Equipment Reliability Strategies

Nicholas Nguyen, Pablo Sanchez, Hoang Long Quan Nguyen, Viraj Vipinbhai Sabhaya

CSE Senior Design

Sponsor: Becht

UNIVERSITY OF TEXAS ARLINGTON | COLLEGE OF ENGINEERING

Problem Statement

There exists a potential to leverage Equipment Reliability Strategies to reduce risks associated with health, safety, and environmental accidents in industries that heavily rely on mechanical and technical equipment. Specifically, these strategies can serve as a proactive approach to anticipate and identify the potential failure mechanisms inherent in such systems. The intent is to enable the prioritization of these mechanisms in order to devise appropriate responses before they evolve into actual failures.

This problem can emphasize by financial implications. Failing to address this issue not only increases the potential for undesirable accidents but also significantly risks the return on investment (ROI) of these industrial assets.

This problem can be solved by taking several steps into consideration like Maintenance history, Inspection plans, Risk Management, and Operations guidelines.

Background

Across most industries, millions of dollars are spent on equipment failure and maintenance. In addition, these failures may also cause related health, safety, and environmental accidents that must be addressed. That is the main reason why Becht developed the "Equipment Reliability Program" Application and use it to help organizations identify the causes of these equipment failures and apply strategies to void those failures from occurring again in the future. By using the service from Becht, organizations can further maximize their asset return on investment. However, the "Equipment Reliability Program" Application is outdated and needs to be completely redesigned. Therefore, Becht sponsors this project, and our team will work to develop a brand-new user-friendly web application, using technologies currently and successfully being used by Becht. It will solve the same problems as the "Equipment Reliability Program" Application, but with a better modern UI/UX, a new design approach, complex data hierarchy, and added functionalities.

Core Features and Requirements

FRONTEND
The user will use their Becht account to login, once logged in they will go to the landing page where they will see their existing clients and be able to select one client to see the equipment that corresponds to that client or create a new client. The user can add new equipment and its properties in the Equipment page. Added equipment will be shown on equipment list to the left. The user can navigate to History page where they can add or view the service histories of an equipment or navigate to the Best Practice page where they can add or view the strategies for the chosen equipment.
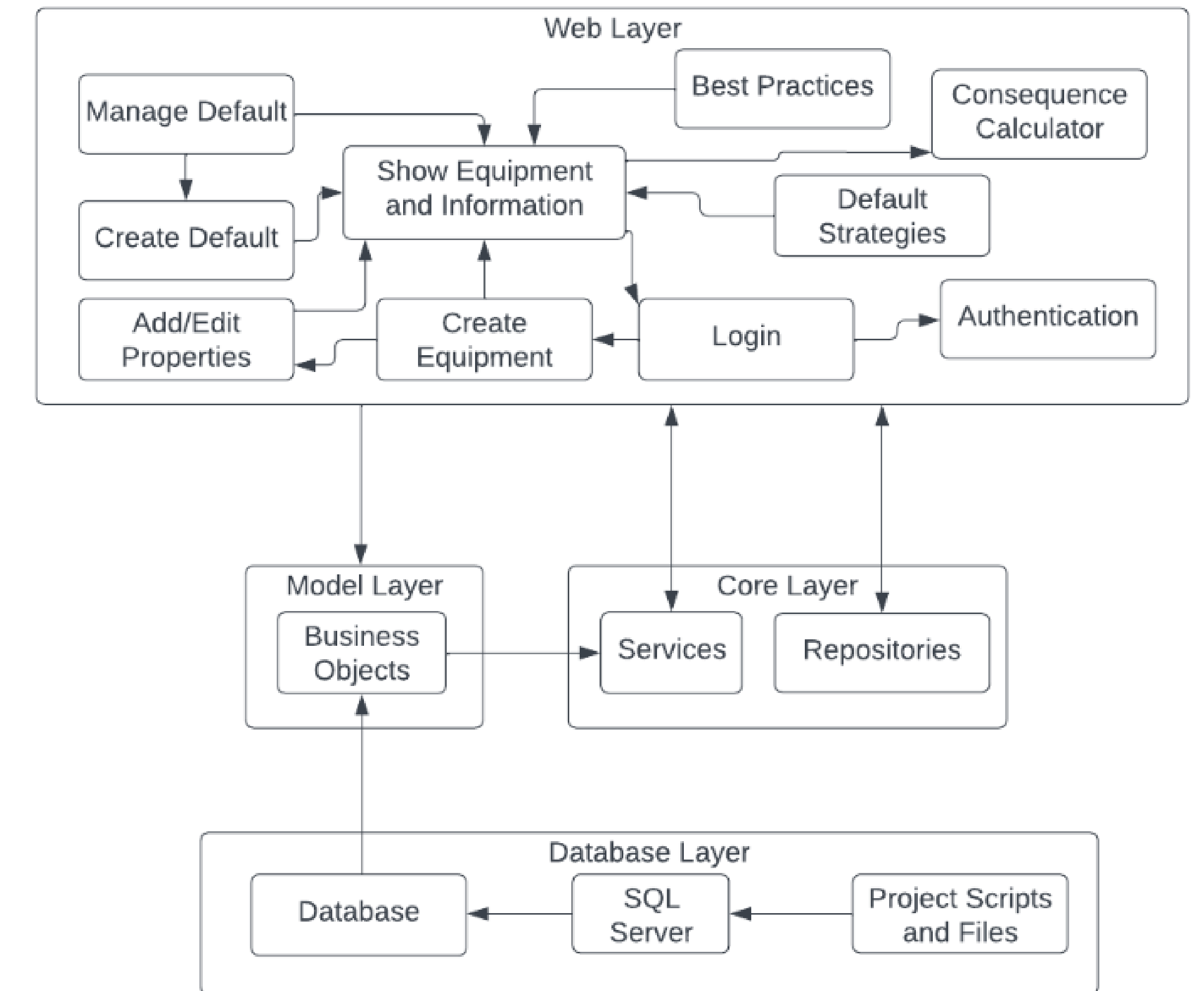
BACKEND
At the backend, core logic, data manipulation, and storage occurs. It is essentially the interface between the user-facing frontend and the data stored in the database. ERS has implemented a Microsoft's SQL server to store important information, such as client's data, equipment, service histories, and best practices. ERS's backend also maintains an Equipment History page by tracking changes made to various equipment over time.
Furthermore, the backend provides the functionality for adding new equipment through the Equipment page. When a user adds new equipment, the backend processes the new data, validates it, and securely stores it in the SQL Server.

Detailed Design Phase

The Equipment Reliability Strategies Application consists of four layers, from top to bottom, which are the Web, Core, Model, and Database layers. The Web Layer has the views, which is being presented to the User, helpers, language resources, security configurations, and the interact able parts of the web application. The Core layer contains the business logic of the application, including the security, access, and authentication tasks. The model layer, sometimes referred to as the business layer is an essential part of software architecture that divides an application's business logic from its display layer and data layer. The business layer contains the application's core functionality, such as the rules and processes that govern the behavior of the system. It encapsulates the data and provides services to the presentation layer for interacting with the data. The business layer also handles business workflows, business rules, and data validation. The Database layer is where all the database schema and application data are stored securely on the server side.
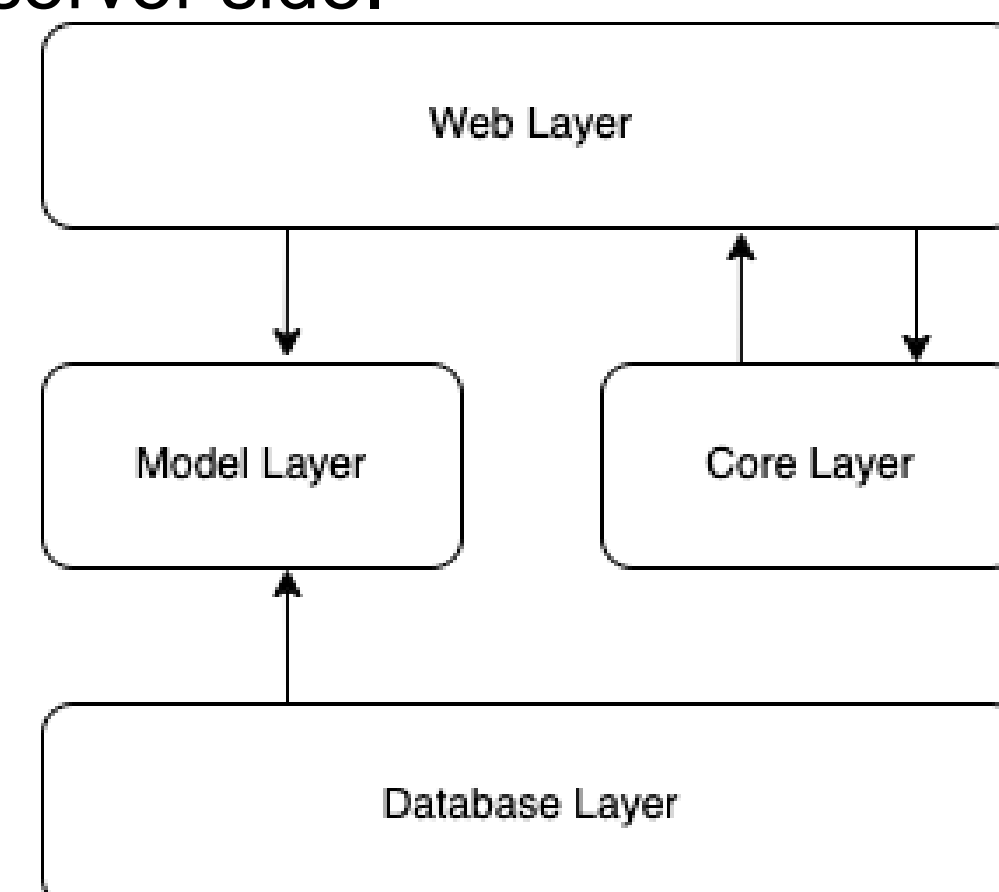
System Architecture Diagram

Conclusion

The current status of the project is much of the front-end work is completed such as many of the needed pages are done and ready to show off the information. However, a lot of the back-end still needs to be worked on for instance a database should be connected to the web application for it to have information to show and somewhere to store information that is provided by the user.

Because of limited time, there are still some pages to be developed to achieve the best use of this application such as: Scenarios, Actions, Mitigations, Link.