Project Deliverable C

Design Criteria

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Abstract

This document contains Project Deliverable C. The purpose of this document is to outline the design criteria of the product. This criteria was decided according to client needs/requests, and through user/technical benchmarking. Further, this document contains all technical benchmarking done.

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1.0 Introduction

Robert Ritchie has tasked our design team to create a product that displays the specific conveyor speeds that optimize the yield of beer from his manufacturing line. Following the initial client meeting, our team created the following problem statement.

“A need exists for Robert Ritchie and his fellow supervisors to find the optimal speeds of their beer packaging process to ensure it is “always at top efficiency (Project Background, Brightspace)”. The solution must have an attractive and straightforward interface that uses a flexible algorithm based on the V-Curve Theory to report optimized speeds of each unit and make recommendations on how to achieve them.”

This report will document our design criteria and metrics that will be used to measure our prototype’s ability to solve our client’s problem. Along with listing criteria, technical benchmarking and possible pathways for prototyping our optimization project have been researched and summarised to determine target specifications.

2.0 Design Criteria

Priority	Design Specifications	Relation =,<, or >	Value	Units	Verification Method
Functional Requirements					
5	Calculate the optimised yield (within a margin of error TDB)	=	TBD	Kegs/h and Bottles/ min	Test
5	Easy to use(number of actions to achieve desired result)	<=	2	Number	Test
5	Display the calculated optimal speeds of each unit	=	TBD	Kegs/h and Bottles/ min	Test
4	Identify units which are not running at the optimised rates	=	TBD	Kegs/h and Bottles/ min	Test
4	Can implement any machinery involved and any order of units in the process.	=	Yes	N/A	Test
Non- Functional Requirements					

5	Safety (data provided is proprietary information and thus must be stored securely)	=	Yes	N/A	Test
4	Convenient (small handheld device or desktop app)	=	Yes	N/ A	User Test
3	Aesthetically pleasing user interface	=	Yes	N/A	User Test
Constraints					
-	Cost	<=	100	$	Final check
-	Recommendations cannot exceed the max speed of each conveyor	<	Max speed	Kegs/h, Bottles/ min, Cans/min	Test
-	Algorithm needs to be based off of the speed of the filler station	=	Input	Filler speed	Test
-	Recommendations are based off the data provided by the client	=	Yes	N/A	Test

3.0 Technical Benchmarking

3.1 Existing Products

Company	ALTAIR (ALTAIR 2022)	Cisco- Eagle (Cisco-Eagle 2022)	Shanxi Dedicated Measurement Control (Dedicated Measurement Control 2023)	Anylogic (Anylogic 2022)
Product detail	Analyses factory data in order to maximise productivity and reduce risk. Uses simulation modelling and Smart Manufacturing principles	Analyses the conveyor shortcomings providing a solution to optimising productivity.	Equipment designed to minimise the cost and optimise efficiency	Conducts a manufacturing simulation model that collects data on - Demand - Inventory levels - Line capacities - Production times The data ultimately provides insight for the company managers
Cost	>100$	>100$	>100$	(Pay as you go) >100$
Operation	- Factory data needs to be	Meet with clients in person then	Easy installation (take less than 30	ITE consultation - discrete event

	provided by the client. - Share data-driven across the organisation. - Clients are able to run software anytime, anywhere.	solve issues.	mins). Portable (The system is operated in manual mode using a laptop computer)	modelling of production system -The simulation results are exported to excel and that data helps management optimise production line
Speed display (Interface)	Solutions on no-code, cloud-ready interface.	The results (target speed) will be provided to the client at the end.	Conveyor condition is displayed in real-time.	Excel sheet of simulation data and report
Safety	Local or cloud based data storage for data privacy	Experts help in creating a secure operation.	Achieved IP67 rating. (water and dust proof)	Simulation modelling risk free environment

3.2 Important attributes

- **Consultations are often used by optimization companies to create unique solutions for clients**
- **Methods of data analysis often include simulation modelling**
- **The life of a conveyor also factors in to its efficiency, machinery can used to accurately measure such possibility**
- **Excel can be used to show simulation data reports or a unique cloud-based interface**
- **Data privacy is a safety issue with cloud-based services**
- **Target speeds are unique to different conveyor production lines, conveyor experts can analyse in-person and recommend solutions**
- **Companies and applications that provide unique optimization solutions to clients cost more then 100$**

3.3 Methods of Creating an Optimization Product:

Our product in the simplest form will require creating a basic software application that will obtain the user to input the filler speed and the application will output the desired conveyor speeds and yield. What the software specifically needs to compute is vague as seen in the design criteria above as the specifications for our calculated values and v-curve algorithm have not been provided yet.

The client was unclear whether he preferred a purely software application or specifically wanted a separate handheld device. Our team came upon creating an android application as a solution for both, as it can either just be installed on to the clients phone as a software-only product or a separate device could be purchased to install the software onto it to create a physical product.

A Windows application and a compiled MATLAB application are both desktop solutions. Although MATLAB-coder would allow a MATLAB application to be converted to an android application. Therefore using MATLAB is a highly customizable pathway for developing our solution.

Excel is an idea brought from Anylogic's method of reporting analytics. Excel is widely available, and good with displaying analytics and computing intricate algorithms. It can also be linked with MATLAB-spreadsheet to create better simulation graphics and increase its computing power.

Type of product	**Needs**	**Cost**
Windows desktop application	- Visual studio code - Win32 API - C++ (Kennedy 2021)	Open source (free)
Android application	- The Android Software Development Kit (SDK) - Java/Kotlin - Android device (Android 2023)	Android device >100$ SDK open source (free)
MATLAB application for desktop or android or excel	- MATLAB - MATLAB spreadsheet link (for excel) (Spreadsheet Link 2023) - MATLAB compiler (desktop application) (MATLAB Compiler 2023) - MATLAB coder (android converter) (MATLAB to iPhone and Android Made Easy 2023)	MATLAB (free university licence) MATLAB compiler ~4800$ MATLAB coder ~860$ MATLAB spreadsheet link ~49$(student fee)
Excel	- Microsoft 365 licence - Excel	Microsoft 365 licence (free university licences/ free to

		use web version)

Wrike Snapshot
https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=TeVh7BYUjPZIpWymI3fUyJIo6AprlUSJ%7CIE2DSNZVHA2DELSTGIYA

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