DALHOUSIE UNIVERSITY
FACULTY OF ENGINEERING
Department of Industrial Engineering

SPRING LOADED

Bracing for Change

INVENTORY PLANNING AND RISK MANAGEMENT WITH SPRING LOADED TECHNOLOGY

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1. BACKGROUND

- Spring Loaded Technology is a start-up company that manufactures bionic knee braces in Burnside, Nova Scotia
- There is a need to formalize many of their processes to prepare for scaled-up manufacturing as the company transitions to greater product sales
- The capstone project goal is to provide tools and recommendations that will enable evidence based decisions when developing policies

2. OBJECTIVES

A. Create a Return Merchandise Authorization (RMA) Traceability tool

B. Create a Risk Management guide

C. Develop an inventory management tool for steady-state demand

D. Develop an inventory forecasting tool for time-varying demand

3. RISK MANAGEMENT DELIVERABLES

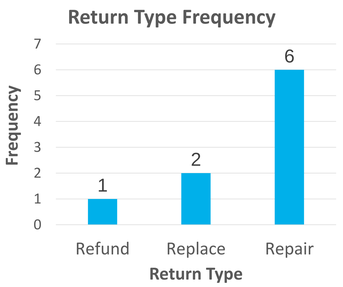
A. RMA Traceability Tool

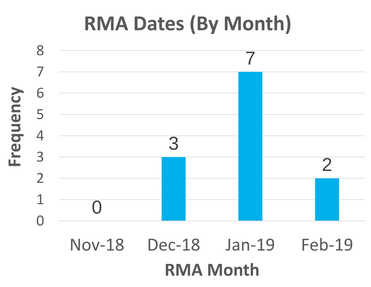
Input: RMA data from client Material Resource Planning (MRP) software

Output: Frequency graphs based on a user defined date range summarizing return types, return reasons, and total monthly RMA activities

Use Cases:

- Highlighting key reasons for brace returns to make product improvements
- Highlighting time periods for RMA activities to identify potential manufacturing or material lot defects





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B. Risk Management Guide

Input: Client-identified risks of interest (such as cash flow issues or inventory shortages)

Output: Risk management strategy

Use Case: Develop or update methods for managing risk and minimize the impact of the associated consequences

4. INVENTORY PLANNING DELIVERABLES

C. Steady-State Demand Inventory Forecasting Tool

Input: Desired capital as inventory or order period per supplier

Output: Exchange curve for user-selected supplier with resulting inventory costs and order period

Use Cases:

- Determining order quantity for coordinated orders from suppliers
- Deciding on an optimal order period for all suppliers given desired inventory limits
- Quantifying the impact of changes to order periods

Refresh

Select Supplier
EMJC

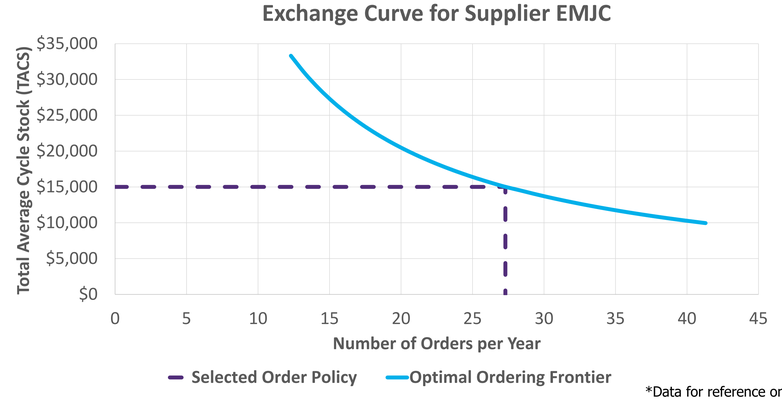
Add to Dashboard

Desired TACS
$ 15,000

Supplier Decision Dashboard

Supplier	Brace Cost %	Order Period	TACS*
ABCC	2.56%	53	$992.91
BLPSFRCS	0.47%	27	$501.79
DEFC	1.10%	63	$7,905.30
EMJC	5.77%	9	$15,008.78
		Grand Total:	$24,408.78

*Total Average Cycle Stock



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D. Time-Varying Demand Inventory Forecasting Tool

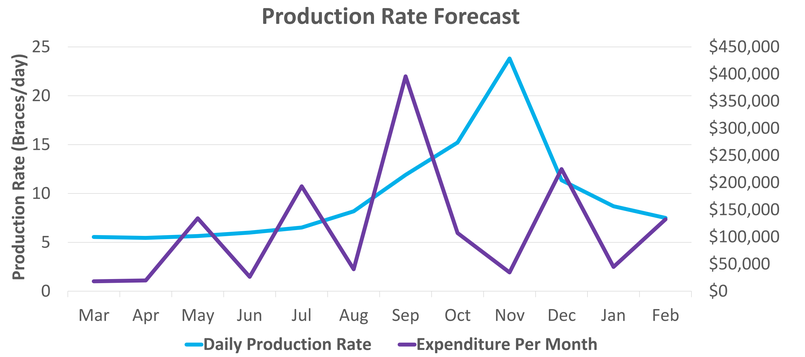
Input: Brace production forecast and order period per supplier (from Steady State Inventory Forecasting Tool)

Output: Total inventory expenditure per month

Use Case: Forecasting cash flow for future changes in production rates

Month	Production Forecast	Inventory Expenditure
March	100	$18,255.00
April	120	$19,904.84
May	130	$134,351.92
June	120	$26,554.58
July	150	$193,359.23
August	180	$40,481.16
September	250	$395,757.88
October	350	$107,245.86
November	500	$34,602.06
December	250	$224,865.88
January	200	$44,755.04
February	150	$132,486.77

Supplier	Brace Cost %	Order Period
ABCC	2.56%	65
CBSPSP	0.11%	20
DEFC	1.10%	25
EMJC	5.77%	30
FAC	3.23%	30
FSAT	0.25%	10
LEETPS	0.18%	8
MDPCJ	0.33%	20
MLRI	0.22%	15
MMC	1.80%	20
RWC	35.86%	25
SALT	0.62%	20



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5. COMPANY IMPACT

The following feedback was received from the client:

- The RMA tool will help identify trends in customer experience data that will help shape product designs to better facilitate customer needs
- The steady-state demand forecasting tool will help identify how much capital we are committing to inventory relative to time spent placing orders
  - This will help identify areas where we are over-committed, and potentially improve inventory turnover
- The time-varying demand forecasting tool helps us resolve the complicated question of "how much do we have to spend to make braces by what date"
  - This is important to know when to commit different levels of capital for parts with different lead times
  - This tool helps with our current design, and will self-adapt to future, more complex designs

6. CONCLUSION

The deliverables provided to Spring Loaded Technology will enable the company to perform detailed analysis of their inventory management and quality control procedures. The company will be able to position themselves to scale up production while managing cash flow and capital as inventory.

7. RECOMMENDATIONS

- Track defective parts and material lots in MRP software
- Implement risk management strategies
- Determine optimal ordering policies for all suppliers and coordinate orders
- Develop solutions to projected cash flow problems by adjusting ordering policies in the inventory forecasting tool