7th International Scientific Conference
"Business and Management 2012"
May 10-11, 2012, Vilnius, LITHUANIA

ISSN 2029-4441 print / ISSN 2029-929X online
ISBN 978-609-457-116-9 CD
doi:10.3846/bm.2012.150
http://www.bm.vgtu.lt

DEMAND PLANNING SPECIFICS IN FOOD INDUSTRY ENTERPRISES

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Abstract. With the development of modern approaches to integrated planning of business processes, importance has been increasing of forecasting future customer demand, also called demand planning. Although the main aim of the demand planning is to estimate the size of future sales of the company, businesses should not forget to manage demand. Effective demand management leading to a balanced demand in time is an essential prerequisite for accurate demand forecasting, optimal utilization of the enterprise capacity and easier operational management in the enterprise. The article deals with the function of demand planning in Sales and Operations Planning and in Advanced Planning Systems, focusing on the specifics of the food industry enterprises. These businesses are characterized by raw materials and products that usually cannot be stored in the long term, and therefore they can very well demonstrate the importance of managing business processes according to accurate forecasts.

Keywords: demand management, demand planning, food industry, Sales and Operations Planning, Advanced Planning Systems.

Jel classification: L66, M11, M31

1. Introduction

The demand forecast has always played a significant role in planning and control processes of the value-chain management in companies. The demand for company products directly determines the required sort and volume of produce in time and place of their sale, thus indirectly influencing resource and capacity planning within the whole supply chain ranging from raw material purchase to product distribution to the end customer. The necessity of creation of future consumption estimate leads to formation of independent forecasts performed at several places of the supply chain and leading to incorrect co-ordination of company activities and to disproportional amount of stock along the whole material flow in the company.

At the end of the last century the above mentioned reasons resulted in a need for integrated management of company inner processes. These should be covered by a common demand forecast related to the whole company. Only this kind of forecast can be efficiently utilized as a source of information for all further company planning steps (Vlckova, Patak 2010). The importance of the common forecast of future company sales is supported by the fact that most authors devoted a new company function to the chain management and it is called demand planning.

Within the theory of company management there have been developed two methodologies for integrated company process management in the past two decades. These methodologies are called – Sales and Operations Planning (S&OP) and Advanced Planning Systems (APS). The target of this article is, based on the literature research, to clarify the function of demand planning in both methodologies of management. Benefits and drawbacks of the demand planning function in both methodologies are being discussed in the article with respect to authors' experience with manufacturing companies in food industry of fast-moving consumer goods (FMCG). This type of companies is unique with its short expiry time of their raw materials, intermediate products, and also final products. This limited expiry time prevents long term stock creation applicable on all places of the supply chain. The need for effective demand planning and management in the markets of this specific produce is going to be demonstrated by a case study presented at the end of the article.

Demand planning function explanation, its benefits and disadvantages should lead to better understanding to the issue and consequently to improved and more efficient demand planning and management together with all positive impacts on the company. The research methods were a method of structured literature research and a method of in-depth interview with managers of selected chemical and food processing companies.

2. Demand planning in S&OP

Sales and Operations Planning (S&OP) is a decision-making process that balances the company plans for all business functions to support the company's strategies, business goals and targets. The essence of S&OP lies in monthly sliding planning of sales and resources needed for sales realization with a prospect of several months (usually 12-24 months). Final plans undergo approval procedure, during which they are modified in accordance with current possibilities of the company and also according to company management's prospects and experience.

The process of monthly S&OP is commonly described in scientific literature (Wallace 2004) in five steps:

- data gathering;
- demand planning;
- supply planning;
- pre-meeting;
- executive meeting.

One of the steps, which is in the centre of attention within S&OP, is demand planning. Most authors (Wallace 2004; Sheldon 2005) see the fundamentals of demand planning in demand forecast construction by means of assessment and analysis of the information obtained by data gathering. According to another author (Gray 2007) the demand planning phase comprises update and approval of forecasts and demand plans for both current and new products. In both cases, the main goals of demand planning involve not only obtaining of as exact future demand estimate as possible, but also understanding demand variability, designation of number of pending orders and actuarial reserves necessary for compensation of demand fluctuation.

Wallace and Stahl (2008) consider demand planning to be the most complicated step of S&OP, due to very specific views on future demand planning and forecasting from each company division. Demand planning complexity is not seen in imperfect software or in inaccessibility of a database suitable for analysis, but there are constraints in unification of company division's priorities.

S&OP has undergone remarkable evolution during the past 30 years. Gradual integration of company functions (inventory, financial, product and portfolio, strategic deployment, supply chain collaboration) has resulted in the Integrated Business Process (Crum, Palmatier 2011), where demand planning plays a role of the future demand forecasting.

3. Demand planning in APS

Advanced Planning and Schedulling (APS) is represented by a collection of methodologies and steps, whose goal is to optimize allocation of resources and materials necessary for demand ensurance. APS serves primarily to produce planning in manufacturers, where standard MRP and ERP systems fail (Kristianto *et al.* 2011). This failure can be caused by e.g. fast outdating of operational produce plans (idle times of machines, defected products, alternative machinery utilization) or by frequent operational interference of produce which needs to be optimized. Effective optimization can be possibly achieved by means of Excel tables but only in a limited amount of orders (Plaček 2008). APS principles and tools may be generalized and exploited in the Supply Chain Management. In this context there are certain improved systems of planning known as Advanced Planning Systems (APS or APS/SCM).

APS architecture results from the structure of functional planning along the whole supply chain with regards to varied planning horizon. If we classify planning in the supply chain according to two standards (plan function and planning horizon), we obtain Supply Chain Planning Matrix (Rohde *et al.* 2000) illustrated in the Fig. 1.

Demand planning in APS systems overtakes the role of mid-term and long-term sales planning (Meyr *et al.* 2010). The main goal of demand planning is to provide long-term and mid-term estimates of demand trends in dependence on the demand forecast utilization in further company planning. Long-term estimates related to future demand trends are used in strategic planning of the supply chain. Medium-term estimates of the final products of the supply chain provide offer base for short-term planning of both produce and distribution in the company (Reuter, Rohde 2010).

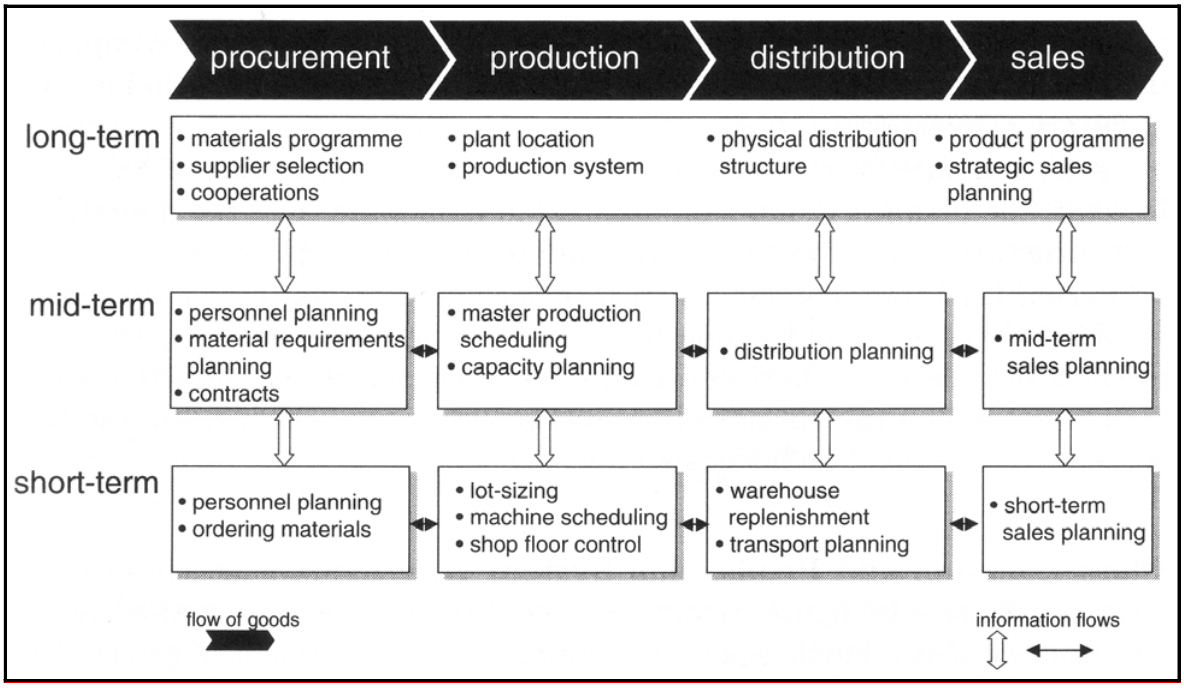

Fig. 1. Supply Chain Planning Matrix (Rohde *et al.* 2000)

According to Kilger and Wagner (2010), demand planning usually represents a series of activities repeated on a monthly basis and leading to demand forecast update. A standard demand planning process which is applied in practice is divided by authors into partial operations. Demand planning process starts with sales product range update and with past data preparation (especially correction of the data which could distort the forecast). In the following phase the purged data are used to calculate the forecast by means of appropriate statistical techniques (statistical forecasting) and by all sorts of expert methods (judgemental forecasting) in more company departments (distinctively in sales, product management and marketing). Both forecasting approaches have certain advantages and disadvantages. That is why it is advisable to integrate both approaches (Armstrong, Collopy 1998). The obtained forecast is often being discussed in practice due to the fact that it originates from numerous company departments and it is based on miscellaneous information sources leading to different opinions. Therefore demand planning phase belongs to the essential phases that should lead to the forecast release.

4. New demand planning function

In the integrated approaches to the company process planning can be seen the shift from demand forecasting to demand planning in involvement of all the company departments into the process of forecasting and final forecast approval (Githens 2003). Single methodologies of management may differ in steps of final forecast approval and in distribution of the forecast to other company departments. During the S&OP decisions process the demand plan (sales plan respectively) is approved, and then the operational plan of functional company departments is approved. On the contrary in APS there is only the demand forecast approved and this is thanks to the software support then shared in the real time by all company departments and it often directly enters the automatized planning processes (production scheduling, etc.).

Demand planning takes the position of one of the most collaborative approaches, due to the fact that in demand plan creation there are a huge number of inputs from numerous company functions leading to their confrontation (Lazich 2007). Obtained forecast can be thanks to these processes much more credible to all company departments dealing with the forecast creation, and also to those who participated at the approval procedure.

Integrated demand forecast also indicates higher level of accuracy and reliability due to higher amount of information considered during the time of forecasting. Most of the authors (Sheldon 2007; Crum, Palmatier 2003, Asuru 2008; Behret, Kahraman 2010; Snieska 2008; Pilinkiene 2008; Kaplinski 2008) agree on the fact that company goals and strategies, marketing plans, statistical analyses of past data (especially POS data), information about intended future sales obtained from sales representatives and sales department staff, information about new products and planned

innovations in current products, these all should be included among the main information inputs of the demand planning. All the above listed information can be usually obtained from company departments such as marketing, sales or product management. However, in what way can demand planning benefit from involvement of company departments related to logistics, namely purchase or distribution?

To be able to understand participation of logistics departments of the company in the demand planning, it is necessary to get much broader perspective of the role of demand planning within integrated company process management. Majority of authors (Kilger, Wagner 2010; Wallace, Stahl 2008; Sheldon 2005; Dickersbach 2006; Knolmayer *et al.* 2009; Moon *et al.* 2000; Stadtler 2004) see the goals of demand planning in the most accurate estimate of the future customer demand. Sales which are going to be realized in future depend on many circumstances lying out of the company's scope of influence - e.g. competition, market potential and capacity (Knyviene *et al.* 2010). But companies could influence future sales by factors such as promotion, brand strengthening, customer care, credit policy (Pecinová 2010; Tetřevová 2006), environmental policy (Vávra, Munzarová 2010) or collaborative planning (Branská 2010). All company activities, which to a certain extent influence future demand for company products, may be perceived as tools for demand management. If a company uses these tools deliberately in order to achieve company goals, it also should be able to assess impact of such control on the structure and volume of future sales. Exploitation of this knowledge in demand planning is not sufficient. Obtained forecasts should at the same time represent basic criteria for selection of appropriate tools for demand management. From this point of view, demand control and demand forecast form two inseparable parts of demand planning.

Efficient demand management should include consideration of standard marketing goals (turnover increase, increase of the market share, etc.) and also consideration of logistical needs of the supply chain. Incorrect demand management may in short-term increase company sales, but it can simultaneously raise the wave of logistical cost increase related to significant fluctuation of demand in time (uneven capacity utilization, excessive stock creation, etc.) These are the reasons why the process of demand planning ought to as well involve departments of logistics, the providers of information about possibilities and capacity of supply chain and at the same time they are able to enumerate logistics costs generated in active demand management. Demand planning role can be seen not only in active demand control and demand forecasting, but also in expected demand coordination together with needs and options of the supply chain.

Generally the companies fill significant fluctuations in demand by stock creation. This stock is burdened by high costs of stocking and losses of capital blocked in stock. In such cases, when raw materials, intermediate products, or produce cannot be stored for a long period of time, the order may become unmanageable in the logistics point of view. Food industry companies can easily get into such situation when producing FMCG with a short shelf life. The companies, which operate under pressure of potential customer loss or under thread of high penalties for late delivery, very often opt for overdesigned capacity of production. This capacity is not adequately utilized during the time of low demand. Paradoxically, at the moment of a sudden demand increase, the company is forced to exceed the scheduled time capacity limits. Finally there comes disproportional rise of labour costs (higher costs related to overtime payments) resulting in negative influence in the social level (work conditions) and also in the level of product quality (breaking the regulations etc.). An example of inefficient demand planning can be illustrated by the following case study.

5. Case study: diary works

The studied company belongs to diary works having a long-term tradition of production of diary sour products. More than two thirds of the produce is being sold to the end-consumers through retail chain stores, thus representing the key customers of the company. The total market supply of the sour diary products significantly exceeds their total market demand resulting in excessively growing negotiation power of the purchasers.

High negotiation power of the retail chain stores affects negatively the deals between the diary works and the purchasers. In order to keep the position on the target market, the studied diary works has to comply with demanding requirements of the customers and has to accept high fines and sanctions implied by the clients in case of breaking the contract conditions. Among the basic condition also belongs the promptness of meeting the order (usually 1 day) whereas the production cycle it takes approximately 3 days. Final products have relatively short shelf life and a purchase of only fresh products with full life expectancy is frequently the only accepted demand.

From the perspective of supply there is a complication to the supply chain management in

the fact, that key raw materials are practically impossible to be stocked up. Key raw materials for produce of sour diary products are milk and sour cream, which the company buys from the farmers. Due to the fact that milk is bought according to the framework agreements and to the topical amount of drawn milk, the sour cream is bought extra following the current requirements of the customers for final purchase of the produce. Nevertheless sour cream needs to be ordered a week ahead to its delivery. Cream has to be processed immediately upon delivery. Therefore demand forecast plays a key role in operational control of material flows in the company.

The demand forecast is formed at several places of the company. To support long-term company decisions (target market preference, product management, price and communication strategies, etc.) company marketing and sales departments create their own forecasts primarily in the sector of long-term demand trends. Also material and technical supply department controlling raw material and material purchase for the produce, packaging and product distribution creates its own forecast. The sales department then holds the responsibility for the key raw material purchase. This department also processes orders, communicates with customers and provides incoming information (sales plan) to the operational planning of the produce. Various demand forecasts in single logistical departments represent potential threat of material flow disturbance in the company. In the past there occurred such disturbance in the company in a form of momentary lack of consumer packaging. The reason for the deficit was the fact that produce and sales sections were working with different presumptions of future demand. However, the company accepted certain measures in a form of increase in actuarial stock of packaging material instead of enhancing communication among logistical departments of the company. This step would lead to formation of a common demand forecast shared by the whole company.

Ability to demand forecast on the target markets is considered to be very problematic by the company managers. The purchasers are not willing to provide detailed information about their sales and about consumer behaviour of the end-customers. This information is considered to be confidential. Despite this fact, the biggest problem in customer order supply represents order fluctuation around the long-term average.

During weekly demand planning, which forms a base for purchase of key raw materials and for produce planning, sales department uses only data about the sales which were realized by the company in the past period of time (previous week). Reason for this practice can be found in absence of company's information software and in an easily accessible database of past sales. The analysis of utilization of statistical methods in demand planning in the company has revealed the fact that by exploitation of simple time series forecasting methods the error of forecast in the biggest customer would be reduced from 19.5 % to 12.1 % (Patak, Vlckova 2010). Thanks to many-year experience of sales reporters and thanks to high flexibility of produce (production is controlled in compliance with revised daily plans) is the company able to meet demanding requirements of the customers and to deliver ordered amount of products in time. This challenging way of operational management fails at the moment when the sales begin to fluctuate strongly owing to realized sales support.

According to company managers, are the end-consumers in the Czech markets of food industry trained to buy cheap goods. Therefore the most efficient form of marketing communication channel with the end-consumers is the price sale support in retail. Unfortunately this way of demand management results in the highest oscillation of sales in time (Fig. 2) and practically zero increase in company profit (costs related to price decrease and to placement of the product in the flyer are covered to a large extend by the producer at the expense of their margin). However, the price support of the sales cannot be fully eliminated from the marketing management because final effect of increased sales assists in strengthening the position of the product on the shelf (there is no threat of listing out the product from the product range of the retail chain), it also strengthens the brand position in minds of end-consumers and it supports repeated purchases of advertised products (customary behaviour of end-consumers).

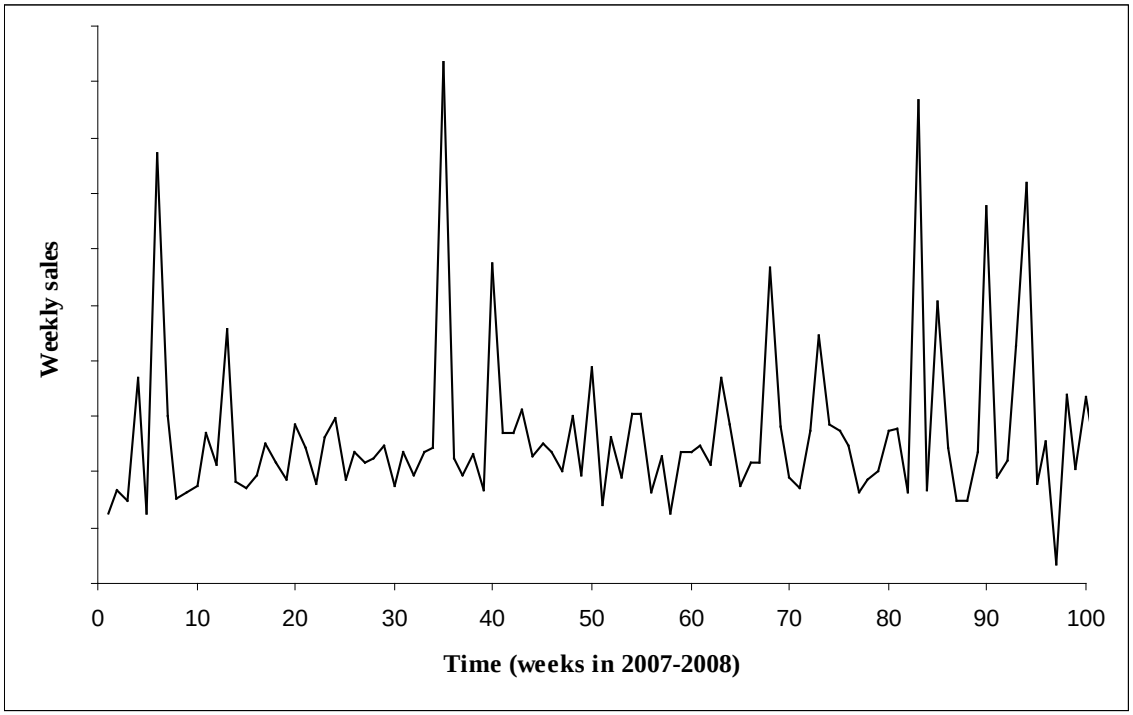

Fig. 2. Historic sales of key product realized by the biggist customer (Patak 2009)

The company has to cope with strong oscillations in sales by means of operational increase of production capacities and also by labour capacities (longer working time or by engaging another shift of part-time workers) in accordance with current needs. This situation brings consequences described in the previous chapter of this article. The forecast of the sales promotion influence is made more difficult by the fact that the company does not systematically keep track of sales support efficiency of the past period. Therefore there is only a limited amount of input data available to create the actual forecast (e.g. in certain cases the purchaser provides tentative estimate of product purchase). Performed analysis of promotion influence on sales (Patak 2009) demonstrated certain patterns in fluctuations as well as the importance of the assessment and a long-term observation of promotion efficiency. Awareness of promotion efficiency could also assist in targeted demand management leading to balanced sales in time concerning the whole volume of orders. At the same time the company could attempt to find ways to other promotion methods facilitating the growth of sales without distinct fluctuations in time. Balanced sales are the fundamental presumption of equal utilization of capacity eliminating or at least reducing the need of operational increase in production capacity and labour capacity.

Production range extension and increasing market share gradually formed challenging environment in the studied company where the effective supply chain management without long-time experience and knowledge of the company employees cannot be sustainable in a long-term perspective. Integration of the company processes through a single company forecast is a fundamental premise for optimalisation of safety stock and also efficient purchase control, supply, produce and sales. The usage of statistical methods of forecasting and promotion efficiency monitoring would increase efficiency of planning and demand management. This type of control is conditioned by implementation of advanced company information systems. Unfortunately also nowadays the absence of these systems represents one of the biggest barriers to efficient demand planning utilization in practice (Vlckova, Patak 2011).

6. Conclusions

Efficient demand planning should fulfil three fundamental functions in the company: demand forecast, demand control and coordination of opportunities and capacities of supply chain with the expected demand. This can be achieved by mere integration of company processes roofed by a single demand plan united for the whole company. Meanwhile cooperation among all company departments in demand forecasting makes essential part of modern approaches to integrated management of company processes (S&OP, APS), active demand control is very often omitted during the demand planning.

The company should not control the demand solely in order to meet standard marketing goals, at the same time the company should maximally attempt to balance the fluctuations in development of the future sales in time. A balanced demand curve in time makes fundamental assumption for more accurate demand forecast, for equal company capacity utilization and for optimal control of logistical activities in a supply chain. Elimination of distinctive fluctuations in sales can be achieved only by a thorough analysis of influence of event marketing on future sales of the company and by suitable choice of type of marketing events and also by suitable timing of their realization.

According to our experience and research carried out in companies of chemical and food industry in the Czech Republic, a need of efficient demand planning can be very well demonstrated in these companies producing FMCG of the food industry. In these companies it is practically impossible to clear fluctuations in sales by creation of excessive material stock, of unfinished products and of final products determined to end consumption. The reason lies in fast obsolescence of the products (relatively short expiry period) or in necessity of instant processing during manufacturing. Such companies often solve problems in the supply chain, caused by unlevelled demand in time, inefficient interference to operational control of logistical activities of the company. It is resulting in many negative effects in the economy and the social level of the company. Efficient demand planning is key factor during elimination of the cause of above described problems. That is why it represents fundamental assumption of successful supply chain management.

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