



GINA CODY
SCHOOL OF ENGINEERING
AND COMPUTER SCIENCE

Department of

INDU 490 Capstone Industrial Engineering Design Project

2020-2021



Highlights from
2021 include:

IMPROVING WAREHOUSE AND LOGISTICS OPERATIONS AT BRIGHT STAR CONSTRUCTION

INDU 490 CAPSTONE - PROJECT TEAM 1



PROBLEMS FACED

The company had a non-strategic way of storing products within the warehouse that led to long order picking times & manual assignment of trucks for the deliveries to customers which is not optimal & increases transportation costs

ANALYSIS CONDUCTED

Analyzed the current state of the storing and delivery processes and conducted important analyses such as ABC analysis and analysis of the daily deliveries in order to determine potential solutions to the problems faced.

SOLUTIONS IMPLEMENTED

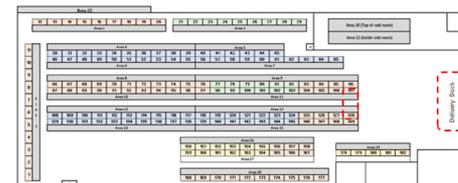
- **Fast Pick Area in the Warehouse:** Storing area located at an efficient location in the warehouse where fast-moving products are stored. Reduces order picking time but must be restocked.
- **Delivery Tool (using Excel, VBA and CPLEX)** to efficiently dispatch the trucks for daily deliveries in the most efficient manner while decreasing transportation and employee costs.



Presentation Page of the Delivery Tool

IMPROVEMENTS

Reduction in order picking time of approximately 6 working days per year. Automatic assignment of trucks, reducing transportation & employee costs.



Fast Pick Area Location in Bright Star's Warehouse

INDU CAPSTONE 2020-2021 PROJECT ARCTIC

Meet the Team



Farnaz Ghaenian Stephanie Di Micco Geordan Ferris Nada Kharrague Adrienne Richard Kimberly Richard

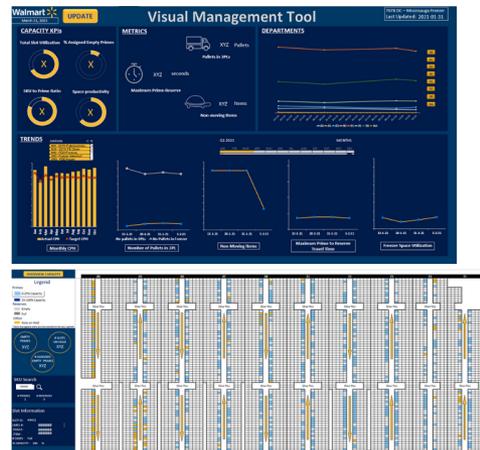
Challenge

- **Walmart Canada** has three large freezer distribution centres across the country
- Due to the growing demand of frozen items and the complexity of maintenance for perishable foods, Walmart explored the options of expanding the warehouse or building a new facility in the Mississauga region
- Through an in-depth capstone project analysis, **Industrial Engineering** tools and concepts were implemented to improve the current non-optimal operations, freezer capacity utilization and to increase visibility

Solution Package

The solution was provided in two distinct deliverables:

A **Visual Management Tool** was developed using **VBA coding** and **Power Query** to improve processes and decision making in order to highlight crucial information



Using **Operation Research** and **Mathematical Modeling**, assessments were made to provide an optimal storage configuration strategy

Objective Function
Minimize $\sum_j Y_j$

Constraints

$$\text{Subject to: } \sum_i X_{ij} = 1 \quad \forall i \in I$$

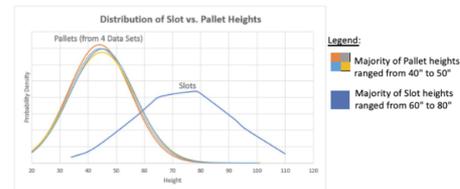
$$\sum_i X_{ij} \times H_i \leq C_j \times Y_j \quad \forall j \in J$$

$$\sum_i X_{ij} \geq Y_j \quad \forall j \in J$$

$$X_{ij} \leq Y_j \quad \forall j \in J, \forall i \in I$$

$$X_{ij} + X_{kj} \leq 1 \quad \forall j \in J, \forall i \in I, \forall k \in I \text{ such that } (i \neq k) \ \& \ (T_i \neq T_k)$$

$$X_{ij} \ \& \ Y_j \in \{0,1\} \quad \forall i \in I, \forall j \in J$$



Implementation

The project was implemented through two phases:

Phase 1 – Pilot implementation: Implementation in the Mississauga freezer for a two-month period as a proof of concept

Phase 2 – Expansion: Scaling and expansion to additional freezers sites in Canada, followed by warehouses across North America

“Really impressed with this capstone project and the partnership! The final recommendation has the potential to deliver great value to Walmart’s overall inventory management.” - **Jonathan Rodriguez, Manager of Logistics Engineering**

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