THE GENESIS OF GENIUS

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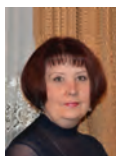
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LOGISTICS

DETERMINING THE OPTIMAL LEVEL OF PRODUCT AVAILABILITY ACCORDING TO THE PRODUCT LIFE CYCLE

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An abstract

The project proposal of the research is devoted to examining the level of logistics service according to the present context of the company and product life cycle. The problem of the paper is based on the phenomenon that companies do not estimate accurate logistics costs and stage of product life cycle for meeting it. The research is focused not so much on studying types of logistics services but rather on determining the level of logistics service in terms of costs and product availability. The aim of the project is to find the optimal level of logistics service for the particular stage of product life cycle.

Background of the study

Logistics might be recognized as a key factor of the company's success. There is currently growing concern for making logistics operations more effective and profitable for the company. To achieve this, a company should function as one organism by developing corporate strategy and several sub-strategies for each department. The main barrier is the difficulty of formulating flexible strategies that can be modified in accordance with market changes. It should be admitted that the company's success on the market is strongly interconnected with demand and amount of purchases made by customers. Thus, logistic service determines demand changes and consumer requirements. However, a manager should also take into account costs for providing customers with goods (Chopra, 2010).

Numerous companies face difficulties in reaching sufficient results in their activity and one of them is uncertainty of demand. Needless to say, that the problem of estimating demand for the highest company's productivity has been repeatedly addressed by renowned scholars. It appears that the most challenging task is estimating the future demand and, consequently, the size of the order that will be appropriate for sufficing consumers' requests and making the company hold stronger positions.

Therefore, the issue of providing customers with needed amount of products is said to be paramount for all those engaged in achieving the highest level of product availability - that is a number of products available for purchase at any given time (Bruno and Vilcassim, 2008). Nevertheless, while this problem arouses a great deal of debate, Russian reality shows that meeting consumer demand is not of top priority and methods of making business more effective are underused.

The problem statement

All of the aforesaid highlights the ambiguity of the common situation on the market and importance of studying consumer demand more closely to estimate needed rates of orders. So, the most essential problem is to assess appropriate level of logistic services for matching demand and supply with lower cost and with most available satisfaction of both sides of the deal.

Section

1

The working hypothesis of this project is the assumption that the level of product availability should be changed throughout fluctuations of consumer demand at different stages of product life cycle in order to support the company's competitiveness and to follow the corporate strategies.

In this project the emphasis is not so much on types of logistic services but rather on determining the optimal level of products available for consumers in the company.

Professional significance

In terms of novelty of the present study, it is essential to make reference to the fact that despite the considerable research in spheres of marketing and logistics takes place, the scientific environment lacks papers devoted to interconnection of these sides of business in consideration of costs. Consequently, this work is believed to deepen the theoretical knowledge and to explain the ways of practical appliance of the Sunil Chopra's conception. Therefore, the major purpose of this research is to explore the optimal level of product availability that depends on current limitations of consumer demand. Achieving the purpose of the project intends completion of the range of tasks. One of the objectives is devoted to explicit explanation of product availability importance for the company and main results that it can help to achieve for the company. The next step of the project is to examine in more depth factors influencing the product availability level and ways of estimating them. The third objective is targeted on listing approaches that improve supply chain profitability by acquiring more appropriate level of product availability. Finally, the methodology of finding the optimal level of product availability will be introduced and clarified. In conclusion, it is extremely important to scrutinize the optimal level of product availability regarding achieving accordance of demand and supply including costs carried by the company.

Literature review

Principally, the research is conducted in terms of methodology of Sunil Chopra, a professor of Operations Management. That approach serves for analyzing product availability (Chopra, 2010). Consequently, the literature review is preferably to be started with the demonstrating his crucial concepts. The punch line of Chopra's approach is defined as requiring product availability to be evaluated in the context of costs and profits which can be generated by a certain level of products available. Thus, to accomplish the needed amount of orders managers should take into consideration factors that reduce the effect

of firm's operating. These elements are costs (Chopra, 2010). Therefore, better functioning of the company depends on reaching balance between the level of availability and the costs. Undoubtedly, this is one of the most difficult parts of planning in the company because demand also should be taken into account and estimated very accurately.

Consumers' behavior on the market establishes demand and, consequently, is significant for the company. As Su and Zhang claim, customers will patronize a firm only in case of being assured of finding in stock what they are looking for (Su and Zhang, 2009). Otherwise, customers according to their common type of behavior can go to another store for purchasing. Actually, statistics illustrates that 21–43 percent of consumers faced with a stock-out will not wait for replenishment actions (Chiang, 2010). All of these favors the Chopra's point of view about the demand and the amount of provided evidence is enough for accepting the proposition of analysis importance.

Evidently, the essence of methodology supported by Chopra is that overstocking and understocking costs have a crucial impact on product availability. The first type of costs is loss incurred by a firm for each unsold unit at the end of the selling season. As for the cost of understocking, it is the margin lost by a firm for each lost sale because there is no inventory on hand (Chopra, 2010). It is worth mentioning that this theory did not have sufficient practical implementation despite the evidence that the level of availability of goods is a key factor in the profitability of the company (Conlon and Mortimer, 2010).

In one the latest study the group of scholars (Fukushige, Yamamoto and Umeda) proposed that depending on the situation, in which the company finds itself, there are various methods for estimating the optimal order quantity of the goods. However, in any case, the decision will depend on the Cycle Service Level (CSL), which determines the magnitude of the deficit of the goods within the period of planning (Fukushige,

Yamamoto and Umeda, 2012). This claim is very challenging and highlights the interdependence of different sites of businesses.

Besides, achieving highest results by a company may be implemented by means of increasing effectiveness of criteria influencing profit margin. Chopra identifies the ways of improving supply chain profitability. The author argues that there are three managerial levers of advance: increasing salvage value of each unit, decrease the margin lost from stock out or reducing demand uncertainty. The latter can be accomplished via the following means (Chopra, 2010):

1. Improving forecasting;
2. Applying quick response program;
3. Introducing postponement in production;
4. Tailoring sourcing.

Thus, the optimal level of product availability is one that maximizes supply chain profitability.

Methodology

This part of the proposal examine in some detail the method used in carrying out the study. The way to achieve the set aim is based on quantitative research, offered by Sunil Chopra. This method is reposed on calculation of the optimal cycle service level (CSL) and appropriate order size (O) for a company. From documents concerning distributive transactions and financial reports the information concerning fixed costs associated with each order, replenishment lot size (Q), average demand per unit time (D), standard deviation of demand per unit, retail price, unit cost, reorder point, safety inventory, cost of holding one unit for one unit of time (H) will be collected.

The analysis of the case when demand during stock out is lost assumes that demand arising when product is out of stock is not answered. Consequently, minimizing costs does not become equivalent to maximizing profits. Moreover this method is appropriate in the context of normally distributed demand.

Firstly, the optimal cycle service level is given

as CSL*= 1 - $\dfrac{HQ}{HQ - DCu}$

Secondly, with the help of Excel's formulas the optimal order size will be find as O* = NORMINV (CSL*, μ, σ), where μ – mathematical expectation, σ – standard deviation.

Then, using the formula of expected profit (π) it becomes possible to evaluate the results of using this method (Chopra, 2010).

π=(p-s) × μ × NORMDIST((O*-μ)/σ,0,1,1) – (p-s)×σ× NORMDIST ((O*-μ)/σ,0,1,0)-O*×(c-s)× NORMDIST (O*,μ,σ,1)+O*×(p-c)× [1- NORMDIST (O*,μ, σ, 1)]

This methodology is totally based on quantitative research concerning only the financial and, as a result, parametric aspects of planning. Consequently, without taking into account non-parametric data the research is aimed at estimating cost effectiveness of the company by comparing previous profit results and acquired by implementing the Chopra's methodology.

Results

Listed collected information will reveal the importance of changing the product availability throughout the fluctuation of consumer demand during product life cycle.

Considering results of the project it is worth mentioning that the amount of products available for customers in store depends on stage of product life cycle, which was to be proved (Fig 1).

As for practical implementation, the analysis of received empirical data will likely allow to prove the importance of accomplishing the Chopra's methodology in different companies.

Conclusion

Customer is one of the most significant elements of company's functioning. Thus, accurate evaluating of consumer demand is essential for making profit. Consequently, taking into account required criteria concerning selling product and expected demand may be useful for firm's development.

Besides, the advanced evolvement of further research is influence of product life cycle stage on logistic services and product availability. This guideline will present the opportunity for making demand more predictable according to its life stage.

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Section

1   Figure 1. Decreasing Optimal Supply Chain Service Level by Reducing the Standard Deviation of
               Demandinthe Course ofProduct Life Cycle

	Stages of product life cycle		
Input	**Introduction**	**Growth**	**Maturity**
Mean demand, μ	293,63	382,75	606,18
Standard Deviation of Demand, s	**197,1**	**122,2**	**98,6**
Cost per unit, *c*	253,93RR	268,20RR	279,12RR
Retail price, *p*	362,75RR	357,60RR	348,90RR
Salvage Value, *s*	181,38RR	178,80RR	174,45RR
Intermediate Calculations			
Cost of overstocking per unit, *Co*	72,55RR	89,40RR	104,67RR
Cost of understocking per unit, *Cu*	108,83RR	89,40RR	69,78RR
Expected overstock units	106,11	48,75	28,10
Expected understock units	56,17	48,75	53,08
Optimal Results			
Optimal Order quanity,O*	344	383	581
Optimal cycle service level, CSL*	**0,60**	**0,50**	**0,40**
Maximum Expected Profit (π)	18 143RR	25 501RR	35 654RR

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