This Capstone Design Project focused on reducing demurrage-related operational costs through the optimization of container inventory monitoring, operational visibility, and coordination activities within CBX Global logistics operations. The project was developed using the DMAIC methodology (Define, Measure, Analyze, Improve, and Control) to identify operational inefficiencies affecting container return coordination procedures, monitoring practices, and operational response times.

During the Define phase, the project team identified recurring operational delays associated with container return activities, limited operational visibility, inconsistent monitoring procedures, and communication inefficiencies affecting logistics coordination performance. Historical operational records provided by CBX Global demonstrated that approximately 91% of the evaluated containers presented delays, with an average excess retention time of 6.57 days and estimated demurrage-related operational costs totaling approximately $55,715. These historical records were utilized as operational references to understand previous operational conditions affecting container return activities.

The Measure phase focused on collecting and evaluating operational data to establish the primary project baseline and quantify process inefficiencies affecting logistics operations. During the operational observation period between December 22 and January 9, the Capstone project team collected operational data directly associated with container return coordination activities. The collected operational sample demonstrated that approximately 40% of the evaluated containers presented operational delays, with an average excess retention time of 1.68 days and associated demurrage-related operational costs totaling approximately $5,128.

During the Analyze phase, several Industrial Engineering tools and analytical methodologies were utilized to identify the root causes contributing to operational delays and process variability. Tools including Pareto Analysis, Fishbone Diagram, 5 Whys Analysis, Failure Mode and Effects Analysis (FMEA), and Value Stream Mapping (VSM) demonstrated that limited operational visibility, delayed follow-up activities, inconsistent monitoring procedures, and reactive operational coordination practices represented the primary contributors affecting operational efficiency and demurrage-related operational costs throughout logistics operations.

Based on the findings obtained during the analysis process, the Improve phase focused on the development and implementation of operational improvement strategies intended to improve operational visibility and strengthen monitoring efficiency throughout container inventory operations. One of the primary operational recommendations involved the implementation of a dashboard-based visual management system designed to support real-time monitoring activities, KPI visibility, and proactive operational coordination procedures.

Following the implementation period between April 27 and May 15, operational results demonstrated measurable improvements throughout container return operations. The

implementation stage demonstrated that delayed containers were reduced to approximately 9%, average excess retention time was reduced to 0.41 days, and estimated demurrage-related operational costs were reduced to approximately $1,846.

Finally, the Control phase focused on establishing monitoring strategies, KPI visibility procedures, standardized operational practices, and sustainability recommendations intended to maintain the operational improvements achieved throughout the project.

Overall, this Capstone Design Project demonstrated how Industrial Engineering methodologies and continuous improvement principles can be effectively applied to improve operational performance, strengthen operational visibility, reduce process variability, and minimize demurrage-related operational costs throughout logistics and transportation operations.