PROCESS AUTOMATION OF I/O DOCUMENTATION

Lai Zi Ying | De Cotta Stephanie Frances | Do Thi Minh Tam | Tan Jun Xiong Kerwin | Teo Jia Ying
Department Supervisor: Associate Professor Chai Kah Hin
Kongsberg Maritime Supervisor: Rakesh Sharma Parameswara, Bilal Ali Ahamed
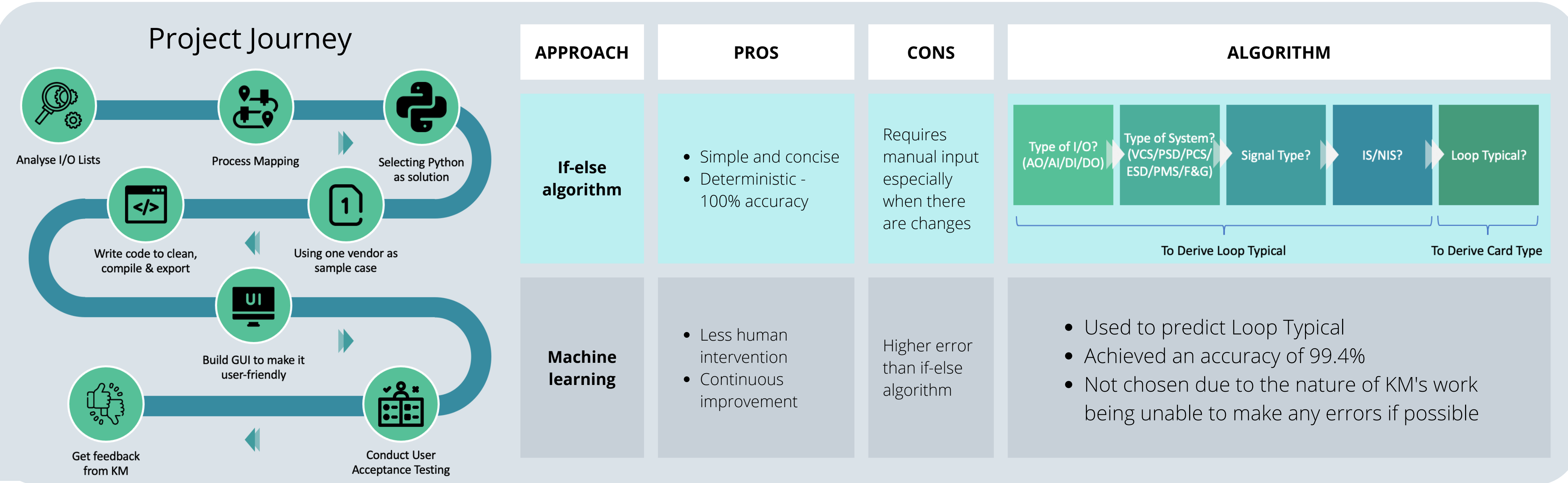
Problem Overview

Kongsberg Maritime (KM) receives multiple lists from different vendors and manually integrates the vendors' list into a standardised Master Input & Output (I/O) List before distributing it to the different departments. Due to the large amounts of data in a project, an average of 100 hours is taken to perform the integration and allocation of signals. Furthermore, manual integration potentially increases the amount of human-induced errors, adding unwanted time to the process for error correction.
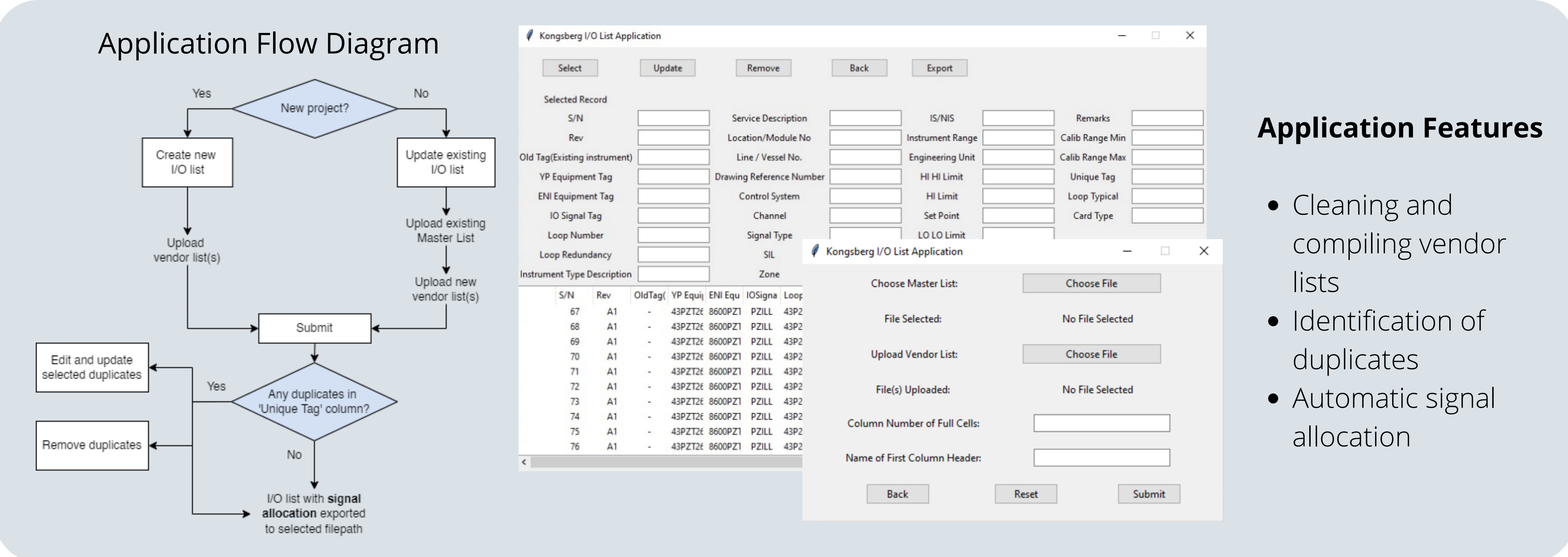
Objectives

Reduce the time required to document I/O list by:

1. Automating, executing and managing I/O documentation
2. Creating an user-friendly interface for a diverse group of end-users
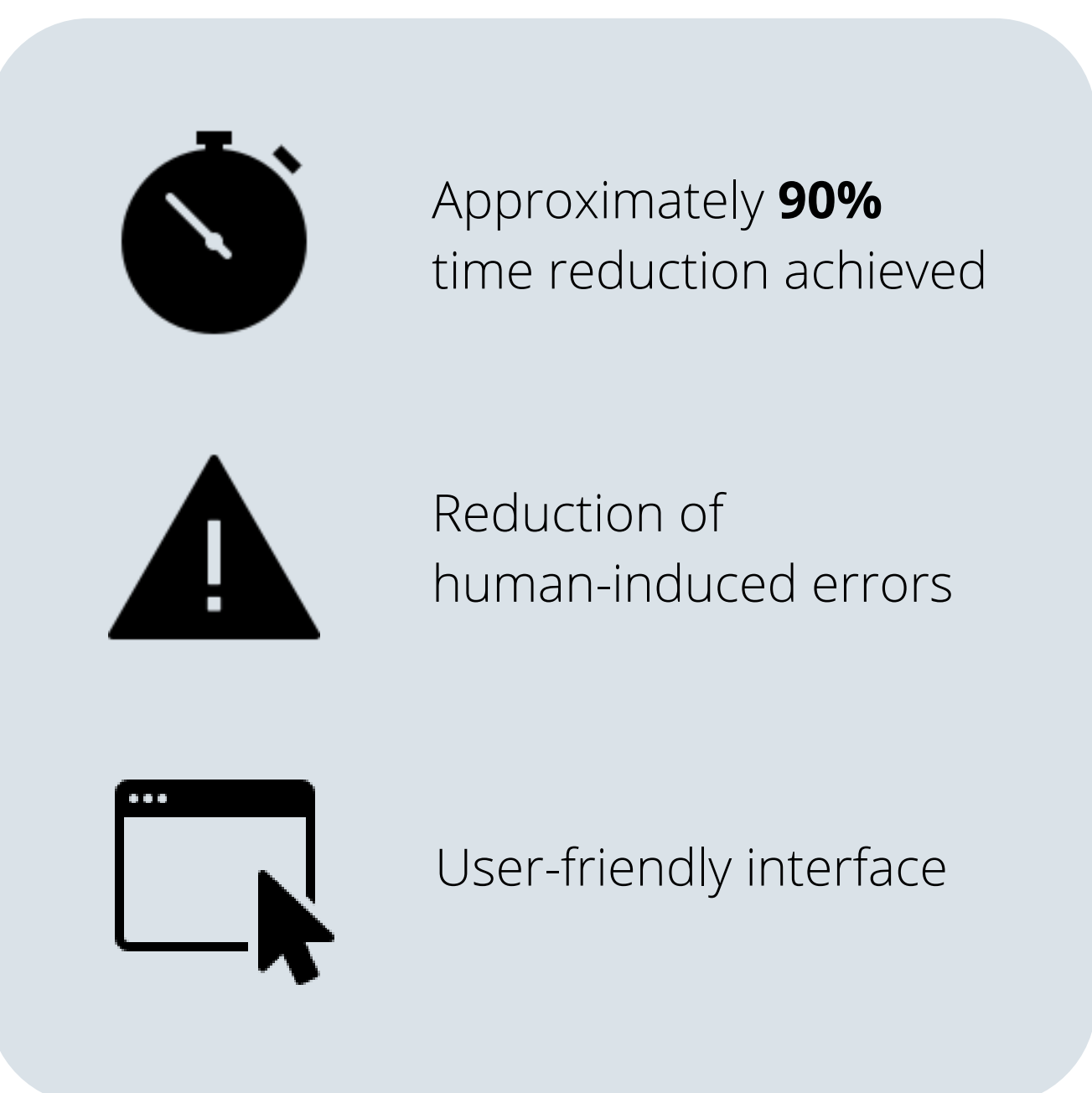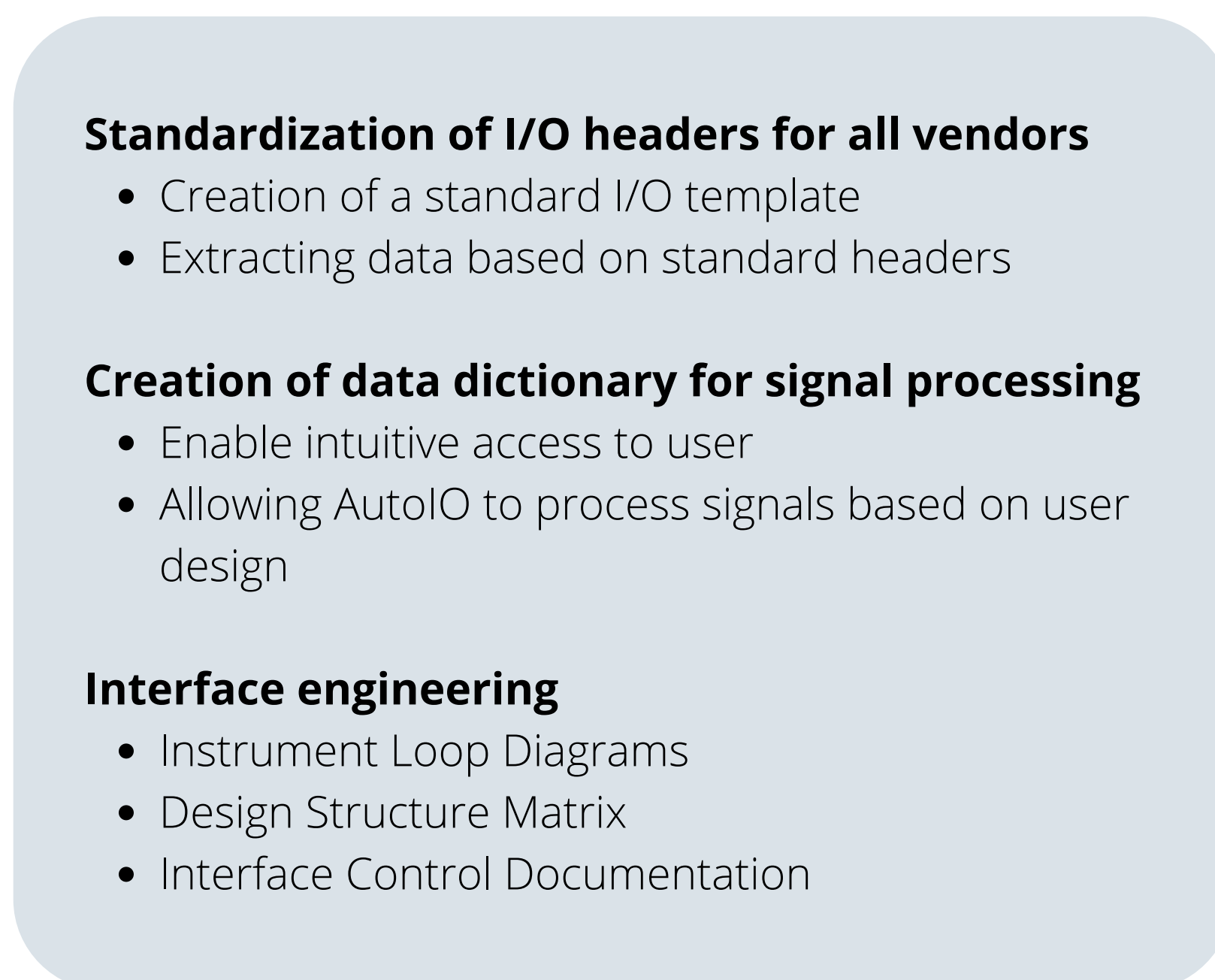3. Devising a highly reusable solution for different vendors

Methodology

Project Journey

- Analyse I/O Lists
- Process Mapping
- Selecting Python as solution
- Write code to clean, compile & export
- Using one vendor as sample case
- Build GUI to make it user-friendly
- Get feedback from KM
- Conduct User Acceptance Testing

APPROACH	PROS	CONS	ALGORITHM
If-else algorithm	• Simple and concise • Deterministic - 100% accuracy	Requires manual input especially when there are changes	Type of I/O? (AO/AI/DI/DO) → Type of System? (VCS/PSD/PCS/ESD/PMS/F&G) → Signal Type? → IS/NIS? → Loop Typical? (To Derive Loop Typical / To Derive Card Type)
Machine learning	• Less human intervention • Continuous improvement	Higher error than if-else algorithm	• Used to predict Loop Typical • Achieved an accuracy of 99.4% • Not chosen due to the nature of KM's work being unable to make any errors if possible

Proposed Solution - Graphical User Interface

Application Flow Diagram

Application Features

- Cleaning and compiling vendor lists
- Identification of duplicates
- Automatic signal allocation

Evaluations & Benefits

Approximately **90%** time reduction achieved

Reduction of human-induced errors

User-friendly interface

Future Directions

Standardization of I/O headers for all vendors
- Creation of a standard I/O template
- Extracting data based on standard headers

Creation of data dictionary for signal processing
- Enable intuitive access to user
- Allowing AutoIO to process signals based on user design

Interface engineering
- Instrument Loop Diagrams
- Design Structure Matrix
- Interface Control Documentation

Skillsets Acquired

Technical Skills
- Systems Thinking
- Process Analysis
- Python (Machine learning, Tkinter)
- Excel

Soft Skills
- Project Management
- Time Management
- Communication
- Teamwork
- Adaptability