of this journal is focused exclusively on refining the design concept. The research does not cover the system construction phase (coding), application testing, or the final deployment phase to a server. The decision to limit the research to the analysis and design stages allows the researcher to explore and present the system logic, architectural flow, and data structure with maximum depth and accuracy.

The ultimate goal of this journal is to produce a robust, structured system design specification document that is validated both academically and practically. These design documents (blueprints)—comprising Use Case, Activity, and Class diagrams—are intended to serve as a clear, definitive, and actionable guideline for the software development team

(programmers) in the subsequent phase, ensuring the realization of a reliable, efficient, and effective XYZ Travel Ticket Booking Information System.

2 RESEARCH METHOD

To produce a system design that is accurate and aligned with actual field requirements, this study employs a descriptive-analytical approach combined with the initial stages of the System Development Life Cycle (SDLC). The scope of the methodology is strictly limited to data collection, requirements analysis, and visual design modeling.

The following are the details of the methodological stages used in this study:

2.1 Data Collection Technique

This phase serves as the primary foundation for understanding the issues inherent in the manual ticket booking system at Travel XYZ. Data was gathered using three main techniques:

- Observation (Direct Observation): The researcher directly observed daily operational activities at the Travel XYZ ticket counter. This observation focused on staff workflows for handling ticket bookings, the use of logbooks to check seat availability, and the processes for recording passenger data and generating payment receipts.
- Interviews: Structured interviews were conducted with relevant stakeholders, specifically administrative staff/counter personnel and the management (owner) of Travel XYZ. These interviews aimed to gain deeper insight into frequently encountered challenges—such as double bookings or data loss—and to understand their expectations for the proposed new system.
- Literature Review: The researcher collected and examined theoretical references from textbooks, existing scientific journals, and relevant academic articles. This review focused on fundamental concepts of Information Systems and Software Engineering, as well as standard guidelines for using the Unified Modeling Language (UML) in object-oriented design.

2.2 Requirement Analysis

Based on the collected data, the researcher conducted an analysis divided into two main aspects:

- Analysis of the Current System (As-Is System): Mapping the logic of the business processes currently used by Travel XYZ to identify pain points causing operational inefficiencies.
- Analysis of Proposed Requirements (To-Be System): Defining specifications for the new system—specifically functional requirements (such as schedule management, ticket booking, seat selection, and automated report generation)—to resolve issues found in the existing system.

2.3 Design System

Once all functional requirements are clearly defined, the methodology proceeds to the logical design stage using the Object-Oriented Analysis and Design (OOAD) approach. Visual modeling is conducted using Unified Modeling Language (UML) tools. In accordance with the defined scope, the design focuses on the following three diagrams:

- Use Case Diagram: Used to provide a high-level abstraction of system functionality. This diagram maps the actors (users) involved—such as Administrators, Customers, and Management—and the interactions they can perform with the system.
- Activity Diagram: Used to model the workflow logic of each business process within the proposed system. It describes the sequence of activities, branching conditions (such as seat availability validation), and the final outcome of an activity in a sequential manner.
- Class Diagram: Used to construct the relational database architecture. This diagram describes the entities or object structures that comprise the system (such as Passenger,

Fleet, Ticket, and Transaction classes), their respective attributes and operations, and the cardinality of the relationships between these entities.

By applying the aforementioned methodology, this research will yield a comprehensive and logical system design blueprint for a ticket booking information system, ready to proceed to the implementation (coding) phase in subsequent research or development projects.

3 RESULT AND DISCUSSION

This section outlines the findings from the field data collection phase, which were subsequently translated into requirement specifications and culminated in the design modeling of the Travel XYZ ticket booking information system. In accordance with the research scope, the presented results focus on the logical architecture and conceptual design.

3.1 Analysis of the Current System

Observations and interviews conducted at Travel XYZ revealed that the entire operational business cycle still relies on paper-based record-keeping. The current ticket booking process begins when a prospective passenger contacts the travel agency via telephone or WhatsApp, or visits the service counter in person. An administrator then consults the daily logbook to check for vehicle and seat availability for the requested route and date.

If a seat is available, the administrator records the passenger's name, route, seat number, and price in the logbook. Payments are made in cash at the counter or via bank transfer, with proof of payment submitted manually through text messages. A critical weakness of this system becomes apparent during peak hours. It frequently happens that two administrators serve different customers for the same route and schedule. Due to the lack of real-time data synchronization, Administrator A and Administrator B often assign different passengers to the same seat number, resulting in double bookings. Furthermore, the accumulation of logbooks makes retrieving transaction history extremely slow and creates a high risk of data loss or damage.

3.2 Requirement Analysis

Based on the mapping of weaknesses in the current system, this study outlines the functional requirements that the new system must accommodate. These requirements include:

1. Master Data Management: The system must provide features for administrators to add, modify, and delete data regarding the vehicle fleet, travel routes, and departure schedules.
2. Booking and Seat Selection Management: The system must be capable of displaying a visual seat map in real-time. Seats currently being booked or already paid for must be automatically locked (preventing other customers from clicking or selecting them).
3. Transaction Management: The system must facilitate the uploading of payment proof by customers and include an administrator verification/validation feature for issuing e-tickets.
4. Report Automation: The system must include a reporting module (daily, monthly, and annual) that automatically compiles revenue and passenger count data, accessible directly by company management.

3.3 System Design

The defined functional requirements are then translated into a system design using the Unified Modeling Language (UML).

3.3.1 Functionality Design (Use Case Diagram)

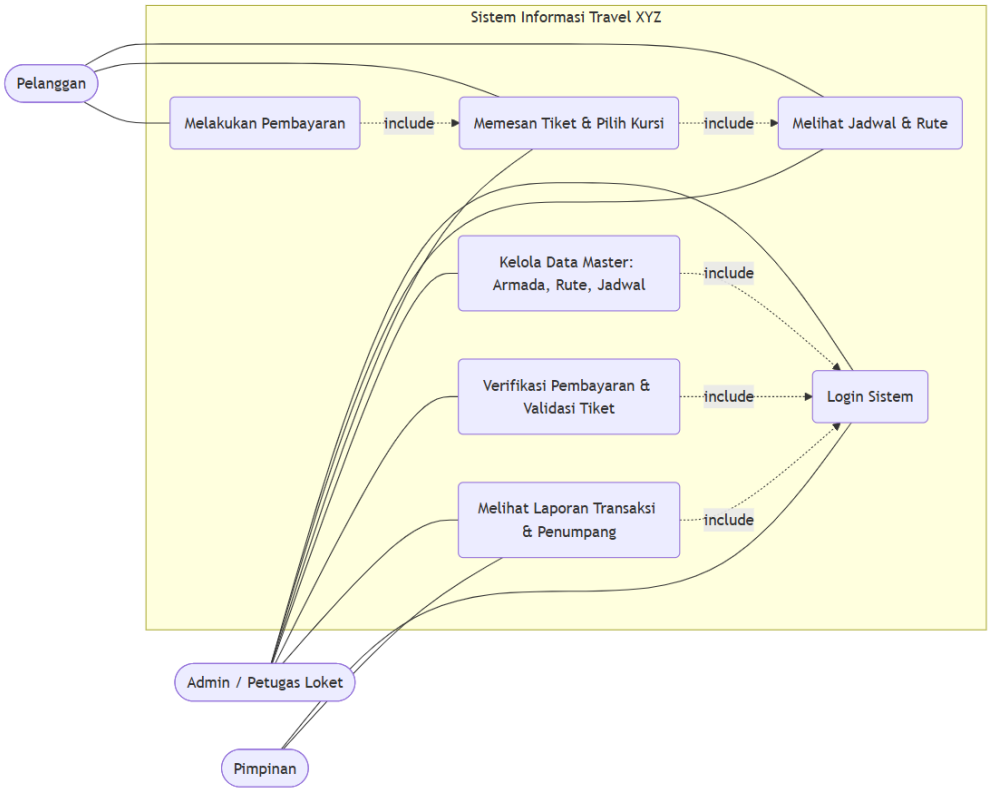

Fig 1. Use Case Diagram

Fig 1 is Use Case Diagram design maps out three primary user entities (actors) with access rights isolated according to their respective roles:

1. Customer: Provided with an interface to search for departure schedules based on route and date. Customers can book tickets, select seats via a seat map, fill in personal details, and upload proof of payment transfer.
2. Admin (Counter Staff): Acts as the primary operator managing master data modules (fleet, routes, schedules). The Admin is also responsible for validating incoming customer payments and confirming orders to generate e-tickets.
3. Management: Granted special access rights in the form of a managerial dashboard. Management is not involved in daily transactions but focuses on monitoring through features that generate comprehensive reports on transactions and overall operational performance.

3.3.2 Workflow Design (Activity Diagram)

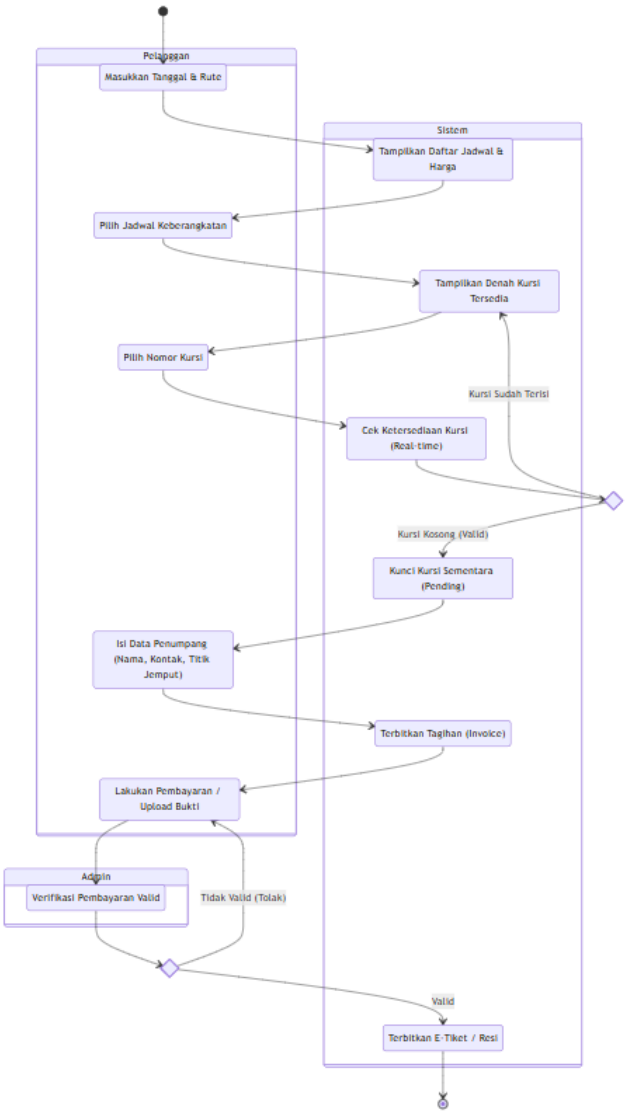

Fig 2. Activity Diagram System

Fig 2 is primary focus of the Activity Diagram design is modeling the logic to resolve double-booking issues. The workflow is designed by implementing a concurrency control mechanism (data locking).

When a customer selects a departure schedule, the system processes a database query to load the seat map. The system logic operates in stages: it checks seat availability the instant the customer selects a seat number. If the status is "Available," the system immediately changes it to "Pending" (temporarily locked) for the duration of the payment window (e.g., 30 minutes). During this "Pending" period, other customers or administrators viewing the same schedule will see the seat grayed out (unavailable). If payment is not completed within the time limit, the system logic automatically reverts the seat status to "Available." This workflow mechanism ensures that no seat selection conflicts go undetected.

3.3.3 Database Design (Class Diagram)

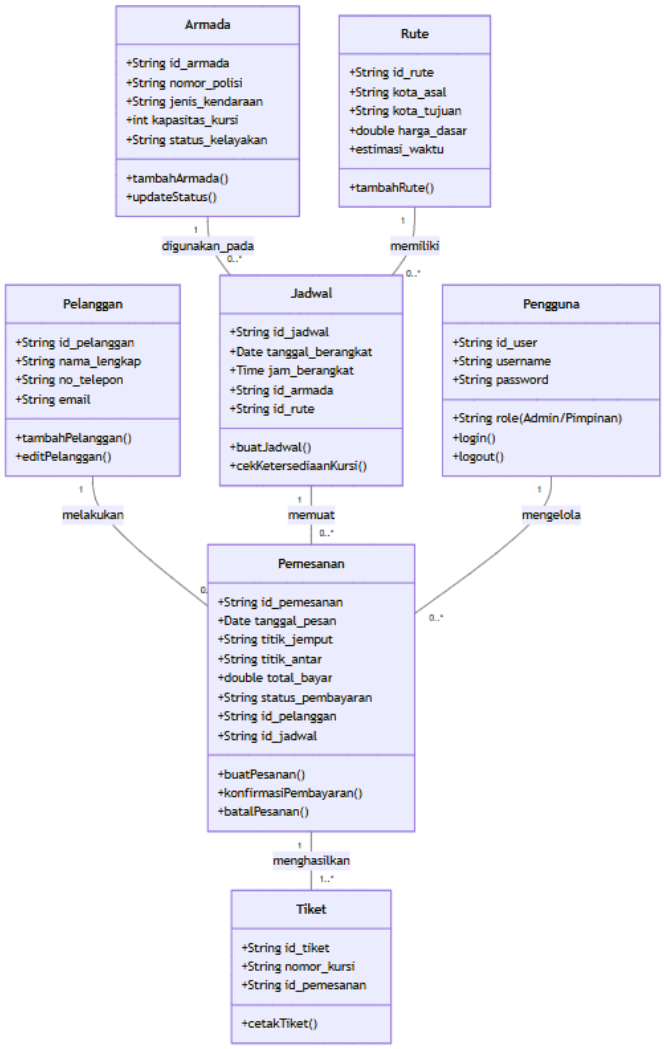

Fig 3. Class Diagram System

Fig 3 to ensure a robust data architecture, eliminate redundancy, and accelerate report generation, the Class Diagram was designed using a relational database normalization approach. The diagram comprises seven primary class entities:

1. User: Stores authentication credentials (Admin and Management).
2. Customer: Stores profile data for ticket purchasers.
3. Fleet & Route: Separated into two independent classes to ensure scalability (allowing for easy additions as routes expand without disrupting schedule data). Both are related to the Schedule class.
4. Schedule: Acts as an aggregation class that combines Fleet, Route, and Departure Time.
5. Booking: Serves as the primary transactional class. A single booking record captures the customer, the schedule, and the total payment amount.
6. Ticket: Separated from the Booking class to accommodate a one-to-many relationship. This means a single Booking ID (e.g., a family group) can generate multiple Ticket IDs (with distinct seat numbers).

3.4 Discussion

The system design developed in this study has theoretically and logically addressed all the fundamental issues faced by Travel XYZ.

First, the transition from physical logbooks to a relational database—as outlined in the Class Diagram—eliminates the risk of data loss or damage due to physical factors such as torn, misplaced, or water-damaged paper. Passenger and transaction data will now be stored

permanently and in a structured manner on the server. Second, the issue of double booking—previously a critical operational pain point—has been resolved through the Activity Diagram modeling for the seat selection phase. A temporary seat-locking mechanism ensures the system accepts only one booking request per seat number at any given time.

Third, time inefficiencies in data tabulation have been resolved through the separation of access rights defined in the Use Case Diagram. Management no longer needs to wait until the end of the month or interrupt administrative staff simply to determine daily revenue totals; the relational database system enables automated, real-time report generation.

Overall, this conceptual design is robust and has yielded a highly comprehensive blueprint. The design documentation (UML) is free of ambiguity, making it ready for handover to the software development team (programmers) for implementation into program code (the construction phase) during the subsequent stage of the system development cycle.

4 CONCLUSION

Based on the analysis and design results outlined above, this study concludes that the primary operational constraint faced by Travel XYZ stems from its reliance on a manual, paper-based system. The limitations of this record-keeping infrastructure have led to systemic issues, including seat double-booking, a high risk of transaction data loss, and a managerial reporting process that is both slow and highly susceptible to human error.

To address these issues, this study has produced a comprehensive design specification—or blueprint—for a Ticket Booking Information System, utilizing Unified Modeling Language (UML) standards. Through Use Case Diagrams, the study successfully mapped out clear, distinct interaction boundaries and access rights for Customers, Administrators, and Management. Activity Diagram modeling established a logical workflow that specifically resolves double-booking issues via real-time seat availability validation and locking mechanisms. Furthermore, Class Diagrams structured a relational database architecture that ensures data integrity, eliminates redundancy, and enables the automation of operational reporting.

Overall, this conceptual design logically accommodates all functional requirements for the proposed system (the "To-Be" system) intended to replace the existing one (the "As-Is" system). Given that the scope of this study was focused exclusively on the analysis and design phases, it is recommended that future research or projects utilize this blueprint as the foundation for the subsequent stages—software construction (coding), testing, and final deployment—to bring the Travel XYZ information system into actual operation.

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