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Introduction to software engineering

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# Reflections on the Work Done

## Introduction:

The development of the car rental system project has been an extensive journey, combining the design and implementation of the front-end, back-end, and database components. This project aimed to create an intuitive and functional application that allows users to browse available cars, make reservations, and manage their personal details. The project involved multiple stages, each presenting unique challenges. In this reflection, I will discuss the challenges faced throughout the development process, what went wrong, and suggestions for improvements in future projects.

## Challenges Faced :

### 1. Frontend Development Challenges

The database design, as discussed in the previous section, was one of the most complex parts of the project. Initially, designing the schema to handle users, cars, and rentals seemed simple, but as new requirements emerged, the complexity grew.

- **Ensuring Data Integrity:** Managing data consistency and avoiding anomalies like orphan records (e.g., rentals without corresponding cars or users) was a

challenge. Implementing foreign key relationships and validation rules at the



database level helped mitigate this, but it required careful thought during the design phase to ensure that all data relationships were accurately represented. ● **Performance Optimization:** As the data set grew, performance issues began to emerge, particularly with complex queries joining multiple tables. While we implemented basic indexing for frequently queried fields (like car availability or rental status), the project would benefit from more advanced optimization techniques, such as query caching or materialized views for frequently accessed data.

- **Concurrency Issues:** One of the significant challenges was handling concurrency issues. For instance, two users attempting to rent the same car at the same time could lead to race conditions. Implementing locking mechanisms and ensuring the consistency of the rental process required extra effort.

## 2. Backend Development Challenges

On the back-end, the challenges stemmed from handling the business logic, connecting the application to the database, and ensuring that all functionality worked as expected. ● **Authentication and Authorization:** One of the critical aspects of the back-end was handling user authentication and authorization. We implemented a secure login system with encrypted passwords and session management. However, ensuring that users could

not access restricted resources or perform unauthorized actions was initially tricky. Establishing roles for admin users and regular users,



and ensuring that the correct permissions were assigned, required a more complex back-end structure than initially anticipated.

### 3. Database Design and Integration Challenges

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