CS 499 Milestone Two: Enhancement One

Software Design and Engineering

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Artifact Overview  
 The artifact I selected for enhancement is the To-Do List application, originally developed during CS 250: Software Development Lifecycle. This Java-based application is a simple task management tool that allows users to add, remove, and display tasks through a command-line interface. It was initially designed as part of a course assignment to apply Agile methodologies and demonstrate an understanding of the software development lifecycle. While functional in its original state, the artifact lacked advanced features and modern design elements required for real-world usability.

Justification for Inclusion in the ePortfolio  
 The To-Do List application is included in my ePortfolio because it effectively demonstrates my foundational skills in software development while showcasing my ability to enhance and expand upon an existing codebase. This artifact was chosen due to its simplicity and flexibility, which made it an ideal candidate for incorporating improvements that align with industry standards.

The enhancements highlight key software development skills such as refactoring, graphical user interface (GUI) development, and database integration. Specifically:

* Refactoring improved the readability, maintainability, and robustness of the code through the use of descriptive variable names, modular methods, and proper error handling.
* GUI Development involved creating a user-friendly interface using JavaFX to replace the original command-line interaction, significantly improving user experience.
* Database Integration added persistent task storage using SQLite, enabling users to save and retrieve tasks across sessions, which enhanced the functionality and scalability of the application.

These improvements collectively demonstrate my ability to apply software engineering principles to design, develop, and deliver a professional-quality solution.

Course Outcomes Addressed  
 Through the enhancement process, I successfully met the course outcomes I initially planned to achieve in Module One. Specifically:

1. Software Design and Development: I demonstrated an ability to design and implement well-structured, maintainable, and scalable solutions that address user needs.
2. Innovative Techniques and Tools: By integrating SQLite for database management and JavaFX for GUI development, I employed innovative tools and techniques in software engineering.
3. Problem-Solving Skills: I applied problem-solving strategies to refactor the code, resolve design inefficiencies, and enhance functionality.

I also made progress toward developing a security mindset, as the enhancements incorporated basic input validation and error handling to mitigate potential vulnerabilities. Moving forward, I plan to further refine this aspect of the artifact to meet additional security-focused course outcomes.

Reflection on the Enhancement Process  
 The process of enhancing the To-Do List application was both challenging and rewarding. Initially, the task of refactoring the code required careful analysis to identify inefficiencies and opportunities for improvement. This step taught me the importance of clarity and structure in software design, as even minor changes to variable names and method organization had a significant impact on readability and maintainability.

Developing the GUI introduced new challenges, particularly in designing an interface that was both functional and intuitive. I learned how to use JavaFX components like ListView and event handlers, and I gained experience in creating a responsive layout that enhances the user experience.

Integrating the SQLite database was perhaps the most technically demanding aspect of the enhancement. It required me to write SQL queries, handle database connections, and ensure data consistency. This process deepened my understanding of database management and reinforced the value of persistent storage in modern applications.

Challenges and Lessons Learned  
 One of the biggest challenges I faced was ensuring that the new features integrated seamlessly with the existing functionality. For example, adapting the GUI to interact with the SQLite database required significant restructuring of the underlying code. I also encountered technical difficulties when testing the database connection, which underscored the importance of thorough debugging and validation.

Through these challenges, I gained valuable insights into the iterative nature of software development. Each obstacle provided an opportunity to refine my problem-solving skills and reinforce my understanding of software design principles.

Conclusion  
 The enhancements made to the To-Do List application demonstrate substantial progress toward proficiency in software design and engineering. By refactoring the code, developing a GUI, and integrating a database, I transformed a basic application into a professional-quality artifact suitable for inclusion in my ePortfolio. These enhancements highlight my ability to apply innovative tools and techniques to create scalable and maintainable solutions, addressing key course outcomes and preparing me for success in the field of computer science.