ROLE OF DEMAND PLANNING IN BUSINESS PROCESS MANAGEMENT

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Abstract. Only these enterprises which are able not only to identify customers’ needs and requirements but also flexibly respond on them can succeed in present very quickly varying business environment. From this resulting customer’s pressures on time compression needed for orders fulfilment and simultaneously requests of management on reduction of locked-up capital in inventory create environment in which systems controlled by demand begin to assert. Knowledge of demand and sales derived on the base of forecast and their sharing play significant role. Therefore this article deals with the question of changing relevance of demand forecasting and particularly with the forecast utilization in the demand planning from the enterprise point of view. The methodology of the demand planning and its integration with other business processes is also described here.

Keywords: demand forecasting, demand planning, business process management.

1. Introduction

At present, the substantial survival ability of the company rests in adaptability to constant changes of the environment. The success is seen by the companies not only able to reveal customers’ wishes but rather capable of flexible reactions to their requirements. If the company wants to stand up to competition, it must accelerate and make more efficient not only the partial internal company processes but also the management of tangible and intangible information flows within the whole supply chain. The growing pressure of the supply chain customers on accelerated reaction of suppliers enforces shortening time periods for processing orders. It is, however, often possible to carry it out only at the expense of enormous effort of the production company and leads to non-economical rise of costs. That is why management seeks the ways of eliminating or reducing the costs. It creates the environment in which the systems controlled by the demand are applied. The systems controlled in such a way are an essential prerequisite for the creation and setting of the production and all related processes that are to maximum degree balanced and simultaneously adaptable.

There are a number of principles and methodologies for management of production, stock, human resources etc. However, the rapid development of information technologies during the last decade moved these theoretical procedures to an entirely different level. The information systems play a key role mainly in operative planning and management. Many companies cannot nowadays imagine running the business without accessing relevant information from ERP (Enterprise Resource Planning) systems. The concept of ERP does not relate merely the planning methods but is rather a synonym for a group of complex information systems, designed for the management of internal company processes.

In consequence of more efficient information use through ERP, the partial planning methods as MRP II (Manufacturing Resource Planning), Sales and Operations Planning (S&OP) or APS (Advanced Planning and Scheduling) are developed. All these methodologies of planning and management and their software support have something in common. They enable optimization of company processes in a short time providing the volume of real sales of particular customers’ particular products is known, well in advance. However, where to get the information if the customer service lead time is often a far smaller interval than the lead time required by the organization to produce or distribute the product? In these cases the expertise in demand and sales prognosis play a significant role.

The research carried out in numerous production companies, primarily of chemical and food processing industry in the Czech Republic (Hambálková 2009; Paták 2009; Roháčová 2009), however, showed the changing and strengthening role of the demand and sales forecast is often underestimated by management and thus it is not paid an adequate attention.

The aim of this paper is to demonstrate the significance of the demand and sales forecasting for the production company and support the use of these forecasts via the demand planning. It describes the demand planning methodology and its integration within other company processes.

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. Significance of demand forecasting

The forecasting is a process in course of which possible future variants of a phenomenon or object, maybe even variant solutions of ways leading to future situations are formulated. The forecasting creates a basis for planning company processes (Johnson 2009). It enables managers to plan future needs and consequently make rational decisions. Forecasting is a continuous process that requires product managers to think about markets and understand those (Haines 2008).

Forecasting methods were developed since the 1950s for business forecasting and at the same time for econometric purposes. The application in software modules makes it possible to forecast for a lot of items in a few seconds (Stadtler 2008). Accurate demand forecasts are an important input to decision models used in APS. Forecast errors are directly related to required safety stocks, while frequent adjustments of demand forecasts can lead to dramatic changes in plans (Stadtler 2005).

If the company wants to maximize the effect of accessible methods for internal company processes, it must build on objective and evaluated demand forecasts. The choice of optimum forecasting procedures and following use of obtained forecasts may become a competitive advantage. Together with other modern methods it accelerates other company processes, reduces the costs and increases the value for the customer.

The demand forecast determines the volume of products, place and time horizon in which they will be needed. In relation with the demand forecast it is necessary to deal not only with the quantitative aspect of the needs (the volume demanded by customers) but also their qualitative aspect (the type of customers’ needs). The accurate demand forecast is thus important for the production and distribution management but also for e.g. areas of marketing (distribution of sales forces, communication, promotion and planning of new products), finance (current need of money, budgets and calculations), investment designs (production facilities, workshops and warehouses), research and development (innovations) and human resources (structure and labour force volume planning, training).

It is important to accept the process of forecasting as a part of company planning. A lot of small and middle-size businesses neglect this activity or avoids it on purpose as it evokes feelings of vanity with most practitioners (Šindelář 2009). The future is always stochastic. In case of market turbulences it is even more valid. The forecast thus, based on its character, cannot ever be considered entirely reliable. The opportunity for the forecast use, nevertheless, does not depend only on the confidence level. Every evaluated forecast represents an efficient instrument for decision making as every decision issues from a particular future forecast. It is not then surprising that in the recent years we have been meeting the concept of demand planning more and more often.

3. Demand planning

Demand planning represents a set of methodologies and information technologies for the use of demand forecasts in the process of planning. The aim is to accelerate the flow of raw materials, materials and services beginning with the suppliers through transforming to products in the company and to their distribution to their final consumers.

The demand planning process is done to help the business understand profit potential. Indirectly it sets the stage for capacity, financing, and stakeholder confidence (Sheldon 2006). The implementation of the demand planning enables to determine the closest possible forecast to the planning horizon and decide the volume of production, stock and sources capacity distribution among particular products to maximize the profits of the whole company.

The key requirement for efficient company management is sharing the mutual forecast. However, the research carried in production companies showed individual departments of the company in some cases draw up forecasts on their own and thus they base their planning on different figures. This provokes conflicts among the resulting activities of in-company plans (Gros, Grosová 2004). The same situation happens also in case when the company prefers approved financial plan which does not correspond with the updated forecast results.

The forecasting should always be the process which is essential and determining for other company processes, including financial planning. The financial plan, however, often represents the main motivation source for company managers as it reflects requirements of the company top management and main strategic company goals.

While managing processes via the demand planning the managers should not be assessed according to their meeting the financial plan but rather according to their ability to predict the future development of both the demand and demand control so that the main strategic goals are
achieved by economically the most advantageous way.

It is evident the demand planning does not represent only one of many tools of managing the company processes. It is a whole philosophy of company planning and decision making on strategic, tactic and operative levels. With regard to the current turbulent environment escalating requirements on a prompt company response to customers’ orders, especially the pressure put on ready operative decision making.

3.1. Methodics of demand planning

Methodics of the company demand planning (Formánek 2004) can be divided into six steps:

- understand essential forecast principles;
- integrate systems for forecasting and planning;
- identify key factors influencing the demand level;
- identify and understand customer segments;
- select appropriate forecasting techniques;
- build a system for measuring performance and error rate of forecasts.

Every forecasting process should start with making aims and purposes of the resulting forecast clear. The company should precisely define the area of the future demand, the volume of which it tries to estimate. In this phase it simultaneously determines the time horizon of forecast defined as a time gap between the point, for which the forecast is carried out, and the point, when it is carried out. These decisions should correspond with the needs of other company processes for the resulting forecasts to be used efficiently both at the strategic, tactic and operative levels. Though, for their decision making the partial company departments require forecasts of different aggregations and forecast horizons, the forecasts should not be performed at the level of individual company departments. The only one central unit should be in charge of final demand forecasts. This is the only way for the company to ensure the creation of an integrated demand forecast issuing from the same information and sheltering all the company processes.

If the company wants to acquire the most precise and reliable demand forecasts, it should utilize all information about future jobs it may get. It should be aware of what customers it will produce for and what distribution ways will be used to serve them. It should also identify their needs, wishes, requirements and determine factors that could significantly influence the demand volume. At the same time it should know the reliability of this information and systematically collect the information necessary for the chosen forecasting methods. While collecting and classifying this information it is adequate to use all available segmentation techniques and methods of cluster analysis (Bottomley, Nairn 2004). When applying the procedures in the right way, there is an opportunity to reduce considerably the number of forecasts of the whole production portfolio to forecasts of the product categories (e.g. product lines) in particular customer segments.

In connection with in previous paragraph mentioned the term Hierarchical Demand Planning (HDP) can be found in the literature. HDP is based on the assumption of independence among variables, and this allows for simple and easy aggregation and separation of plans and data (Nielsen, Steger-Jensen 2008).

A variety of modeling techniques are available for producing forecasts. Based on data patterns, forecasting horizon, data availability and business requirements the choice of technique differs (Voudouris, Owusu, Dorne, Lesaint 2008). Via appropriate combining of the forecasting techniques it is possible to estimate quantitative influences of the identified factors and set the demand forecast (Lehmann, Winer 2005).

The most frequently used statistical forecasting method is the time series technique. It uses historical data sequenced by time and projects future demand by the same time sequence (Crum, Palmatier 2003). POS data is rich in information for building forecast models. Building a good forecasting model with POS data is demonstrated in many case studies (Andres 2008; Gallucci, McCarthy 2008).

While a quality forecast is a good basis for a demand plan, the forecast needs to be modified for external activities that will have an impact on the demand for the product being forecasted. The impact of promotional events needs to be integrated into the forecast and demand plan so that the accuracy of both is improved (Gattorna et al. 2003).

As soon as the forecast is elaborated in detail into individual product forecasts geographically allotted along a time period, it is labelled “sales forecast”, which is a more unambiguous term especially for the sales management. It is an objective and evaluated forecast of sales that the company is capable of carrying out in the future.

To make the forecasts objective, the practice integrates numerous unbiased experts for obtaining required forecasts. Another way of making the forecasts objective rests in using several methods for forecasting the same phenomenon and the obtained results are finally mutually compared. As every forecast is preconditioned by a complex of
external and internal factors, this fact should be reflected in the alternatives of the potential future development. That is why the forecasts should be always drawn up in variants.

The evaluation of the variant forecast is carried out in terms of its credibility and confidence. The credibility of the forecast can be understood as a degree of its true value, i.e. as the approaching of the model future image to the reality. The confidence of the forecast is determined by the probability with which it is likely to expect the individual forecasts variants to come true.

Though the forecast cannot ever be considered entirely reliable, the company should arrive at an agreement over the final forecast and its reflection in all the company plans. Only this way leads to fulfilling the basic concept of the demand planning, i.e. the company should not for example accept decisions on production based on its wishes but only on the set forecasts.

The forecast, or as the case may be, the sales plan set on its basis is necessary to be compared with the real sales. The discrepancy between the forecast and the real sales value in the forecast period is the forecast error. Its value should issue in correction activities of the company.

Watching the validity and accuracy of the partial forecasting methods may then help with the selection of appropriate methods, specific in relation to a particular situation.

It is important to realize the demand planning use in practice is not a mere creation of a perfect system for carrying out the demand and sales forecast (Blanchard 2008). The objective of forecasting is to predict demand whilst the aim of demand planning is to shape the demand and produce a resource requirements plan (Voudouris et al. 2008). Without the right forecast - planning system integration it is not possible to use efficiently the information provided in the forecasts.

3.2. Forecasting and planning system integration

First and foremost the company should perceive the demand planning as an instrument of the marketing management of the company. Every marketing oriented company needs to integrate the company plans with forecasts as these forecasts as such more or less represent a real view of the future requirements and wishes of the customers to which the company should efficiently adapt.

However, there is a feedback between the marketing and demand planning. The information system aimed to support the demand planning should save, classify and process also information about the influence of the marketing management on the future sales volumes. Via assessing these influences it is possible to control the demand efficiently to achieve optimum management of the other company processes.

**Fig. 1. Scheme flow of information in processes planning**
This feedback can be demonstrated by the following example. The forecasting result of the promotion influence on the sales might be a future demand for products the company is not able to produce in time, e.g., due to the capacity limits in production. If, however, they consider more marketing strategies, they will certainly find the one that supports the strategic company goals and simultaneously reflects the production capacity potential.

The right applying of the demand planning in practice should involve also the demand control which will lead to such sales forecasts in which all the company sources are utilized to the maximum degree.

If the forecast is to be used in all the company processes, the relation of these processes with forecasting must be assured in such a way for the forecast to be the essential initial information for other company planning. Also the company processes feedback to the forecasting itself must be assured in the same way. This cannot be achieved without the support of integrated in-company information systems. That is why the demand planning is often perceived as a superstructure of the ERP systems. The scheme flow of individual processes is depicted in the Fig. 1.

There are numerous applicable modern analytical instruments which due to new technologies enable real time planning and large information volumes processing as detailed as possible, e.g., sales of individual customers or sales categorized according to delivery locations (Formánek 2007). The software products for the demand planning, traded in the current market, use advance statistical functions combined with expert estimations of the given market situation and development, gained from internal and external collaborators (Knolmayer et al. 2009). As a rule they provide a unified platform for creating a quality demand forecast that can be shared in real time by all company departments.

In an operational setting, software now permits automatic forecasting and the integration of forecasts into planning. But large numbers of series are still being forecast by the crude methods contained in planning systems while opportunities to apply more sophisticated and precise techniques are not offered. So there is still much room to apply advances in statistical forecasting to current business processes (Kusters et al. 2006).

3.3. Demand planning as instrument of business processes management

The result of the demand planning process is the establishment of independent requirements which will trigger the planning activities as distribution, production and procurement planning (Dickersbach 2009).

Frequent situation which is solved in monitored companies is that the period which is required for realization of all activities from purchase, through production up to distribution is longer than is acceptable for customer. If all the forecasts represent credible quantitative estimates of the future sales, the company could efficiently control all the company processes even in these situations. It could be labelled as managing the processes by the real demand known to the company well in advance, which means before the moment when the real product demand comes into existence. It is obviously a purely hypothetical situation which does not happen in practice.

Every forecast should be, however, variant and evaluated by the confidence. Every sales forecast can be thus generally determined in terms of the forecast confidence interval when the forecast confidence is understood as the probability, under which the company carries out the future sales in the volume complying with the given value interval. In forecasting by using statistical methods the limits of the production confidence interval can be exactly determined. While exploiting the qualitative forecasting methods (expertise, intuition), the pessimistic variant of the forecast can be the lower limit and the optimistic variant can be the upper limit of the interval (Fig. 2).

The knowledge of the forecast confidence interval can be used e.g., while planning the production of cycle and safety stock of the final products in the production company.

In common practice of the demand planning the company would generate such stock reserves that would cover the sales as far as reaching the lower confidence interval limit of forecast while covering uncertain sales belonging into the forecast confidence interval would cover the safety stock. This, however, would be still relatively high in relation to the whole volume of sales.

The sales forecast for fast-moving products is usually well predictable by means of extrapolation of the last sales time lines. The highest probability density in these cases will appear in the middle of the confidence interval. It is possible to prove the high speed of product moving would cause the safety stock to get constantly renewed on average in the volume of half the interval. Thus there is a decrease of the safety stock (Fig 3a).
When the product moving decreases (Fig 3b), it is more efficient to reduce the safety stock by means of adapting the production processes so that they are controlled by the real demand, i.e. by orders. One of the possibilities rests in a prompter response to customers’ requirements not only in the company but along the entire supply chain (Christopher 2005).

This way of planning the production obviously means the width of the forecast confidence interval will remarkably influence the volume of the safety stock and the requirements on the change of the company processes. Though both the facts will assure a high reliability of meeting all the future customers’ requirements, they bring the company costs related to the capital locked-up in stock, to maintaining stock and changing processes. The demand planning partial target thus should also be the effort seeking the ways to constant decreasing of the width of the production confidence interval.

The suggested way of utilizing the knowledge of the forecast confidence interval allows not only more efficient mass flow management in the company, but they can be generalized for the management of all activities of all but to using it generally for managing all the company processes.

Demand planning processes provide the tools for understanding, projecting, and managing demand in the supply chain network (Sehgal 2009). Since a supply chain involves the synchronisation of a series of inter-related but different stages of business processes influencing multiple trading partners, its demand planning and forecasting cannot rely on a single, stand-alone forecasting tool (Min, Yu 2008).

![Fig. 2. Limits of the forecast confidence interval](image1)

![Fig. 3. Cycle and safety stock planning focused on utilization of the forecast confidence interval](image2)

4. Conclusions

All the supply chain links nowadays face a heavy pressure from the part of the customers, which is to make them shorten the process time of their orders. A significant role is played by the development of the information technologies. Especially within the operative planning there comes to the development of partial planning methods such as MRP II, S&OP, APS. However, a frequent problem of the production companies rests in the issue of how to get, i.e. well in advance to predict correctly and precisely the initial information on the sales volumes of individual products with individual customers.

Our research in numerous companies showed if the companies do not use systems controlled by the forecast, whether for they do not trust the final forecasts or for they are not able/willing to work with them, they must seek other ways of compensating this insufficiency in the reliable forecast creation competence. The production companies must then often face very unbalanced utilizations of all the capacities and solve these situations only at with great effort leading often to inadequate rise of costs, e.g. by raising the stock of finished products, extraordinary shifts, hiring large numbers of
contemporary staff at the expense of the regular staff. In such cases demand planning can be starting point for companies which exploits forecasting methods and effectively interconnect them with other business processes. Investigations realized in recent years indicate that key factor for successful implementation of demand planning in companies is very forecasting and planning integration. We also pointed out on the basic principals of this integration.

Software products for the demand planning enable flow of planning the company processes on individual forecasts. Using them, management however does not have exploited always possibilities to manage company processes on the base of all information, which each forecast provides. As we have pointed out the knowledge of the forecast, its accuracy and confidence enables more efficient deciding on whether in the given case it is meaningful to manage the company processes according to the forecast or adapt them to the control of the real demand.

The demand planning is a significant instrument for creating the forecast, its integration with the in-company plans and business processes management. It is a whole philosophy of company planning and decision making on strategic, tactic and operative level.

References


