DYNAPLAS OPTIMAL INVENTORY SYSTEM DEVELOPMENT

Megan Maguire

Dynaplas Ltd, located in Scarborough, Ontario, is a plastics injection moulding company, which produces automotive components using engineered resins. The Engineering Department designs and builds injection moulds and tools for both internal use and commercial distribution. Dynaplas' automotive products include pulleys, connectors, seals, fuel systems, brake parts, and insert bearings. Recently, as part of a continuous improvement effort, Dynaplas examined trends in its customer orders over the last couple of years. They found that, on some occasions, parts were shipped out late and/or in poor condition, resulting in unnecessary and unforeseen costs. Therefore, the Engineering Department launched a project to develop an optimal inventory level prediction model, Figure 1, to ensure that every Dynaplas product is available in sufficient stock to guarantee customers receive quality parts, on time. To begin, all factors involved in developing the prediction model and user interface had to be identified [1].

Megan Maguire, a 3rd year Management Engineering co-op student from the University of Waterloo, was asked to develop an optimal inventory level prediction model. Her specific tasks include examining the steps required to develop a mathematical model and building a user interface to help implement the application.

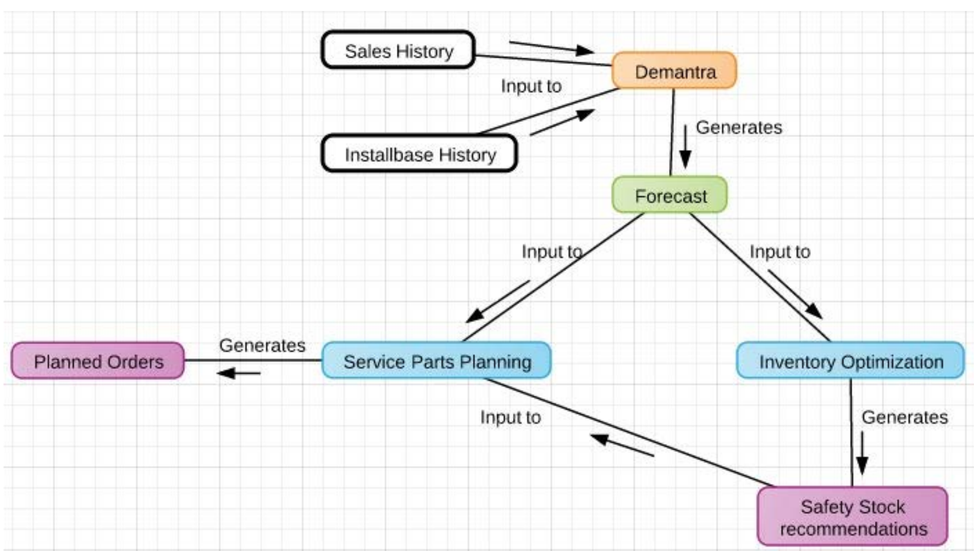

Figure 1: Inventory optimization approach [1]

Intended Learning Outcomes and Target Courses

The teaching objective of this case is to illustrate the application of Economic Order Quantity (EOQ) models to optimize inventory control using a quantitative approach. Therefore, the main expected learning outcome is for students to gain a firm grasp of mathematical modelling and formulations, and output analysis along with project management concepts. This case can serve as complementary material in Operations Planning and Inventory Control (MSCI 332) and Production and Service Operations Management (MSCI 432) courses. At the end of this case study, the student(s) will be able to:

- Generate a useful list of needs and functional requirements
- Justify the need for optimal inventory size and inventory level
- Generate a linear optimization model, perform basic project management, and demonstrate decision analysis.
- Identify and analyze conceptual solutions that meet the problem requirements and constraints
- Practice technical creativity while adhering to the design needs and requirements, as well as applicable standards

Organization of Case

Using this case study, different aspects of optimization techniques and applications can be discussed. Methods, such as integer optimization, dynamic programming, and heuristics are used to design alternatives solution for this Dynaplas Ltd problem. The following is a breakdown of the four parts of the case and gives brief details of the contents.

WCDE-00201-01 Case Study

This module constitutes the case itself and will present the problem description and background information about Dynaplas Ltd and Product & Service Optimization management. The module will have

- Opening paragraph
- Dynaplas Ltd and Project Background
- Data Collection and Considerations
- Problem Statement

WCDE-00201-02: Preliminary Analysis

This module will describe the constraints and criteria for the optimal inventory level prediction model. The module will include

- Requirements

- Constraints and Criteria
- Criteria Weighting and Bias Reduction

WCDE-00201-03: Solution Design

The module offers a conceptual layout solution for the given problem. Provided for each conceptual design is a description, comparison with criteria, benefits and drawbacks. The module will include

- Developing the Solution
- Forecasting
- Lot Size
- Safety Stock
- Developing the Interface

WCDE 00201-04: Implementation Aspects

This module provides some additional information and considerations for implementation. The module will include

- Model Output
- Acceptance Testing
- Future Procedures
- Identifying Savings

Data Included

- Figure 1 – Customer locations
- Figure 2: Forecasting variance BWI (Poland)
- Figure 3: Overall forecasting variability
- Figure 4: Actual and forecasted demand
- Figure 5: Bill of materials (setup Hrs)
- Figure 6: Demand and EOQ
- Figure 7: Main menu
- Figure 8: Miscellaneous parameters run size
- Figure 9: Inventory depletion long term
- Figure 10: Inventory depletion short term
- Figure 11: Model procedure
- Figure A--1: Forecasting variance TI group

- Figure A--2: Forecasting variance bosch
- Figure A--3: Demand, EOQ and safety stock
- Figure A--4: Scheduling run size
- Figure B--1: Interface settings
- Figure B--2: Variance report
- Figure B--3: Update complete
- Figure B--4: Item lookup prompt
- Figure B--5: Item lookup report
- Figure B--6: Recommendation lookup
- Figure B--7: Recommendation results
- Figure B--8: Error messages
- Table 1: Finished goods inventory
- Table 2: Accepting testing

Time Plan

Date	Step
March 03, 2014	Date you intend to submit the Case plan (step 2)
March 17, 2014	Receive feedback for your Case plan
April 07, 2014	Company agreement for you to use this material for educational purposes
April 28, 2014	Date you intend to submit the draft Case study (step 3)
May 12, 2014	Receive all external review comments on your case study
May 19, 2014	Date you intend to submit the final Case study (step 3) after reviewing the comments.
June 02, 2014	Date you intend to submit copyright license agreement and case release form

References

[1] Megan Maguire, "Manufacturing Success: Discovering the Optimal Inventory Level" 3B Work Term Report, Department of Management Sciences, University of Waterloo, Waterloo, ON Canada, June 21, 2012