UNIVERSITY OF TWENTE.

"Improving the phasing in and out process at COMPANY X"

Master Thesis
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MANAGEMENT SUMMARY

This research is performed at Company X, located in Place Y. Company X is the world market leader in Product Z, most commonly known in the Netherlands under a sub brand, and a major manufacturer of W products. Company X had a revenue and net income of respectively more than $2 Billion and more than $100 Million in 2014. As a starting point of this master thesis, Company X has stated that it does not excel at phasing in new products and phasing out old product inventories, and are looking to improve the efficiency of their inventory. Therefore, we formulate the following research question:

> *"How can Company X improve their phasing in and out process to decrease the obsolete costs of the inventory of their make to stock items of the Z products at the distribution center while achieving the target service levels?"*

To start answering this question, the current phasing in and out process is analyzed to identify potential problems. During the problem identification the major contributors to the obsolete costs are identified using the total financial reservations made for these costs. This analysis shows that the reservation of €6 Million for Product Z is 79% of the total reservations made and that this value is made up for 83% by three product lines. Next to that, the major contributor to the financial reservations are make to stock items. The factors that cause the high obsolete costs are identified and fall in three categories, namely: a high minimum order quantity, faulty (production/purchase) orders, and wrong (delayed) start of the phasing out process.

Then, a literature review is performed to create an understanding of ways to tackle these problems. In the literature, it is stated that when inventory has the potential to suddenly become obsolete, traditional inventory analysis is rendered unsuitable for balancing reordering costs with costs of overstocking. The literature shows that when the number of weeks since the last obsolescence (in the case of recurring obsolescence) of a product increases, the optimal order quantity decreases. Next to that, according to the literature, when in the presence of an optimal inventory policy, the order-up-to levels increase at a decreasing rate when the mean lead time rises. These theoretical results do not only enforce the benefits of reduced lead times but also that the obsolescence factor should be significant in inventory management decisions. Finally, if a sudden change in demand rate can be foreseen, timely adaption of the order-up-to levels is crucial for optimal stock control. Adapting to a drop in demand is difficult since natural attrition of excess stocks depends on the demand process. Even if the timing and the size of the drop are known exactly, when to change the inventory control policy to minimize obsolete stocks without staking availability remains a challenging question. In the literature, it is shown that changing the policy in advance instead of immediately after the drop in demand results in significant cost savings.

According to the theoretical statements, we are led to believe that lowering the minimum order quantity in the prospect of a drop in demand rate has a positive influence on obsolete stock and thus costs. We have formulated the following proposition to research this assumption:

> *"Lowering the minimum order quantity of an article when there is evidence that the article is at the end of its lifecycle has a positive influence on the resulting obsolete value which is greater than the increase in total value bought of the article during its lifecycle."*

The proposition is tested with a simulation study, using Microsoft Excel with Visual Basic for Applications, of 14 make to stock articles from the three major product lines, that are mentioned above. The 210 experiments per article are based on two factors. The first factor is the number of order lines of the previous 365 days of an article; used to determine when to lower the minimum order quantity. The second is the minimum order quantity factor; used to determine with which factor the minimum order quantity should be lowered.

The results of the simulation study show that lowering the minimum order quantity of an article when there is evidence that the article is at the end of its lifecycle has a positive influence on the resulting obsolete value which is greater than the increase in total value bought of the article during its lifecycle, for all but one article. Next to that, on average no increase in the total value bought during the total lifecycle of an article has occurred. This means that the proposition is not rejected based on the empirical research. On average over the 14 simulated articles, switching when the total order lines drop below 15 per year, and ordering 40% of the original minimum order quantity results in in an average decrease of 28% in obsolete costs. This in comparison when using the optimal setting for each article, which results in an average decrease of 58%. Based on the simulation study, however, no generic tool could be generated to help Company X determine when to switch to a lower minimum order quantity and what this lower quantity should be.

These results are based on the difference between the obsolete costs of simulations with and without lowering the minimum order quantity, which is different from the obsolete costs that occurred in practice, which leads to the following point. The results of the simulation study shows that following the rules of the (r, q) policy, ordering a quantity q when the inventory level drops below a reorder point r, has a significant positive effect on both the obsolete costs and total value bought. It is remarkable that although Company X says they use this policy for the reorder point controlled articles, Company X does not follow this strategy. The results show that when strictly following the (r, q) policy, the obsolete costs can be reduced up to 50%.

The actual total obsolete costs made for the Product Z in 2015 was almost 1.4 Million euros. This means that by following the strategy of Company X, almost €700,000 can be saved on a yearly basis. These cost savings excludes the savings that can be made by lowering the minimum order quantities, which is an additional €200,000.

Further recommendations are change the way the reorder points are calculated to cope with the variability of uncertain demand, reducing the opening stocks of new articles to lower the risk of obsolescence during phasing in, monitor the end date of collections and articles to make sure that the phasing out process is started on time, presenting the initial information of an article from the ‘request for finished product’ form in SAP, engage in delaying the customer order decoupling point strategies, and improving the SAP transaction that filters production/purchase orders to reduce errors.