How to manage and improve inventory control

– A study at AB Ph Nederman for products with different demand patterns

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The article is based on a study at AB Ph Nederman & Co in Helsingborg. The purpose of the master thesis was to improve the inventory control at Nederman by lowering the stock level after a specific service level. This was done by two focuses. The first one was to find ways to divide the products in different classifications based on their demand pattern and the second focus was to find a way to control these classifications. To be able to meet the purpose, an analysis was made to find the different demand pattern, create a model that divided the products into the different patterns, and implement the new solution in the inventory system.

Background

AB Ph Nederman & Co is a global company that develops, produces and sells systems for improving the safety and working conditions in factories and other facilities. The company was founded in 1944 in Helsingborg, Sweden, by Philip Nederman. He had seen the health risk in the manufacturing industry and started to sell ventilations fans.[1] Today the company is world leading in industrial air filtration and has a complete range of products for creating entire customized systems[2]. In the last years has the product range increased continuously and Nederman is now having difficulties to control the stock- and service level for the products with their current inventory system, which creates a need for a new and more sophisticated one.

Inventory management is a very old concept that was first used in the beginning of the 20th century and many of the theories that are still used in the industry today were during this time. The main different is today's advanced computer system that enables much better way of controlling products on an individual level.[3] The downside with these new systems is that they can be very expensive and to be able to justify the investment of a system, companies need to ensure that they uses all features and functions to obtain the full potential from the programs.

The decision to invest in such a system or not, is something that many companies, including Nederman, is facing today and in the near future.

The existing inventory control system at Nederman is perceived as a quite blunt system and they are using a replenishment system with predetermined order sizes that are refilled based on a reordering point. The reordering is based on the safety stock and the demand during the lead time.[4]

All products that are classified as stock items are controlled in the same way and they are divided in two groups, purchased and manufactured.[5]

Each group is represented by a matrix based on frequency and item value, creating a matrix

[1] Nederman Company History, 2010.
[2] Nederman, 2012, *Nedermans Homepage.*
[3] S Axsäter, *Inventory Control,* 2006, p. 1
[4] Erik Blix, Plant Manager interview, 2012, 01 19.
[5] Ibid.

with 35 cells where the products are distributed based on their specific properties. Every cell contains a value that is representing a certain amount of safety days. These matrices are called SS-Bas matrices and the value in every cell is called SS-bas which is the number that gives the base of the safety stock. Every cell contains a group of products that are given the same amount of safety days and from there an individual safety stock based on the formula

$$SS = SS - bas * \sqrt{\frac{LT}{30}} * \frac{D}{365}.$$[6]

Problem statement

The existing system with SS-bas is as earlier mentioned perceived as quite blunt among the employees at Nederman. And there is a belief among the management team that a new dimension in terms of demand pattern can be added to the existing system. This would create a more flexible tool for controlling the products.

In order to improve the inventory control Nederman needs to lower the stock levels and increase their service level and they believe that a change is needed in order to reach any improvements.

This creates the quite clear problem statement:

> "Find a way to divide the products into different classifications based on their demand pattern in order to improve the inventory control."

And in order to make improvements the second focus will be:

> "Finding ways to control the different classifications that will lead to improvements on stock levels given a certain service level."

The purpose of this master thesis is therefore to improve the inventory control at Nederman by lowering the stock level given the goal of the service level.

[6] Erik Blix, Plant Manager, interview 2012, 01 19.

Methodology

This master thesis has been conducted with a systems approach. In order to manage and improve the inventory control with focus on a few activities the whole system needs to be taken into consideration and many logistic problems has been described by the systems approach.[7] The systems approach has a more analytical focus since there are a lot of numerical data to analyze. How the employees interact and thereby affect the outcome and result is interesting but have not been taken into consideration in the scope of this master thesis. Therefore a systems approach with an analytic focus has been used throughout the thesis.

Since there is a good theoretical knowledge in the subject the focus has been to guide and propose actions for the company. This approach is called normative[8] and has therefore guided the authors through the master thesis.

The characteristics of the master thesis made abduction[9] the best approach method. The authors have used a theoretical start point and from there moved back and forth between the theory and practice in order to validate empirical findings with theory before implementing a suggestion.

There has been a combination of quantitative and qualitative analysis in this master thesis.[10]

[7] B Gammelgaard, 'Schools in logistics research? A methodological framework for analysis of the dicipline', *International journal of Physical Distribution & Logistic Management,* vol 34, No 6, 2004, pp 479-491.

[8] M Björklund & U Paulsson, *Seminarieboken – att skriva, presentera och opponera,* 2003, p. 58.

[9] G Kovács & K Spens, (2005),"Abductive reasoning in logistics research", *International Journal of Physical Distribution & Logistics Management*, Vol. 35 Iss: 2 pp. 132 – 144.

[10] M Björklund & U Paulsson, *Seminarieboken – att skriva, presentera och opponera,* 2003, p. 63.

The amount of numerical data needed has put the focus on quantitative analysis that has been supported by qualitative analysis.

The data used in the master thesis is a combination of primary and secondary data.[11] The majority of the data has been collected from databases and to reach a deeper understanding interviews have been performed throughout the process. Literature has been used to support theories and all data has been collected carefully to ensure high credibility[12]. The same data has been collected several times and everything has been validated with different employees at Nederman.

Theoretical framework

The theory used in the study is mainly covering three different areas; How to determine demand pattern, forecasting methods and replenishment systems. The theory mostly used throughout the analysis is the different methods of finding and dividing products according to their demand pattern and the theory covering the area of replenishment systems.

Frequency, standard deviation and coefficient of variance[13] are the three theoretical tools mostly used in the analysis to track and divide the products in different demand pattern. The theory that was mostly use for looking at the replenishment systems was (R,Q)-systems[14], reordering points and $SERV_1$.

[11] M Björklund, U Paulsson, *Seminarieboken*, 2012, p. 68.
[12] M Björklund, U Paulsson, *Seminarieboken*, 2012, p. 59-62.
[13] A Norrman, lecture notes - project in logistics (MTTN15), 2011 p. 50-51.v
[14] S Axsäter, *Lagerstyrning*, 1991, p. 42.

Analysis

The analysis was separated in several different parts, which all contributes to the conclusions in different ways. During this part of the master thesis the entire process from raw data until implementation of the new matrices was done. The first step was the current state analysis, which gave an overview how Nederman is working today and how the current system is managed.

The next step was to determine the demand pattern for the products. By using historical data for all products, calculating the coefficient of variance, the weekly demand and frequency, four different demand patterns was found amongst the articles, along with products suitable for make or purchase towards customer order and these were; stable, variable, lumpy and peaks.

The third step in the analysis was to set the limits between the different groups, and from there divide all products into different demand pattern. After several test the limits was set, and seven new matrixes was made, four for purchased, and three manufactured. The purchased articles contained all four demand pattern, and the manufactured contain all, except from the lumpy since those products had more characteristics of make to order products than make to stock.

When the products were divided into the seven matrices, the process of creating the new start values for the matrices started. The calculations ended up in two different options to set the start values, one method after the theory, and one more adapted to the current system at Nederman. The authors together with the supervisors at Nederman decided to continue working with alternative 2, and therefore drop alternative 1 since the first option was not in line with the master thesis purpose, proving that demand pattern was a

good way of dividing products. Using alterative 2, and instead using the current SS-bas as an index for the new model, made it possible to prove that the possible improvements are a result of the new dimension.

The last step of the analysis was to implement the new matrices in the current system. After calculating the entire new solutions safety stock, the decision now was how many of the products that were to be included in the implementation. After discussion with Nederman, a decision of implementing the new solution on 20 % of the analyzed products was made.

The product range was divided into five different random groups, and one of these groups was selected, also randomly, to use the new solution. The implementation was made on the 21st of March and the monitoring of the service level started the 30th of March and ended the 21st of May. The implementation showed that all the five groups maintained the same service level, showing that the new solution, with the seven matrices, could keep the current service level and, if fully implemented, it would cause a stock level decrease of 0.9 million SEK, with other words 8 % of the safety stock value.

Conclusions and recommendations

The master thesis came to the conclusions that adding a new dimension to the current inventory control system at Nederman will lead to a possibility to lower the stock level and maintain the current service level. This conclusion reflected the problem statement in a good way, and followed the purpose in one of two aspects. The stock level was decreased, but the service level maintained the same level, not increased as stated in the purpose.

The academic contribution from the report was divided in three different parts. The first one was that the master thesis established further that it is possible to use coefficient of variance to separate very variable products. The master thesis further shows that the limits between the different demand patterns are highly individually for companies, and should be fully adapted to the specific company's product range and needs. And the third thing that also was shown in the thesis was the way to use demand pattern to control products.

The recommendation to Nederman was that the master thesis has showed that the new model would make improvements on the inventory control and if Nederman wishes to fully implement the suggested system and believes that this will be sufficient for the near future the following actions are recommended for the new model.

- Use the guidelines for make to order in order to separate the stock items from the products more suitable for make or purchased to order.
- Change the two matrices to the seven matrices developed during the master thesis.
- Update the demand pattern for all products every 4 months and allocate them into the matrices.
- Keep working on the SS-bas values in the different cells and matrices by doing regular changes according to monitored service levels to find additional savings in stock level with a maintained service level.

It is also suggested that Nederman, in order to reach a better service level and keep lowering the safety stock value, has a need for an even more sophisticated system that is optimizing everything on a product level and that this should be taken into consideration.

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