

## Challenges Faced During the Zippy Used Autos Project

During the development of the Zippy Used Autos PHP web application, I encountered several challenges that required problem-solving, research, and adaptation to meet the project requirements. These challenges were critical in helping me learn and refine my skills in web development.

**1. Database Design and Relationships** One of the most significant challenges was designing the database schema to efficiently handle relationships between tables for vehicles, makes, types, and classes. Using foreign keys to link these tables required careful planning to ensure data integrity and prevent issues such as orphaned records. Initially, there was some confusion about the best practices for structuring foreign key constraints, but after reviewing database design documentation and examples, I successfully established the relationships.

**2. Implementing Filtering and Sorting Functionality** The filtering and sorting functionality on the public homepage posed a challenge, particularly when implementing the filtering mechanism for vehicle make, type, and class. Handling multiple filtering options in a way that didn't interfere with each other required careful thought on how to structure SQL queries. Ensuring that the vehicle listings could be dynamically filtered by user selection without causing performance issues was another hurdle. However, after trial and error with SQL queries and testing different approaches, I was able to implement an efficient solution that met the requirements.

**3. Admin Panel Design and Security Concerns** Creating an admin panel that allowed for the deletion of vehicles and the management of makes, types, and classes raised several challenges, primarily related to security. I had to ensure that the deletion functionality was safe, preventing any accidental deletions and ensuring that only authorized users could perform these actions. I also had to ensure that the admin area was separated from the public-facing website to maintain security and prevent unauthorized access.

**4. MVC Design Implementation** Adhering to the MVC (Model-View-Controller) design pattern was another challenge. Structuring the project to separate concerns and keep the code organized was initially difficult, especially with managing database operations through models and handling user interactions through controllers. However, following MVC principles helped improve the maintainability of the code and made it easier to scale the project.

**5. User Interface and Responsiveness** Ensuring that the website was responsive and worked well on both desktop and mobile devices required a significant amount of CSS work. I faced challenges in making the vehicle listings and filtering forms display properly across different screen sizes. Using media queries and testing across various devices, I was able to make the site responsive, ensuring an optimal user experience on all devices.

**Conclusion** Despite the challenges faced during this project, I was able to overcome them through persistent problem-solving and learning new concepts. This project significantly improved my PHP, database management, and front-end development skills, and I am proud of the final result. The project taught me the importance of planning, testing, and adhering to best practices to create functional, secure, and maintainable web applications.