



MIT SCALE RESEARCH REPORT

The MIT Global Supply Chain and Logistics Excellence (SCALE) Network is an international alliance of leading-edge research and education centers, dedicated to the development and dissemination of global innovation in supply chain and logistics.

The Global SCALE Network allows faculty, researchers, students, and affiliated companies from all six centers around the world to pool their expertise and collaborate on projects that will create supply chain and logistics innovations with global applications.

This reprint is intended to communicate research results of innovative supply chain research completed by faculty, researchers, and students of the Global SCALE Network, thereby contributing to the greater public knowledge about supply chains.

For more information, contact
MIT Global SCALE Network

Postal Address:

Massachusetts Institute of Technology 77
Massachusetts Avenue, Cambridge, MA 02139 (USA)

Location:

Building E40, Room 267
1 Amherst St.

Access:

Tel: +1 617-253-5320
Fax: +1 617-253-4560

Email: scale@mit.edu
Website: scale.mit.edu

Research Report: ZLC-2014-1

Replenishment Management of smaller outsourced markets for a pharmaceutical organization
Aditya Ganesh Viswanath and Alejandro Chaqués García

For Full Thesis Version Please Contact:

Marta Romero

ZLOG Director

Zaragoza Logistics Center (ZLC) Edificio

Náyade 5, C/Bari 55 – PLAZA 50197

Zaragoza, SPAIN

Email: mromero@zlc.edu.es

Telephone: +34 976 077 605

Replenishment Management of smaller outsourced markets for a pharmaceutical organization

By Aditya Ganesh Viswanath and Alejandro Chaqués García

Thesis Advisor: Prof. Richard Piebernik, Ph.D.

Summary: Our thesis proposes to answer two key questions, which are to determine the appropriate replenishment mode for a new or existing SKU and the means and ways to reduce the average inventory holding pattern at a Regional Logistics Center (RLC) for common labels packs.



Aditya Ganesh Viswanath
Bachelor of Technology in Chemical Engineering,

National Institute of Technology Rourkela, India

Assistant Manager,
ITC Limited



Alejandro Chaqués García
Bachelor of Mechanical Engineering,
Polytechnic University of Valencia, Spain

Bachelor of Mechanical Engineering,
Hanze University of Applied Sciences, the Netherlands

KEY INSIGHTS

1. Growth by M&As has also led to existence of a range of replenishment processes for the sponsor organization
2. Creating a database about information related to supply chain models aids in identifying the most optimum model for a given condition
3. Country wise reservation of stocks has led to excess inventories and undesired obsolescence

Introduction

The Supply Chain models of a major pharmaceutical company have seen increased complexities emanating from numerous acquisitions in the recent years. Apart from expansion of the product portfolio these M&As have also led to the existence of a range of replenishment processes. While some of these processes have historically been a part of the original company suited specifically to each market, a significant number have also been inherited from the acquired company.

This has led to existence of numerous processes, which are often difficult to understand in the context of the real world and also a multiplicity of processes in the same market as a result of the company's growth strategy. This has had detrimental consequences in terms of detailed process knowledge, service levels, process resilience, complexity, and resource requirements at the hub and plants. One such process has been chosen for further research as part of this thesis. Through this project, the authors aim to provide the stakeholders with the following contribution:

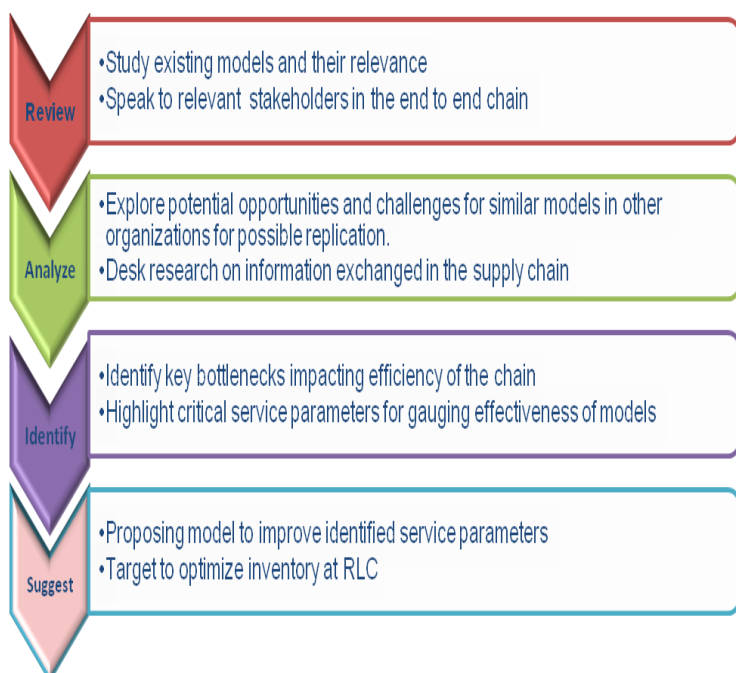
- *Evaluation of supply chains*

The activity will trace the flow of information across the whole chain and is expected to contribute by suggesting steps that will negate the existing inefficiencies in the process. This step is all the more important in the absence (till the time of writing this document) of a centralized information repository in the sponsoring organization to create a readily accessible pool of information.

- *Monitoring of Inventory Models*
Understanding the philosophy driving the inventory ordering processes in the supply chain will help to remove any anomalies in the procedure adopted by the different markets and also help in identifying and removing any excess stocks being ordered or stocked at any point in the supply chain.
- *Developing a Criteria for evaluation*
The methodology developed will identify the factors leading to the occurrence of disruptions in the system with respect to stock keeping and aim to provide the business with a clear methodology and strategy to be adopted for replenishment in markets.

Approach

To achieve the targeted objectives of the thesis the current replenishment methodology and their alternatives will be evaluated in terms of certain key characteristics, which shall have to be identified. The general approach towards fulfilling the stated milestones can be listed in the manner shown below.



Product Labeling

The pharmaceutical industry in general follows a practice of differentiating the SKUs by the packaging adopted for each of them. The packaging is usually differentiated by kind of labels used on them. However, there are many other decision variables. Some of the important ones are:

- Regulations
- Political Issues
- Language uses
- Potential Market Size
- ERP Interface

Depending upon the above, the products are labeled. Some of the most popularly used labels are common label packs, multilingual label packs and multiregional label packs.

Supply Chain Models

In a multi-facility supply chain, a critical tactical decision involves the identification of appropriate inventory strategies at each of the stocking points. In the context of our thesis, we have two important stocking points. These are the markets and the RLC. The plant ideally does not hold any finished goods inventory and ships all the manufactured/finished goods to the RLC. This is not true for all situations, and in some cases, the plant can be in direct contact with the markets and then ship the produced quantity directly to the markets. Hence, there can be situations when a product experiences a single model in the whole process while another product can experience a combination of models as it moves from the plant to the markets.

The label packs can employ either a single or combination of three models depending upon the pack style. The sponsor organization uses primarily three main supply chain models. These models are supply to order, make to order and continuous replenishment of an (r, nQ) variety where if the inventory position reaches the order point r , an order is placed equal to the smallest multiple of Q that raises the inventory position above r .

Analysis of the current state

For most of the SKUs the Plants manufacture the stock based on agreements with the Distribution Center in terms of minimum and maximum inventory at the DC and the forecasted demand. The stock will stay at the DC until a Market places and order. The stock follows a reservation process for which specific units are reserved for specific markets; therefore, the assignment does not follow a pure First In, First Out process. The stock may also be removed from the DC if it becomes obsolete for being too old to be accepted by the Markets.

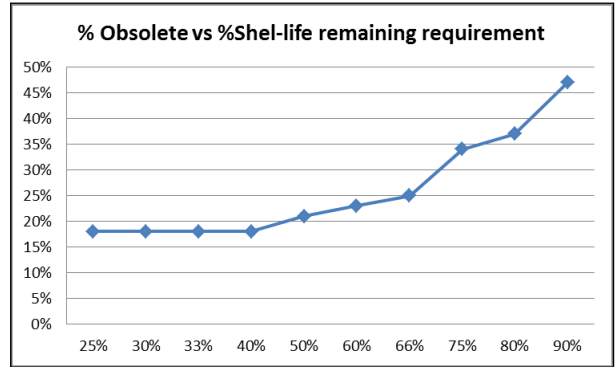
The data provided by the company was characterized by:

- High forecast error
- High obsolescence
- Plant-DC agreed inventory levels not consistent with demand and shelf-life

Our first step in order to evaluate the different replenishment models was to analyze where the current model could be improved. This was done for two reasons. First, to properly compare different models we had to consider a greenfield scenario, and second because some of this products might be already following the best model with non-optimal parameters.

Using the historical sales data, by destination Market and by SKU we tried to find a better forecast than the one currently used by the company. Due to the intermittent demand Croston's method showed the best results, but it was not consistently better than the one provided by the sponsor organization; therefore, it was its forecast the one used for further analysis.

Using a snapshot of the inventory levels, we calculated the expected obsolescence for different shelf-life requirements from the customers. Being 75% the most common requirement, we can see in the following table that it means 34% of the current stock will become obsolete.



Making the same analysis for a situation without reservation, we found that the percentage of obsolete products drops to 27%.

The study of the supply chain agreements showed that in many cases the minimum batch size produced by the plants is by far greater than the expected demand during the time the sponsor organization has to supply the product, without considering the previous stock the DC may hold from previous batches. In some cases, the demand was so low and intermittent that the plant produced only to replace obsolete products, without any product being distributed to the markets.

Product Categorization

In order to decide what products require a more thorough analysis, we graded each SKU/Country combination on the basis of manufacturing flexibility (monthly forecasted demand divided minimum lot size), forecasting accuracy, and usable shelf life: batch size ratio and ordering frequency/year, giving them punctuation depending on those factors.

Forecast Error(MAPE)	
Range	Category
0-20%	1
21%-80%	2
81%+	3

Manufacturing Flexibility	
Range	Category
0-.09	3
0.09-0.5	2
0.5+	1

Usable Shelf Life: Batch Size	
Range	Category
<0.5	3
0.5-1.5	2
1.5+	1

Ordering Frequency/year	
Range	Rating
<=4	3
05-9	2
>=9	1

The product of this factors gives categorizes the products as A, B or C, being C the ones that require most attention.

Range	Rating
<=20	A
21-40	B
>=41	C

Replenishment Policy Framework

We have also proposed a generic model for use by the sponsor organization across products and geographies. Depending on the characteristics of the SKU and the markets different replenishment policies need to be used. The variables to characterize the replenishment policy have to be:

- Stable in time: They have to remain constant for long periods of time. Variables like current inventory can drastically change one day to another when shipping or receiving stock.
- Not affected by the change of replenishment model: If the changes on replenishment model had a feedback on the model decision.

Recommendations

- Use the replenishment policy framework to decide how new SKUs should be replenished, and the product categorization to decide what current SKUs require a revision of the replenishment policy.
- When possible, renegotiate the agreements with the plants, trying to have a better match of production sizes and demand.
- Work with the customers to gain visibility to improve the forecast or negotiate contracts that would smooth the demand.

