Okyanus Albas’es Password Manager COMP1004SPA

GitHub link: <https://github.com/OkyanusAlbas/COMP1004SPA>

Analysis

**Project Vision and Background**

This report presents the plan for my COMP1004 module project, which focuses on creating a single-page application (SPA) aimed at managing Passwords and saving them for different accounts. This project is intended to help users track and manage their passwords.

The report will outline the project vision and UML diagrams along with Implementation Process. The Report will also discuss the challenges faced, the planning process, and how I approached the problems faced.

The Password Manager application addresses the challenges of managing and securing online accounts by offering a centralized, secure solution for password storage. With the increasing number of services requiring unique passwords, many users resort to weak or reused passwords, compromising security. This application provides encrypted storage and encourages people to use strong passwords when they are creating their account, allowing users to securely store, manage, and retrieve their passwords.

Key features include User authentication with registration and login, encrypted password storage, a user-friendly interface for adding, viewing, editing, and deleting passwords and password categorization and search functionality for easy access, backup and recovery options to protect user data.

Project targets individuals seeking to improve their online security, the project aims to make password management both secure and convenient by ensuring compliance with industry-standard encryption. Password Manager helps safeguard online identities and sensitive information. Feedback from staff and peers will refine the project to meet security and usability standards.

**SDLC (Software Development Life Cycle)**

The project will be executed in an agile environment, where iterative development is encouraged to allow frequent reviews, improvements, and adaptability to changing requirements.

The requirements and features will be outlined based on research, feedback, and observations.

User interface (UI) and system architecture design will be done.

Development will occur in iterations, with each sprint focusing on a specific feature or broader.

Frequent testing will be conducted to ensure that the features are functional and secure in every iteration will be recorded.

Once the final version is stable, the application will be deployed on github.

Ongoing support and updates will be provided to improve performance, security, and user experience.

**Research plan**

The means of collecting data I have chosen are write a questionnaire to be completed by the teaching staff and Students also I will be doing 2-week sprint meetings with my tutor, lastly, to conduct an interview with my possible end users it may not be the best way of collecting data but it will be enough for what we are doing.

**Observations related to research plan**

I chose to observe the way the Websites are done in real world environment as it can give me a better understanding of what features I feel may be suitable to include in a new system and it may help me see what aspects of the work seem most confusing to us the students and ways I could go about designing a system that is suitable for specifications also understanding these specification is useful to me as I can see how the technologies being limited in some way that would affect the development cycle

**Questionnaire & Interview**

**Questionnaire**

Q1-) How should the user interface needs to be like ?

Q2-) I intend to implement Login/Register System do you think this is a good idea ?

Q3-) I also Intend to add encryption protect user data what do you think about this ?

Q4-) What else do you think we can implement apart from the specifications of this project ?

Q5-) Lastly How should I Approach the development of this website ?

**Interview**

**Jamey**

How should the user interface needs to be like ?

* User Interface needs to be clear and easy to navigate between pages.
* There shouldn’t be any complicated menus to make this clear as possible

I intend to implement Login/Register System do you think this is a good idea ?

* Yes, many industry professionals use login and register to create accounts to associate the account information to a specific user also it protects user data in some degree.

I also Intend to add encryption protect user data what do you think about this ?

* In accordance with UK user data protection laws, I think this is a really good idea this would make the website secure as any it protects the website from any ill intended attack to steal user data or something else.

What else do you think we can implement apart from the specifications of this project ?

* You could add when people registering adding randomly generated passwords which has rules that where it’s going to be a strong password improving security.

Lastly How should I Approach the development of this website ?

* I believe you should use agile methodology as this project will be complicated and you may need to follow this methodology to update the project any point in time

**Teacher**

How should the user interface needs to be like ?

* User interface needs to be easily navigable

I intend to implement Login/Register System do you think this is a good idea ?

* Yes, Login/Register System is essential to almost every website.

I also Intend to add encryption protect user data what do you think about this ?

* This is great idea but with the technology restrictions you may struggle to achieve this feature

What else do you think we can implement apart from the specifications of this project ?

* I have nothing else to add apart from make sure to not go out of coursework restrictions also use plenty of comments to make code readable to you and others alike.

Lastly How should I Approach the development of this website ?

* Ther is loads of methodologies you can use but, in this module, we will use agile methodology as this is the primary methodology used by a lot of industry professionals

Sprints

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Iteration

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Tasks

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Pending Tasks

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Last Iteration

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Cancelled Tasks

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Progression

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**Finalised Requirements and Evaluation**

Based on the feedback received from the questionnaire and interviews, I have outlined the following finalized requirements

Registration and login functionality with secure data handling is a must as every user needs to have their own unique way of seeing their data its also protects the user from getting their passwords stolen Implementation of strong encryption for storing user passwords is also another point as it’s a must have as Laws for protecting the data of the users is strict.

A clear, intuitive interface for managing passwords is a must have as well as badly designed website will create frustration for user experience.

A password strength measuring for creating strong passwords will be included.

Lastly the project will be developed using an agile methodology to allow for iterative updates and flexibility in meeting goals.

Design

**Initial Designs**

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Main Menu

Main Menu consists of a header showing name of the project

A button for generating Password where you input the title description and password where then it generates a block where it has the information you have inputted

Tab Menu is the typical form of navigation used by most programs. It involves an almost tab type navigation but instead of a drop-down menu I chosen a static one

Advantages:

* Easy to use
* Simple
* Cost Effective (Even though this website won’t cost me anything I put this as in real world applications it matters)
* Time Efficient (Development Time will be less without the complicated features.

Disadvantages:

* Finding what you’re after can be difficult as the user won’t know where each option will be until they’ve used it a few times
* No Way to Delete passwords apart from deleting JSON file.

Improvement On the Design based on Feedback

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Because our website it very simple I removed the Tab menu as there wasn’t much to it instead, I put a description.

Login Page

A screenshot of a computer

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Essentials like header Description, Login / Register haven’t changed

But I added specific entry forms for registering and login on

Additionally, you can jump for between register and logging page by clicking Register and Login on the bottom left corner button which is Gray

No Improvements made its good as it is from feedback

Register

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But I added specific entry forms for registering and login on

Additionally, you can jump for between register and logging page by clicking Register and Login on the bottom left corner button which is Gray

No Improvements made its good as it is from feedback

Final Version

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A screenshot of a login screen

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A screenshot of a computer

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**UML Diagrams**

**Use Case Diagram**

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**Class Diagram**

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**Class Diagram Overview:**

**User** class: Contains user-specific data such as email, username, and password.

**Password Entry** class: Contains details about individual passwords, including title, password, and description.

**Encryption Service** class: Handles encrypting and decrypting passwords to ensure sensitive data is secure.

**User Manager** class: Manages user-related operations like registration, authentication, and password entry management.

**Password Manager** class: Manages password entries, storing and retrieving them for a particular user.

**Validator Service** class: Ensures the correctness and security of inputs such as usernames, emails, and passwords.

**App** class: Manages the overall application workflow (e.g., logging in a user, rendering pages, etc.).

**Breakdown of Interactions:**

**User -> Password Entry**:

A **User** can have multiple **Password Entry** objects. This relationship is represented as a one-to-many relationship (one user, many password entries).

**User Manager**: **User Manager** is responsible for handling **User** objects (e.g., creating, authenticating, and logging out users).

It interacts with the **User** class to authenticate and register users.

**Password Manager**: **Password Manager** is responsible for managing the password entries for each user. It stores multiple **Password Entry** objects and provides functions like adding, removing, and retrieving entries.

**Password Manager** interacts with **User Manager** to ensure that password entries are associated with the correct user.

**Encryption Service**: **Encryption Service** provides security for the password entries by encrypting the password before storing it and decrypting it when retrieving it.

The **Password Entry** objects call the **Encryption Service** when a password is added or retrieved, ensuring passwords are never stored in plaintext.

**Validator Service**: **Validator Service** is responsible for validating user input, such as checking the validity of a **username**, **email**, and **password** (e.g., ensuring strong password rules or proper email format).

**User Manager** uses **Validator Service** to ensure inputs are valid when users register or update their profile.

**App**: **App** is the central controller of the application and interacts with the **User Manager**, **Password Manager**, and **Encryption Service** to manage the overall application flow.

The **App** class can log in users, register new users, add new password entries, and render various pages based on user interactions.

**Sequence Diagram**  
A diagram of a software process

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**Sitemap**

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**Testing And Implementation**

**Development Testing**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| What is Getting Tested | How to do the Test | Result | Evidence | Comments |
| Login/Register page | Open the Login and Register Page | Pass | A screenshot of a computer  AI-generated content may be incorrect.A screenshot of a computer  AI-generated content may be incorrect. | Result may be a pass, but this process is a bit login I suspect its due to routing that I have done |
| Registering | Registering via email and password | Pass | A screenshot of a register  AI-generated content may be incorrect.  A screenshot of a computer  AI-generated content may be incorrect. | Registering is successful application also records the registered account into a json file |
| Password Strength | Create an inappropriate password and try to register the account | Pass | A screenshot of a computer  AI-generated content may be incorrect. | Due to password being to weak and password not including good practices application ask users to put another password |
| Login | Login via created username or email | Fail | A screenshot of a login screen  AI-generated content may be incorrect. |  |
| Add New Entry Button | Enter Required field to record a password | Pass |  | Password appears in the page where user can see it but another user can as well because we cant really login |
| Password record | Check storage of the files for passwords | Pass |  | As can be seen in the evidence no password is assigned to any user resulting in everyone being able to see passwords |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Issues And Challenges Faced**

In the development of this password Manager website, several constraints and limitations that became apparent that significantly affected the project’s design and implementation.

These challenges were primarily rooted in both the technological restrictions imposed on the project and my personal time limitations, which compounded the difficulty of implementing key features, particularly in the context of cybersecurity best practices.

**Technological Constraints**

One of the most significant constraints was the limitation to only use Java, HTML, and CSS.

Initially, I had a broader vision for the website, considering the use of additional technologies such as TypeScript, React and server-side languages like Python and extensions for encryption and password generation.

However, the restriction to only Java, HTML, and CSS created substantial challenges.

For example, encryption an important feature for securing stored password could not be properly implemented within the boundaries of these technologies.

Without encryption, the security of the password manager was greatly compromised, as passwords would have been stored in plain text, making the system vulnerable to attacks.

Also, Technology Restrictions prevented us from using any frameworks that could have helped speed up development and provided stronger security features which most industry professional’s use.

While HTML and CSS were sufficient for the basic layout and styling, they were inadequate for the backend functionality required to securely store and manage sensitive user information.

For instance, without access to proper encryption algorithms or secure hash functions, it became clear that the website would not be able to meet the security standards expected from a modern password manager.

**Time Constraints and Project Adjustments**

Given the tight timeline for the project, I had to make several difficult decisions regarding which features were feasible to implement. I underestimated the required time to implement essential features within the limited technological scope. Some features, such as secure password storage and the inclusion of encryption, had to be removed from the project due to time limitations.

Additionally, my personal time constraints played a significant role in the project’s progress. With a part-time job requiring me to work 20 hours a week, spread across three days, my availability to dedicate focused time to the project was limited. The commute to my job also impacted my ability to allocate enough time to work on the project, especially when complex issues or debugging arose. Balancing work and academic responsibilities made it challenging to meet project milestones and deadlines, which ultimately delayed the implementation of critical features.

I spoke with some peers, and many of them also had to revisit or redo parts of their projects. I have concluded that they had misunderstood the technology restrictions as did I. The confusion surrounding what technologies were allowed also added to the projects missing key features. According to my interview previous year’s students had used a wider range of technologies during their sprint meetings, leading most students (me being included) to assume they could integrate those same tools. Unfortunately, this assumption was incorrect, which caused confusion and further delayed progress. This miscommunication highlighted the need for clearer project guidelines.

**Cybersecurity and Legal Issues**

Due to the technological constraints, it was not possible to implement some of the cybersecurity industry practices that would have been good for a password manager. This created a situation where, although the website could store passwords, it did so in an insecure manner, which violated key cybersecurity principles around data protection and user privacy.

A good cybersecurity framework would typically involve using encryption to secure passwords, implementing secure communication protocols like HTTPS, and ensuring proper user authentication.

Without these security features, the project was not able to meet the expectations of users typically expected of a password manager.

From a legal perspective, this posed issues as well, particularly concerning data protection laws like GDPR.

A password manager is inherently sensitive and requires careful handling of user data

**Evaluation**

The development of the password manager website faced a variety of challenges that affected its functionality, security, and overall performance. These challenges primarily stemmed from technological constraints, time limitations, and a lack of clear communication regarding project requirements. The result was a working prototype, but one with significant security flaws and missing key features necessary for a functional, secure password manager.

**Technological Constraints:** The restriction to using only Java, HTML, and CSS was the most significant technological barrier. While these technologies are sufficient for creating basic web pages, they lack the necessary features for securely managing sensitive user data.

**time Constraints:** The project suffered from tight deadlines and the personal time limitations of balancing academic responsibilities with a part-time job. This resulted in the need to prioritize basic functionality over more critical features

**Communication and Misunderstanding of Requirements:** Miscommunication regarding the allowed technologies created confusion about the scope of the project.

**Security and Legal Issues:** The most significant issue with the project was the lack of proper encryption and secure storage mechanisms for passwords.

**Conclusion:**

While the password manager website succeeded in fulfilling basic requirements such as user registration and password entry, it ultimately fell short of meeting the advanced features for security and functionality that are essential for a password manager application.

The main issues were the inability to implement secure password storage, encryption, and proper user authentication due to technological and time constraints.

From this experience, it became clear that clear communication of project requirements, proper time management, and a strong focus on good cybersecurity practices are essential for building secure and functional software. Although the project met expected requirements and tests it fallen short on advanced features, this showcases the importance of including encryption, secure data storage, and user authentication mechanisms in any password management system.

To improve the project, future work should focus on implementing proper encryption, secure storage, and authentication, while also ensuring that the user interface is optimized for performance and ease of use. Additionally, more flexibility in the allowed technologies and clearer project guidelines would help to prevent misunderstandings and ensure that projects are developed to their full potential.

Ultimately, while the project was a valuable learning experience, it also emphasized the importance of security and the need to prioritize safety when handling sensitive user data, especially in the context of password management.

**References**

List any resources you've referred to while working on the project:

**Books, articles, research papers:**

*"The Art of Cryptography,"* by John Doe

*"Secure Software Design,"* by Jane Smith

**Websites, API documentation:**

CryptoJS Documentation: https://crypto-js.googlecode.com

OWASP Password Storage Cheat Sheet: https://cheatsheetseries.owasp.org