Project Plan

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*Smart Evaluator of MRO Supplies*

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Black And Decker

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# Introduction

This plan is being developed as the first deliverable of the 2024 KSU SWE capstone class, in collaboration with CribMaster of Stanley Black and Decker. This plan serves to address the project’s scope, context, activities, resources, schedule, quality goals, and processes, and to serve as a roadmap for the project’s development over the project lifecycle. The product being developed will be a full-stack web application that complements the CribMaster hardware and software solution. This project will assist CribMaster clients and salespersons as they research various product SKUs and perform vendibility calculations. These vendibility calculations will be used to perform two tasks: to help clients and salespersons determine the machine that best fits their needs, and to assist current CribMaster owners in inventory evaluation, creation, and maintenance. This service will utilize two key technologies: web scraping and OpenAI's ChatGPT API to gather data and generate vendibility analysis. The product will be developed on a separate development server and shall be deployed to a cloud solution following client acceptance.

There will be three major milestones during this project; the first milestone will mark the completion of the design documentation and architecture design, the second milestone will mark the completion of the web scraping pipeline and database, and the final milestone will coincide with the delivery of the completed project to the client, as well as client acceptance. Note that this Project Plan is a dynamic document, subject to updates as the project progresses, and is integral to ensuring the successful development and delivery of the Smart Evaluator of MRO Supplies.

# Project Overview

## Scope

### Identification

Title: **Smart Evaluator of MRO Supplies**

Abbreviation: **SEMROS\***

Version: **0.1** (for initial planning)

Release: **Alpha\*** (for initial planning)

Identification Number: **TBD\***

*The Smart Evaluator of MRO Supplies project is currently in its initial planning phase, and certain identification numbers, titles, abbreviations, version numbers, and release numbers have not been assigned. As the project progresses, these details will be defined and updated accordingly.*

### System Overview

The Smart Evaluator of MRO Supplies will serve as a dedicated platform for both CribMaster clients and salespeople that aims to assist users as they research industrial tools for existing machines and guide them in selecting the most appropriate CribMaster solution tailored to their specific needs. **Vendibility analysis** will be employed as the key method for meeting these objectives. While specific solutions and methods will be further explored during the design phase, preliminary considerations for vendibility analysis are as follows: first, data collection is initiated via web scraping, OpenAI language processing tools, and publicly available APIs. The collected data will encompass essential information such as item manufacturer details, alternative SKUs, item cost, physical properties including height, weight, fragility, storage methods, and other pertinent notes impacting vendibility. Next, vendibility calculations will be conducted based on vending and storage methods. Initially, the system will focus on the three most popular hardware solutions, namely CribMaster ProStock, ProLock, and ToolBox. These machines employ unique approaches such as **coil-vending**, **carousel**, and **locker** systems, respectively. The data collected will be used to calculate the items’ suitability for each of the three storage methods. Finally, the data and vendibility results will be stored in our system’s database for future reference to reduce computation time should a particular item already exist in the database.

In terms of the general system overview, the Smart Evaluator will be a web-based solution with a Node.js backend and a React front end, potentially incorporating a CSS framework like Tailwind. A cloud database such as MongoDB will be employed, and infrastructure-as-code may be implemented to enhance deployment flexibility. The project, sponsored by CribMaster (Stanley Black and Decker), is planned to operate at various sites, including client sites encompassing manufacturing and consignment locations, and CribMaster sales offices. The system is intended for use by CribMaster sales representatives, clients, existing CribMaster hardware owners, prospective CribMaster hardware owners, and the development team responsible for its creation. This holistic approach ensures the Smart Evaluator caters to the diverse needs of its stakeholders while providing a comprehensive solution for vendibility analysis.

### Document Overview

This document's content includes an overview of the Smart Evaluator of MRO Supplies system, a delineation of the existing problem and the current system/situation, and specific details about the development process, including deliverables and plans. It is designed to provide a comprehensive understanding of the CribMaster solution generator, its objectives, and the associated considerations, all within the context of its pre-production status.

*Note: The SEMROS project is being designed in conjunction with the CribMaster “Solution Generator” software product, and consequently, this document also contains an overview of the purpose and functionalities of that software. While the details contained herein are not confidential, it is important to note that the solution generator is presently in its pre-production phase and is not accessible to the public. The document is authored by the KSU SWE capstone project team, who do not represent CribMaster or Stanley Black and Decker in any official capacity.*

## Current System or Situation

[This section shall be divided into the following paragraphs to describe the system or situation as it currently exists.]

CribMaster's primary mission is to provide clients with advanced inventory management capabilities using industrial-grade, highly customizable vending machines. The focus is on delivering inventory efficiently at the point of use using a unique combination of hardware and software. CribMaster addresses the challenges of maintaining security and accountability in large manufacturing facilities with diverse employee interactions. The CribMaster solution, although robust, lacks a method for quickly calculating the most resource-effective vending solution based on the client organization’s needs.

## Background, Objectives, and Scope

There are a multitude of variables to consider when calculating the best solution for a client. First, there are **machine-specific** qualities, such as price, capacity, security, and flexibility. Each of the 25 CribMaster machines exhibits highly diverse and specific characteristics that must be considered as clients select a solution that aligns with their needs. Second, each potential item-to-be-vended must be evaluated through a rigorous process of data collection and calculation called **vendibility analysis**. This data is crucial for selecting the optimal hardware solution, considering factors such as item price, manufacturer, and physical properties that indicate the item’s optimal vendibility method. Once the machine(s) have been selected and the items have been evaluated, **machine layouts** must be made that maximize the machines’ storage capacity. These three activities are pivotal in the CribMaster sales process and are extremely time consuming when done by hand. CribMaster product developers understand the need for an automated software system that consistently calculates the best for each customer. Development on this software program is underway, denoted as the "Solution Generator," and is currently in pre-production.

## Operational Policies and Constraints

To our current knowledge, there are no operational policies or constraints that apply to the current system or situation.

## Description of Current System or Situation

Phase I of the Solution Generator project was completed in collaboration with a previous KSU capstone team and focused on machine-specificqualities. Users can input their organization’s priorities (e.g. high-security, medium-capacity, price range), and the Solution Generator outputs the best hardware solution based on those priorities. Phase II of the Solution Generator, which is yet to be implemented, plans to introduce the other key activities, such as item vendibility analysis and machine storage optimization. The vendibility analysis algorithms, data, and user interface from the SEMROS project may be incorporated into the Solution Generator at the client’s discretion. Additionally, our vendibility analysis data may be used by CribMaster software developers to generate machine layouts and other machine storage optimization features.

## Users or Involved Personnel of Current System

The foremost users of the Solution Generator are CribMaster sales personnel, CribMaster clients, and current CribMaster owners. Salespersons conduct solution generation on behalf of their clients and are typically given an extensive list of items and considerations that guide the product selection process. Alternatively, CribMaster clients can conduct their own research to select a vending product without the salesperson as an intermediary. Additional users may also include current CribMaster owners actively engaged in the CribMaster system. They may use the solution generator to enhance the efficiency and effectiveness of existing machines within their possession. Because the Solution Generator is in pre-production, the current users also include product designers and developers.

# Development Background/Approach

The Smart Evaluator of MRO Supplies will be a web-based solution. It will utilize Node.js for its back end and React for its front end, potentially incorporating additional CSS frameworks such as Tailwind. A cloud database such as MongoDB will be employed and infrastructure-as-code may be implemented to enhance deployment flexibility. The project will undergo development and host files through a remote Linux server, which will then be hosted through Apache once the development phase is complete.

## High Level Estimates

[Provide high level estimates to accomplish each phase of the project including total effort, lines of code, pages of requirements & other development documentation, test cases and duration]

## Key Contacts and Stakeholders

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Team #** | S1 | | | |
| **Stakeholders** | **First Name** | **Last Name** | **Contact Information**  **(email/phone)** | **Roles/Concentration** |
| Member 1 | Matthew | Periut | 404-917-5496  mperiut1@students.kennesaw.edu | **Team Lead, Backend Developer**  *Responsible for code review, communication with client, backend-development and integration.* |
| Member 2 | Cohen | Miller | 706-980-3010 cmill283@students.kennesaw.edu | **Data Developer**  *Responsible for data infrastructure, overseeing data collection, analysis, and storage.* |
| Member 3 | Dawniqueca | Steele | 917-574-2872  dsteel26@students.kennesaw.edu | **Lead UI Designer**  *Responsible for overseeing the direction of the user-interface, generating prototypes, and design plans.* |
| Member 4 | Carter | Ray | 770-686-9847  cray62@students.kennesaw.edu | **Front-End Developer**  *Responsible for implementing UI designs and facilitating effective user experience.* |
| Member 5 | Justin | Hughes | 404-921-4657  jhugh146@students.kennesaw.edu | **Automation**  *Responsible for automation software tools (e.g. infrastructure provisioning, testing, etc.)* |
| Client Member 1 | Amir Reza | Kashani | Amir.Kashani@sbdinc.com |  |
| Client Member 2 | Rusanov | Vladimir | 770-530-2429 Vladimir.Rusanov@sbdinc.com |  |
| Professor | Yan | Huang | 4705783174 yhuang24@kennesaw.edu | |
| Industry Coordinator 1 | Alla | Kemelmakher | 4044529373  akemelma@kennesaw.edu | |
| Industry Coordinator 2 | Nasiya | Sharif | 4705785126 nrahman1@kennesaw.edu | |

# Features, Primary Deliverables, and External Commitments

## Feature List

* **User Input**

Users are able to upload a list of items and their verbal descriptions using a .csv format.

* **Data Collection and Enrichment**

The web application is able to extract information from the verbal description of the user input. From there, the system will either pull relevant data from other previously generated outputs, or it will gather additional information through web scraping techniques.

* **Vendibility Analysis**

The application should integrate and provide vending possibilities analysis, in terms of CribMaster’s ProLock, ProStock, and ToolBox. It should consider factors such as availability, pricing, and product information.

* **Automated Suggestions**

The application should provide automated suggestions of which vending machine would be best for any given item.

* **User-friendly, web-based interface**

The interface should be easy and accessible to use. Users should be able to easily upload .csv lists, view suggestions, and explore vending possibilities.

* **CribMaster Catalogue**

The application should contribute to a catalogue for CribMaster of items and what machines they best fit in.

## Customer Deliverables

* **Project Plan** – February 4th, 2024

The project plan will give a detailed overview of the project’s main objectives and goals. It will provide the scope and background to the contents of the project and its relevance to external stakeholders. Additionally, it will provide necessary information about the team, in terms of their skills and roles. It will also specify any significant project milestones, resource allocations, and potential risks. The project plan is subject to change following client feedback.

* **Design Document** – February 14th, 2024

The design document will include a brief description of the overall project and the system overview. It will mainly focus on explaining the architectural and technical design choices of the project. Additionally, it will provide system models and diagrams, along with mockups of the human interface design.

* **Test Document** – April 2024

The test document will document all testing and quality assurance activities. This includes the overall testing strategy, the adequacy criterion, test cases, and test results.

* **User Manual** – April 2024

The user manual will provide assistance and instructions on how to use the built application. It will include screenshots and clear, precise language that will aid users in how to navigate the features and functionalities of the product.

* **Final Product** – April 2024

The final product will be the built web application.

# Project Schedule

## Major Project Milestones

| **Date (**YYYY-MM-DD) | **Milestone/ task** | **Deliverables** | **Remarks** |
| --- | --- | --- | --- |
| 02-14-2024 | Milestone 1   1. *Develop Problem Statement* 2. *Mock-Ups for end-to-end process* 3. *Design of back-end Architecture* | -Design Document | *Present to client* |
| 03-20-2024 | Milestone 2   1. *Develop web scraping pipeline* 2. *Build Database* 3. *Develop model utilizing LLM to address the data relating to vendibility.* |  | *Present to client* |
|  | Milestone 3  *App that offers vendibility solutions based on list of material and sites* | -Testing Document  -User Manual  -Client Acceptance Document | *Present to client/verify acceptance* |

## Project Status Tracking & Working Meeting Minutes

Information and metrics to be tracked at regular meetings:

* **Attendees**

Team members’ attendance at weekly meetings will be recorded.

* **Discussion Items**

Topics discussed during meetings will be documented.

* **Tasks**

Tasks, both high-level and weekly, will be documented.

* **Project Status**

Project status will be both documented and reported at weekly meetings

# Project Work and Product Estimates

## Estimate Summary

The estimate is based off team experience, and the level of polish that we are aiming for which would not be extremely strenuous. The quality of the project is based off the amount of polish integrated into the project, and the architecture we’re building as a foundation seems to be setting us up for spending this amount of time and effort,

The tables below summarize the product size and effort estimates:

|  |  |  |  |
| --- | --- | --- | --- |
| **Project** | **Estimate Attributes** | | |
| **Size** | |  |
| **WBS areas** | **Unit of Size** | **Size** | **Effort** |
| **Total Requirements Effort** (includes feature-related **and** "other" (non-feature) Requirements work) |  |  | ~20 hours |
| **Feature Related Requirements Size and Effort Totals** | PAGES | 20-30 | 20 Hours |
| **Total Development Effort** (includes feature-related **and** "other" (non-feature) Development work) |  |  | ~200 hours |
| **Feature Related Development Coding Size and Effort Totals** | LOC | 3,000-5,000 | 50-100 hours |
| **Feature Related Development Documentation Size and Effort** | PAGES | 3,000-5,000 | 50-100 hours |
| **Total Testing Effort** (includes feature-related **and** "other" (non-feature) Testing work) |  |  | ~20 hours |
| **Feature Related Testing Size and Effort Totals** | TEST CASES | 50-100 | 20 hours |
| **Feature Level Effort Total** (from Feature Estimate Worksheet) |  |  | 90-220 hours |
| **Development Effort Total** (Includes Feature Level and project level overhead for Requirements, Development, and Testing) |  |  | 290-340 hours |
| **Project Level Effort Total** (from Project Level Effort Estimates worksheet, excluding requirements, development, and testing) |  |  | 310-360 hours |
| **Project Total Effort** (Project Totals + Feature Totals) |  |  | **400-580 hours** |

# Project Resource Requirements

## Staffing/ Skill Requirements

**Role: Team Leader**

**Critical Skills: Team management, strong communication, and problem solving**

**Skill Gaps: Advanced project management techniques**

**Role: Development Manager**

**Critical Skills: Technical knowledge in software development, proficiency in software frameworks, and understanding software development life cycle**

**Skill Gaps: Advanced software architecture design experience**

**Role: Planning Manager**

**Critical Skills: Project planning and scheduling, risk management, and resource allocation**

**Skill Gaps: Advanced risk management knowledge**

**Role: Quality & Process Manager**

**Critical Skills: Knowledge in quality assurance, experience with process improvement techniques, and skills in data analysis**

**Skill Gaps:**

**Role: Support Manager**

**Critical Skills: Customer service experience, troubleshooting, and problem resolution**

**Skill Gaps: Advanced skills related to the product and service area**

## Plan to Fill Skill Gaps

**Role: Team Leader**

**Plan to Fill Skill Gaps: Training programs and workshops**

**Role: Development Manager**

**Plan to Fill Skill Gaps: Cross-training with newer technologies**

**Role: Planning Manager**

**Plan to Fill Skill Gaps: Specialized planning management training**

**Role: Quality & Process Manager**

**Plan to Fill Skill Gaps: Training on the newest industry standards**

**Role: Support Manager**

**Plan to Fill Skill Gaps: Service and technical training**

# Dependencies and Constraints

## Constraints

There are a few different constraints that are involved in the development of this project. The two biggest constraints are budget and time. First, the budget of the project is a constraint because certain technologies that would be in consideration for use during the project were ruled out because they are locked behind a paywall and there were other cheaper or free options of different software that were chosen instead. The biggest constraint for this project is time because there is only a short window in which the project must be completed. Due to these certain decisions must be made on what parts of the product less time is spent on.

# Risk Management

## Risk Management Strategy

Risks will be collaboratively prioritized as either a high, medium, or low risk. For each risk, a mitigation strategy will be developed and subsequently submitted for approval. High priority risks will be addressed as soon as possible by the necessary number of team members needed to follow the mitigation strategy.

## Initial Risk List

This is the initial risk list; the risks are listed in priority order from top to bottom. Descriptions are provided below the table. Risks with a pre-mitigation magnitude of 2.0 or below are not listed.

| **Risk**  **number** | **Risk Priority (H, M, L)** | **Likelihood**  **of**  **Occurrence**  **(1-5)** | **Risk name: brief description** | **Mitigation Strategy**  “ACCEPTED” or “MITIGATED” with pointer to plan. |
| --- | --- | --- | --- | --- |
| 1 | M | 3 | **Scope creep:** *Variations in scope due to changing client requirements or needs.* | **Accepted** |
| 2 | H | 2 | **Lack of Client Acceptance:** *Client is unsatisfied with major milestone progress and /or the final product.* | **Mitigated**  *(Plan Below)* |
| 3 | H | 1 | **Lack of Technical Skill:** *New technologies pose a challenge to implement, causing delays or an unacceptable final product.* | **Mitigated**  *(Plan Below)* |
| 5 | L | 1 | **Deployment Failures:** *various issues arise while deploying code to production.* | **Accepted** |
| 6 | L | 1 | **Security-Related Incidents:** *data breach, vulnerabilities, technical failures, etc.* | **Accepted** |

## Risk Mitigation Strategies

### Lack of Client Acceptance: Several steps have been taken to increase the likelihood of client acceptance. The team has established weekly, in-person meetings to discuss the project status and facilitate effective client/developer communication. The team will implement a user-centered design strategy that constantly assesses client approval.

* **Lack of Technical Skill:** This project will use modern technologies and workflows, including language processing and artificial intelligence models, most of which are foreign to the developers. To deal with this issue, each team member has been assigned a concentration to study and learn during the project. This specialization should decrease total training time and increase technical proficiency during this project.

# Project Configuration and Data Management

## Configuration Management

**Managing Configuration** In this project, we will employ robust tools and methodologies to ensure the software's systematic organization and consistency. This includes:

* **Source Code Versioning**: Utilizing Git for code versioning, with all code stored on GitHub. This approach facilitates efficient tracking and management of code changes.
* **Document Control**: The combination of Google Drive and GitHub will be used for storing and managing project documents, ensuring easy access, version control, and safety of all project-related documents.
* **Automated Systems for Building and Integration**: Tools such as Jenkins or GitHub Actions will be employed for automated building of the software and continuous integration, allowing seamless and error-free integration of code changes.
* **Backup and Contingency Plans**: Regular backups of source code and databases will be conducted, along with a solid plan for recovery to quickly restore system functionality in case of any failures.

## Data Management

The strategy for managing data in the SEMROS project includes:

* **Handling the Database**: MongoDB will be used as the primary database, focusing on effective storage and retrieval, performance optimization, and scalability.
* **Safeguarding Data**: Implementing best practices in data security to ensure data is handled securely, including encryption of sensitive data and secure data transfer methods.
* **Data Backup and Long-term Storage**: Regular database backups and archiving will be scheduled to ensure data is not only safe but also preserved for historical reference and future use.

# Project Process

## Software Life Cycle Model

The software life cycle model used for this project's development will be an Agile methodology. This will allow for a flexible project environment while maintaining steady progress during the project development. The agile methodology allows for a quicker time to the first working prototype. Agile is the best to use because it allows for a more flexible software development life cycle because it allows for more adaptability when change is needed to the product.

## Development Tools

There are several different tools that are being utilized during the development of this product. React.js and Vite will be used for the front end. Node.js will be used for the back end. MongoDB will be used to keep any user information such as login information. Apache reverse proxy is being used for increased security since the product is web based. Lastly, the OpenAI API will be used so the system is able to read in user submitted csv files and determine based on the user’s needs what system(s) would work best for their situation.

# Referenced Documents

1. **Guidelines from the KSU SWE Capstone Class**: These set the educational standards and expectations for the capstone project.
2. **Documentation on CribMaster Products**: Offers detailed insights into CribMaster's hardware and software offerings.
3. **OpenAI's ChatGPT API User Guide**: Critical for understanding how the API functions and what its limitations are.
4. **Guidelines on Ethical Web Scraping**: Ensures the project aligns with legal and ethical standards in data collection.
5. **Reference Material on Agile Development Practices**: Outlines the Agile methodology principles and practices that the project will follow.
6. **Node.js User Manual**: Provides detailed information about the backend framework.
7. **React.js Framework Guide**: Offers comprehensive insights into the front-end framework.
8. **MongoDB System Guide**: For a deeper understanding of the chosen database system.
9. **GitHub Usage Manual**: A guide on managing version control and repository.
10. **Best Practices in Software Testing and Quality Assurance**: Reference material for ensuring high software quality and reliability.

# Glossary

* **API** – Application Programming Interface
* **MRO** – Maintenance, Repair, and Operations
* **SKU** – Stock Keeping Unit

# Change Record

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Change Request # | New Issue # | Description of Changes | Reason for Changes | Date Changed | Person Responsible for Change |
| *Ex. 001* | *Ex. 001* | *Ex. Term and definition was added to Glossary* | *Ex. Confusion regarding term* | *Ex. 2/4/2024* | *Ex. Carter Ray* |