DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON

SYSTEM REQUIREMENTS SPECIFICATION
CSE 4316: SENIOR DESIGN I
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ERS
EQUIPMENT RELIABILITY STRATEGIES

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REVISION HISTORY

Revision	Date	Author(s)	Description
0.1	3.20.2023	ML, NN, PS, HN, VS	document creation
0.2	5.3.2023	ML, NN, PS, HN, VS	document revision

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1 Product Concept

This section describes the purpose, use, and intended user audience for the Equipment Reliability Strategies application. The Equipment Reliability Strategies is a user-friendly web-based application, that uses the latest technologies for both front-end and back-end, targeting organizations that own or operate process facilities across many industries. By using this application, the end-users, such as site managers, engineers, and inspection and maintenance staff will be able to create maintenance plans, inspection plans, risk management, strategies, reports, etc, which keep equipment operating efficiently, minimize health, safety, and environmental accidents, and helps to avoid large and costly repairs down the road.

1.1 Purpose and Use

The purpose of the Equipment Reliability Strategies application is to help organizations, that own or operate process facilities, to manage all of their equipment in a professional and the most efficient way, to keep their equipment operating efficiently, minimize health, safety, and environmental accidents, and to avoid unexpected costly repairs in the future. To use this application users must create an account, and log in with authentication and access control. Based on their roles and granted permissions, the users will be able to create equipment, add or edit equipment properties, and calculate risks for each individual equipment. From there, they will be able to create, update or delete, and manage default strategies, best practices, scenarios, actions, and mitigation, and create maintenance plans, inspection plans, and reports.

1.2 Intended Audience

This application will be made available commercially. The intended audiences of the Equipment Reliability Strategies application are organizations that own or operate process facilities across many industries in general and people who are working for these organizations, such as managers, engineers, and inspection and maintenance staffs in particular.

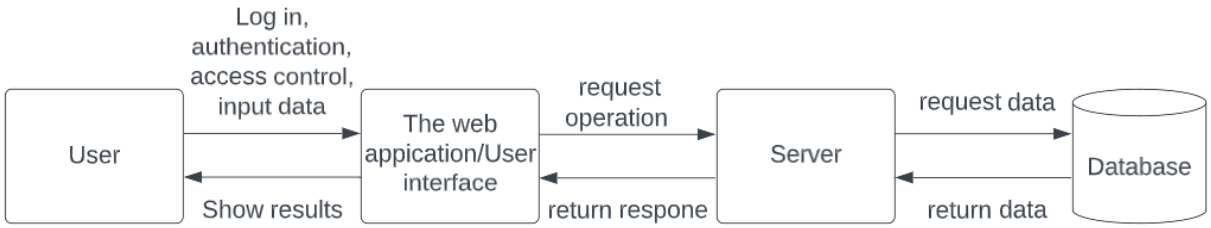

Figure 1: The Equipment Reliability Strategies application conceptual drawing

2 PRODUCT DESCRIPTION

The Equipment Reliability Strategy system is a web-based application designed to assist clients in managing their physical equipment assets and lowering the risks connected with equipment failure. Input and management of equipment data, the definition of maintenance strategies, and risk analysis are all made possible by the system's many features, which are available to users. The system is designed to be user-friendly and customizable, with features that cater to the specific needs of each client.

2.1 FEATURES & FUNCTIONS

A key part of the system, the Equipment Data module gives clients thorough details on the physical assets of the equipment and their maintenance histories. Client, site, and unit data for the equipment/component are CSU data. Another key part of the system is the defaults. Clients can obtain preset maintenance strategies based on engineering standards from the Default Strategies and Best Practices feature. Clients can alter their techniques to meet their specific needs. To choose the optimal course of action, clients can simulate various maintenance scenarios using the Scenarios feature. The Mitigation feature determines the risk level after the action is taken, and the Actions feature enables clients to take specific actions to minimize detected risks. The Consequence Calculator is a key feature that enables clients to calculate risk and consequence based on many factors. The user profile is a feature that can be created and managed using the User Profile module. Users only have access to the features and information that are relevant to their role. Executive summaries and data dumps are available under the Reports feature. A real-time view of the equipment maintenance status, necessary actions, and time history is provided via the dashboard feature. This might also come in the form of notifications.

2.2 EXTERNAL INPUTS & OUTPUTS

Name	Description	Use
Equipment (input)	User will input the equipment to be tracked	Lets correct info to be generated
Equipment Status (input)	External Systems give info like temperature	System can then alert user
Default Strategies (output)	Gives users instructions	User can follow instructions to maintain equipment
Best Practices (output)	Gives user instruction created by the business	User can follow specific instructions
Mitigation (output)	Gives user a way to avoid the worst outcome	User can follow this to help mitigate a negative outcome

Table 2: External Inputs & Outputs

2.3 PRODUCT INTERFACES

Specify what all operational (visible) interfaces look like to your end-user, administrator, maintainer, etc. Show sample/mocked-up screen shots, graphics of buttons, panels, etc. Refer to the critical external inputs and outputs described in the paragraph above.

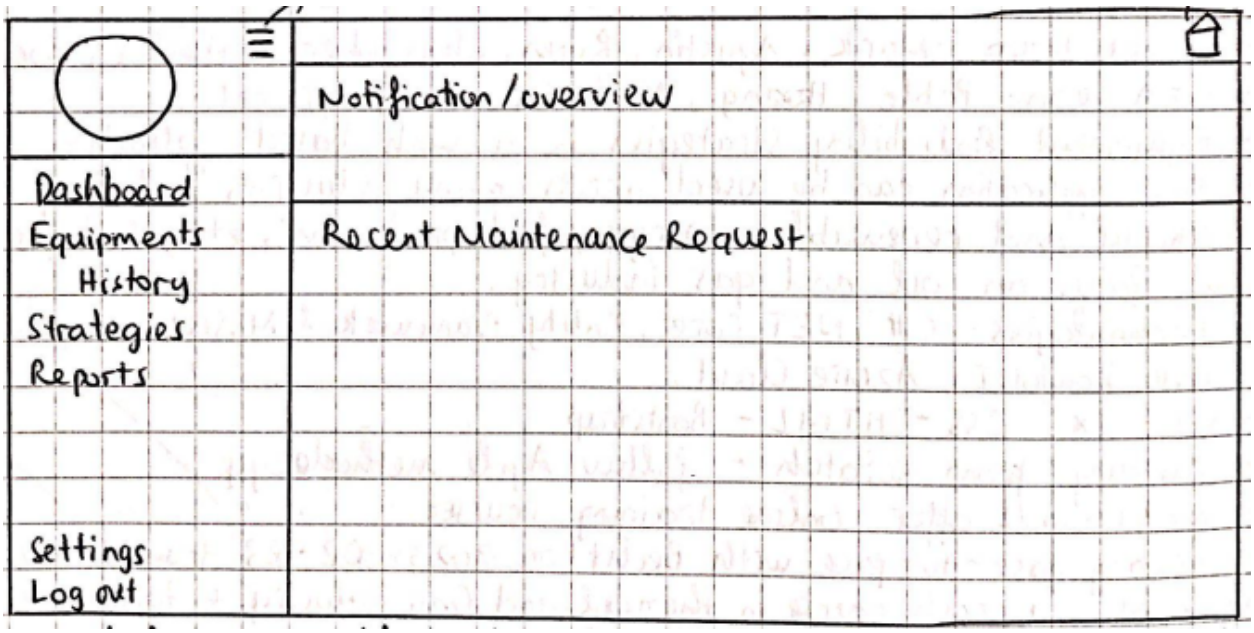

Figure 2: Dashboard

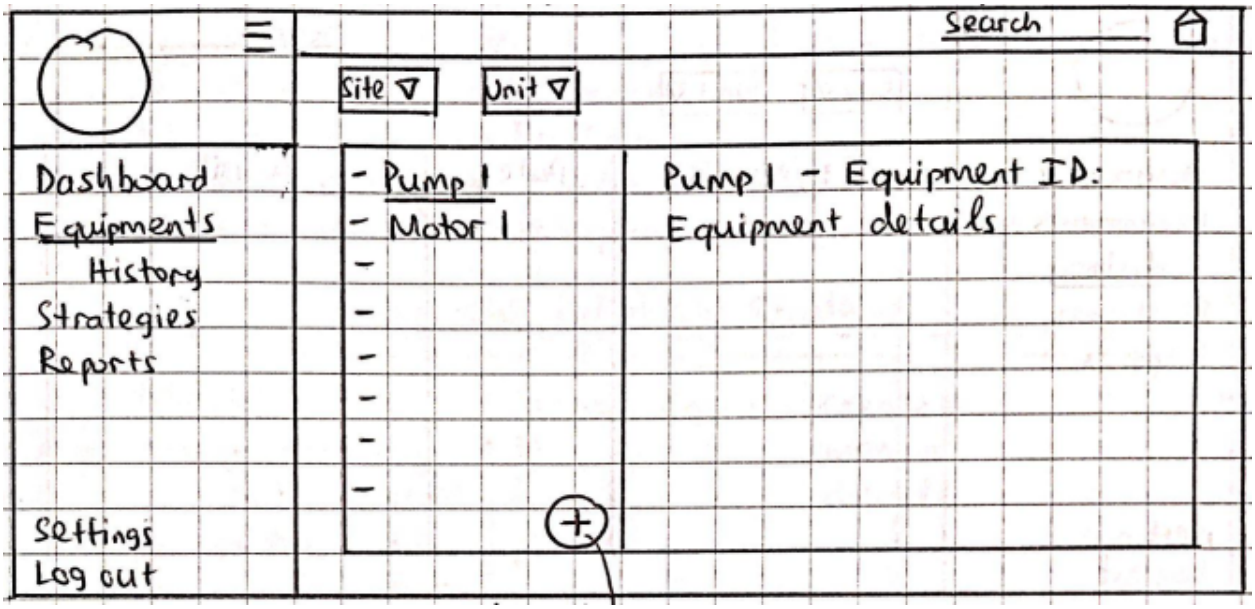

Figure 3: Equipment

3 Customer Requirements

This section lists all of the functional and non-functional Customer Requirements with requirement descriptions, the source of the requirement, a detailed description of realistic constraints and standards that apply to each requirement, and the priority of each requirement. Those requirements are the directly observable features and functions of this application that will be encountered by its users.

3.1 Create account

3.1.1 Description

The users will be able to create an account using their company email address.

3.1.2 Source

Becht

3.1.3 Constraints

A user can create an account using their company email address only. One company email address can be used to create only one account. The password must be 8-16 characters long and contain at least one uppercase, one lowercase, and one special character.

3.1.4 Standards

Company standards

3.1.5 Priority

Critical

3.2 Log in

3.2.1 Description

The users, who have an active account already, will be able to log in to the application using their credentials. After clicking the log-in button, they will be asked to verify their identity via an authentication process.

3.2.2 Source

Becht

3.2.3 Constraints

The users can log in to the application using their company email address and password only. The users must verify their identity via an authentication process.

3.2.4 Standards

Company standards

3.2.5 Priority

Critical

3.3 Log out

3.3.1 Description

The users, who logged in already, will be able to log out of the application by clicking the log-out button at the bottom of the left navigation bar.

3.3.2 Source

Becht

3.3.3 Constraints

N/A

3.3.4 Standards

N/A

3.3.5 Priority

Critical

3.4 Authentication and Access Control

3.4.1 Description

During the log-in process, the users will be able to verify their identity using multi-factor authentication, including an authentication application, email, or phone number. Once the identity of the user has been authenticated, access control policies grant specific permissions to certain tasks and enable the user to access the appropriate level of data.

3.4.2 Source

Becht

3.4.3 Constraints

The multi-factor authentication includes an authentication application, email, or phone number only. Access control involves identifying a user based on their credentials only.

3.4.4 Standards

Company standards

3.4.5 Priority

Critical

3.5 Create Equipment

3.5.1 Description

The users, who successfully logged in, and were granted permission to create equipment, will be able to create equipment by clicking a "plus" button. After that, the user will be asked to input equipment data and click the "Create" or "Cancel" button to complete the task.

3.5.2 Source

Becht

3.5.3 Constraints

The users must be granted permission to create equipment.

3.5.4 Standards

Company standards

3.5.5 Priority

Critical

3.6 Add/Edit Equipment Properties

3.6.1 Description

The users, who successfully logged in, and were granted permission to add or edit properties of equipment, will be able to do so by clicking the "Add/Edit" button.

3.6.2 Source

Becht

3.6.3 Constraints

The users must be granted permission to add or edit properties of equipment.

3.6.4 Standards

Company standards

3.6.5 Priority

Critical

3.7 Create Strategies

3.7.1 Description

We have three types of strategies: Becht default strategy, Client default strategy, and Client strategy. Mark said that those strategies should be in the same table, with one column to specify which type of the strategy is.

3.7.2 Source

Becht

3.7.3 Constraints

The users must be granted permission to create strategies.

3.7.4 Standards

Company standards

3.7.5 Priority

Critical

3.8 Add/Edit Strategies

3.8.1 Description

The user will be granted permission to add and edit properties of strategies.

3.8.2 Source

Becht

3.8.3 Constraints

The user must have access control to add/edit strategies.

3.8.4 Standards

Company standards

3.8.5 Priority

Critical

3.9 Consequence Calculator

3.9.1 Description

Becht Consequence Calculator should take in multiple factors such as fluid, fluid phase, process temperature, pressure, hole size, and H2S service PPM. The factors will calculate the risk of leak rate, volatility, fire/explosion consequence, and H2S Consequence.

3.9.2 Source

Becht

3.9.3 Constraints

Detailed description of applicable constraints...

3.9.4 Standards

List of applicable standards

3.9.5 Priority

Critical

3.10 User Profile

3.10.1 Description

User Profile will contain users' information needed to create a profile. The creation of a profile will be set up through Becht.

3.10.2 Source

Becht

3.10.3 Constraints

Creation of an account must be through Becht.

3.10.4 Standards

Company standards

3.10.5 Priority

High

3.11 Notification

3.11.1 Description

The user will be notified with various information related to equipment, reports, etc.

3.11.2 Source

Becht

3.11.3 Constraints

N/A

3.11.4 Standards

Company standards

3.11.5 Priority

High

3.12 Dashboard

3.12.1 Description

Overview of data that is in an easy-to-digest form. Includes important business metrics and other data that the end users need

3.12.2 Source

Becht

3.12.3 Constraints

N/A

3.12.4 Standards

Becht

3.12.5 Priority

High

3.13 Showing Equipment List/Information

3.13.1 Description

Here the list of equipment added is shown to the user to be able to then click on it and view information over it.

3.13.2 Source

The company using it

3.13.3 Constraints

Must only show equipment that has been added by someone within the company and follow any filters used by the user. Should also load it all within a reasonable time frame that won't interrupt the regular workflow

3.13.4 Standards

Becht

3.13.5 Priority

High

3.14 Integration with third party systems

3.14.1 Description

The application will be able to interact with third-party systems to exchange data

3.14.2 Source

Becht

3.14.3 Constraints

N/A

3.14.4 Standards

N/A

3.14.5 Priority

Future

3.15 Applying AI/ML

3.15.1 Description

Applying AI/ML to generate maintenance plans, inspection plans, and default strategies

3.15.2 Source

Becht

3.15.3 Constraints

N/A

3.15.4 Standards

N/A

3.15.5 Priority

Future

4 Packaging Requirements

This section lists the requirements essential to packaging the delivered product to the end-user. These requirements are motivated by the following design goals: Ease of use, web delivery, security, compatibility with other standards and industry best-practices, device independence, compatibility with other standards and industry best-practices, and reduce fragmentation of web application development space.

4.1 Media Type

4.1.1 Description

The package must be delivered with a standardized media type. This may allow the user to correlate the package with an applicable run-time environment.

4.1.2 Source

ERS team

4.1.3 Constraints

N/A

4.1.4 Standards

Application Packaging Standard

4.1.5 Priority

High

4.2 File Extention

4.2.1 Description

The packaging format must use a consistent file extension to ensure that the media type is correctly identified by web servers.

4.2.2 Source

ERS team

4.2.3 Constraints

N/A

4.2.4 Standards

Application Packaging Standard

4.2.5 Priority

High

4.3 Free and Widely Available Packaging Format

4.3.1 Description

The packaging format must be free and widely implemented on current delivery platforms. This must be supported by users and the operating systems of the developers.

4.3.2 Source

ERS team

4.3.3 Constraints

N/A

4.3.4 Standards

Application Packaging Standard

4.3.5 Priority

Critical

4.4 Device Independence

4.4.1 Description

The packaging format must be suitable for delivery onto multiple devices, including computers and mobile phones that are web-enabled.

4.4.2 Source

ERS team

4.4.3 Constraints

N/A

4.4.4 Standards

Application Packaging Standard

4.4.5 Priority

Critical

4.5 Data Compression

4.5.1 Description

The packaging format should support data compression to make packages smaller.

4.5.2 Source

ERS team

4.5.3 Constraints

N/A

4.5.4 Standards

Application Packaging Standard

4.5.5 Priority

High

4.6 Manifest Files

4.6.1 Description

The web application package must include manifest files to provide instructions for how the package should be installed or executed.

4.6.2 Source

ERS team

4.6.3 Constraints

N/A

4.6.4 Standards

Application Packaging Standard

4.6.5 Priority

Critical

5 Performance Requirements

For the performance of the product we want to make sure that it can run reliably and quickly so that users can easily find equipment in their facility and figure out what they have to do to reliably maintain it. To accomplish this we must make sure that the product is well optimized.

5.1 Quick Web Navigation

5.1.1 Description

The web application's functions, such as navigating through tabs or clicking on buttons, should carry on below a certain speed to provide feedback to the user.

5.1.2 Source

ERS

5.1.3 Constraints

Internet speed, as well as the user's web-enabled device can hinder the speed of the web application.

5.1.4 Standards

General functions should have a response time of 0.3 seconds or less. A Speed Index(SI) of less than 1000 is ideal.

5.1.5 Priority

High

5.2 Responsiveness

5.2.1 Description

The web application should be responsive to computers and mobile phones that are web-enabled. The pages should be able to be scaled and resized to fit the window.

5.2.2 Source

ERS

5.2.3 Constraints

A minimum window size for the application must be designated. Shrinking the window below that thresh hold would reduce the visible area instead of resizing the entire application.

5.2.4 Standards

N/A

5.2.5 Priority

Moderate

5.3 Authentication Speed

5.3.1 Description

Upon entering in valid log in credentials, and successful authentication, the user should have authorized access to the web application quickly.

5.3.2 Source

ERS

5.3.3 Constraints

Internet speed may delay the time necessary to allow the user to have access to the website.

5.3.4 Standards

If authentication is successful, users should have access to the web application within 5 seconds.

5.3.5 Priority

Moderate

5.4 Log Out Speed

5.4.1 Description

Upon clicking the Log Out button, the user should not remain logged in for an extended amount of time.

5.4.2 Source

ERS

5.4.3 Constraints

Internet speed may delay the time necessary to allow the web application to register the button press.

5.4.4 Standards

Users should log off of the website within 5 seconds of clicking the log off button.

5.4.5 Priority

Moderate

5.5 Consequence Calculator Accuracy

5.5.1 Description

The calculator should reliably produce the same outputs given the exact same inputs. The inputs must be correctly loaded into the appropriate equations and models to produce an accurate result.

5.5.2 Source

Betch

5.5.3 Constraints

Only a certain number of significant digits can be displayed for each metric.

5.5.4 Standards

Betch

5.5.5 Priority

High

6 Safety Requirements

Include a header paragraph specific to your product here. Safety requirements might address items specific to your product such as: no exposure to toxic chemicals; lack of sharp edges that could harm a user; no breakable glass in the enclosure; no direct eye exposure to infrared/laser beams; packaging/grounding of electrical connections to avoid shock; etc.

6.1 Laboratory equipment lockout/tagout (LOTO) procedures

6.1.1 Description

Any fabrication equipment provided used in the development of the project shall be used in accordance with OSHA standard LOTO procedures. Locks and tags are installed on all equipment items that present use hazards, and ONLY the course instructor or designated teaching assistants may remove a lock. All locks will be immediately replaced once the equipment is no longer in use.

6.1.2 Source

CSE Senior Design laboratory policy

6.1.3 Constraints

Equipment usage, due to lock removal policies, will be limited to availability of the course instructor and designed teaching assistants.

6.1.4 Standards

Occupational Safety and Health Standards 1910.147 - The control of hazardous energy (lockout/tagout).

6.1.5 Priority

Critical

7 Security Requirements

https://www.overleaf.com/project/63eea0f912c65b6473461071 To maintain proper security within the product we must make sure that only authorized users are allowed to accessing a companies specific instance of the product to view their equipment and to also only allow specific users granted access to do tasks determined by whoever is the higher up observing the use of it.

7.1 Authentication

7.1.1 Description

During the log-in process, the users will be able to verify their identity using multi-factor authentication, including an authentication application, email, or phone number.

7.1.2 Source

Becht

7.1.3 Constraints

The multi-factor authentication includes an authentication application, email, or phone number only.

7.1.4 Standards

Company Standards

7.1.5 Priority

Critical

7.2 Access Control

7.2.1 Description

Once the identity of the user has been authenticated, access control policies grant specific permissions to certain tasks and enable the user to access the appropriate level of data

7.2.2 Source

Becht

7.2.3 Constraints

Access control involves identifying a user based on their credentials only.

7.2.4 Standards

Company Standards

7.2.5 Priority

Critical

7.3 Password Strength

7.3.1 Description

A strong password is essential to keep personal information and online accounts secure. It's important to create a unique and complex password and protect it with care to ensure the safety of your data.

7.3.2 Source

Becht

7.3.3 Constraints

The password must be 8-16 characters long and contain at least one uppercase, one lowercase, and one special character.

7.3.4 Standards

Company Standards

7.3.5 Priority

Critical

8 Maintenance & Support Requirements

Maintenance for the product can be done with updates to the code to help remove any bugs found in the future when it is used by more people at once. To give support throughout the products lifetime we should keep adding new default strategies to the database whenever a new better strategy is discovered for the equipment or when there's new equipment created and a default strategy is needed for it.

8.1 Requirement Name

8.1.1 Description

Detailed requirement description...

8.1.2 Source

Source

8.1.3 Constraints

Detailed description of applicable constraints...

8.1.4 Standards

List of applicable standards

8.1.5 Priority

Priority

9 Other Requirements

At the writing of this document the product is most likely to be tested with Google Chrome with Windows as the operating system so then that would mean that the user would be recommended to be used when trying to use the product as to obtain the best and most reliable results from it.

10 Future Items

This section will reiterate all requirements that are listed as "future" priorities. This is repetitive, but necessary as a concise statement of features/functions that were considered/discussed and documented herein, but will NOT be addressed in the prototype version of the application due to constraints of time, skills, technology, etc.

10.1 Integration with third party systems

10.1.1 Description

The application will be able to interact with third-party systems to exchange data

10.1.2 Source

Becht

10.1.3 Constraints

N/A

10.1.4 Standards

N/A

10.1.5 Priority

Future

10.2 Applying AI/ML

10.2.1 Description

Applying AI/ML to generate maintenance plans, inspection plans, and default strategies

10.2.2 Source

Becht

10.2.3 Constraints

N/A

10.2.4 Standards

N/A

10.2.5 Priority

Future

REFERENCES

[1] Barstow, A., Jackson, D., amp; Kesteren, A. van. (2006, August 21). Web Applications Packaging Format Requirements. Web applications packaging format requirements. Retrieved March 20, 2023, from https://www.w3.org/TR/2006/WD-WAPF-REQ-20060821/

[2] "Web Applications Packaging Format Requirements." Edited by Marcos Caceres, Web Applications Packaging Format Requirements, W3C, 21 Aug. 2006, https://www.w3.org/TR/2006/WD-WAPF-REQ-20060821/.