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CS-499-19649-M01 Computer Science Capstone 2025

7-Final Project: Enhancement One: Software Design and Engineering

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This is the final paper for my capstone project, I am presenting a mobile application named Weight Tracking App in the software design and engineering category. This app enables users to reach their weight goals easily. I planned, designed, and developed this artifact as part of the CS 360 Mobile Architecture and Programming course. This project's development and programming tool is called Android Studio IDE. The app was created using Android Studio, which serves as the official development environment for Android devices. The application is developed using the JAVA programming language and integrates with an SQLite database. Android Studio employs Gradle as a build system to run the apps on an Android emulator.

Login Page for the registered user

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A screenshot of a phone

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This app will provide the user with various features for tracking their weight. As a first step, I will show the user a login screen where the user will be prompted for login credentials and will be able to log in securely. As a result of logging into account being the first screen, subsequent screens will include several options. The password and username will be required to protect the user's privacy. If the user does not have an account yet, the application should have a button that allows new users to create an account by clicking "Create New Account." The user will be required to create an account by clicking that button. A new screen will be displayed asking the user to input the credentials like username, password, email address, age and height. Once added the details, there is a button at the end Create New Account, upon clicking the user will be sent back to the Login page to enter the username and password.

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A screenshot of a weight tracker

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The home screen will be displayed once the user has logged in. Users can see their login weights and various buttons on this screen, such as entering their weight daily. Tracking requires a screen that shows daily weights and when they were entered. At the top of the page, a button for adding weight will direct the user to a screen where their current weight and date can be entered. When a user is new and has just set up an account, they will be asked to input a target weight. Another button will serve as an option to add a goal weight, resembling the add weight feature, but the information will be monitored through a chart. To illustrate progress over time, a grid chart showing the user's weight/dates overtime should also be provided. A notification and congratulations should be sent to the user when the daily weight has reached the target weight. It would also be helpful to add a "settings" button at the top or bottom, enabling users to edit their profiles, set a new goal weight, and define short-term goals.

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Through account creation page for users to enter their personal information, I thereby demonstrating optimization of the mobile app by improving software design and development functionality. This allows users to manage their information, set preferences, track their activity, and access services easily.

On the next screen, users are directed to the dashboard, which displays a grid of daily weight entries and options for adding new entries. In this screen, users can add their weight measurements on the Daily weight input screen, or update or delete the weight record by clicking on the given buttons and set a target weight on the Goal Setting screen.

With the application, I improved account management and login functions, as well as enhanced the software engineering by adding features for visualizing charts that will enable users to track habits and identify areas for adjustment in their dietary or exercise routines. Once the user clicks on the Show Chart button, he will be taken to a new screen which displays the current bar chart according to the daily weight records displayed on the dashboard.

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The ability to set a goal weight and monitor weight changes would benefit each of these users. An easily readable chart will allow the user to understand their weight changes. For these users to use this app, entering their current weight would take only a few minutes. The users could enter data as frequently or infrequently as they would like so it can fit into their lifestyle easily.

In addition to the design of the user experience, it involves the user's interaction with the different screens and actions that the application includes. Using XML, defining the visual structure and layout of the app, applying Material Design principles for a modern, consistent, and user-friendly UI, I have created custom UI elements to meet specific design requirements and also created adaptable layouts for various screen sizes and resolutions. Through its industry-standard icons and symbols, it ensures intuitive usage of the application. In addition to their algorithms and data structure between the different classes and methods, and their layout and source code, it includes design and engineering considerations. A relational database is used to store the data generated, read, updated, and deleted by users of the application.

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By implementing input validation and exception handling, I have enhanced data security, ensuring the protection of account information, along with accessibility, making the interface more user-friendly for everyone, both of which are important.

As a result of my understanding of website goals and requirements, design principles, and industry trends, I have implemented software engineering principles in this weight tracking application to develop engaging and visually appealing interfaces. Using modular components, I have also enhanced the design of the artifact and increased its efficiency, showcasing my capability to boost software performance. My enhancements align with the intended learning outcomes, including improving my proficiency with designing the layout, user interface, and overall aesthetic appeal of web pages.

To ensure that each function I wrote was functioning correctly, I tested it using the Android Studio debugger. In Android Studio, I used unit tests primarily to verify individual components and user interactions on an emulator to ensure the code behaved as expected. It is imperative that a safe and secure system is thoroughly tested in all aspects to ensure it is efficient and user-friendly. Consistently testing your application ensures that it behaves correctly, functions properly, and offers a good user experience prior to its release.

This artifact has been improved in a way that aligns with the course outcomes I aimed to achieve.

[Course Outcomes: 3]: Design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.

Based on your understanding of website goals and requirements, design principles, and industry trends, you can implement software engineering principles to develop engaging and visually appealing interfaces for a weight tracking application. Using modular components, I will enhance the design of the artifact and increase its efficiency, showcasing my capability to boost software performance. To ensure the application is user-friendly, I prioritized essential features like weight tracking, goal setting, and progress visualization. By Keeping the interface clean and straightforward I reduced cognitive load and enhanced usability by designing for simplicity and minimizing complex. With this implementation, I have designed and evaluated computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.

[Course Outcomes: 4]: Demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.

My enhancements align with the intended learning outcomes, including improving my proficiency with designing the layout, user interface, and overall aesthetic appeal of web pages. Understanding how to handle UI components in different states is essential for building responsive and effective applications. I ensured that the user interfaces I designed were user-friendly, visually appealing, and compliant with Android's Material Design principles. Additionally, to guarantee the stability and dependability of the app, I have produced clean, understandable, and maintainable code, including both unit and UI tests. With these enhancements, I demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.

[Course Outcome 5]: "Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities."

A focus on security in Android app development, especially while utilizing Android Studio, is crucial for building robust and secure applications. To minimize vulnerabilities, you should identify potential threats in advance and design your software and code to address them. Along with configuring user accounts and validating input, my improvements also include security measures that protect account information, as well as accessibility options to ensure the interface is usable for everyone. My enhancements include user account setup and input validation for seamless system navigation, security protocols that safeguard account data, and accessibility features that allow all users to interact with the interface. I have also ensured that all user input and external data are validated and sanitized to prevent injection attacks (like SQL injections or XSS) and other exploits. Additionally, keep up to date with all the latest Android security threats, vulnerabilities, and best practices, as well as regularly updating all third-party libraries, SDKs, and dependencies.

**Reflection, Challenges and Lessons Learned:**

Revising and enhancing the artifact presented a valuable opportunity for learning, enabling me to develop both creatively and technically. This experience has had a significant influence on my personal and professional aspirations. A well-designed user interface is crucial for keeping users engaged. In addition to acquiring knowledge of various design principles, I also developed a stronger understanding of how to create a cohesive user experience across different screens and activities. This capstone project allowed me to put into practice the theoretical insights I gained throughout my educational journey. During this transition, I learned to optimize the app’s performance, address security vulnerabilities, and troubleshoot performance issues.

I did not face any significant challenge during the enhancement process but deploying code changes to an API 35 device using 'Apply Changes & Restart Activity.' The app was taking time and often failed to restart, which stopped the changes from being implemented, and attempting to run the app resulted in the error message "loading build artifacts." Only after restarting the application do the results of the code changes become visible. Since the app aimed to be as user-friendly as possible, ensuring consistent user experience across various screen sizes required thorough planning and extensive testing. These enhancements transformed the project into a more modular structure, making it easier to maintain through the development of reusable components.

I have personally benefited from the artifact in terms of research abilities, critical reasoning, and creativity. My technical expertise, project management skills, and ability to work in a team have all advanced because of this experience. Furthermore, the project has provided me with a tangible product to highlight on my resume and portfolio, which will be beneficial for job interviews and applications. Ultimately, the artifact has been instrumental in helping me accomplish my personal and professional goals by enriching my skills, knowledge, and experiences. Additionally, it has given me a platform to showcase these competencies in a practical setting.

**References**

*Smart freelancing platform. Insolvo. (n.d.). https://insolvo.com/development-and-it/web-development/myfreecams-mobile-app*