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Adaptive demand planning in a volatile business environment

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Abstract. Volatile circumstances concerning demand and the increasing product variety force companies to become adaptive. To be adaptive, planning accuracy is going to become a critical success factor in corporate networks. At current state, tools and methods are missing which are aligned with the requirements of a company and its corporate network to receive a more precise demand forecast. The developed method is prototypically applied within a case company in the Austrian agricultural industry. The result of the paper shows in addition to a discussion of the new logic of planning which improvements are achieved in the company.

Keywords: demand uncertainty, logic of planning, forecasting

1. Introduction

The prediction of future customer demand could be easy, if there was only one customer to be served with only one product [1]. This circumstance is unlikely in practice as the customer demand forecasting has to consider several hundreds or thousands of individual products and customers. Therefore, accurate demand forecasting forms a challenge in a considerable number of companies. This is especially true when considering the increasing number of variants in combination with decreasing product life cycles and ongoing globalization issues and regularly evolving information technologies [2].

In the case company these common challenges are amplified by a high degree of added value and a highly customized and increasing number of product variants while facing a steady number of products sold. This results in a decreasing production output per salable product and leads to a reduction of lot sizes and in consequence to an increased uncertainty as reduced quantities for a larger number of variants have to be forecasted. The small quantity of each variant sold which results from high variety with concurrent high degree of value added lead especially to disadvantageous consequences in production (e.g. minimal lot sizes) as well as in sales (e.g. high planning inaccuracy as the salable products are planned individually and therefore the result is a high deviation from the final number of products sold).

A new planning logic on a new planning level and the modification of planning horizons should support the company in improving planning accuracy as well as delivery reliability to create transparency within the corporate network.

2. Company-Specific Application

In the company-specific case, the estimation of the sales department, as part of the qualitative forecasting, includes the individual know-how of the sales employees as they are constantly in contact with customers [3].

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Although they achieve a good prediction base, such a forecast is only reliable if they are transmitted in an unadulterated way [4]. This interface can be a special cause of problems. In the past, the sales department was able to predict with an adequate accuracy that a certain number of products of a specific type would be sold but it was not able to predict exactly which type it would be. The high uncertainty within the sales department in terms of forecasting has lead to a demand forecast far away from the real customer demand. The planned customer demand was dispatched to the ERP system although it would not have been needed to this extent nor would it have possible for it to be produced. At the end of a period, the accumulated demand was revalued and adjusted. For this reason, a bad plan value for the workplace was present throughout the entire period.

Summarizing the initial situation and existing problems it can be said that besides the planning uncertainty the customer orders were being given too little consideration. However, especially the corporate network under consideration requires an orientation towards the customer order to plan and produce flexibly and close to reality. Therefore, the case company asks itself the following question:

How can the logic of planning be designed more adaptive to deal better with demand uncertainty? The subsequent sections try to visualize how the case company answered this question in this very specific context.

3. Adaptive Logic of Planning

In future the case company will focus on the continuous comparison of current and forecast data, to solve the previously described challenges. The core of the new logic of planning forms the rolling planning which adjusts the forecast according to the current customer orders. Each additional customer order that is counted against the forecast leads immediately to an improvement of the forecast and planning accuracy. Fig. 1 illustrates how the demand planning in coordination with the resulting actual customer demand and the planned interdependent requirements is created.

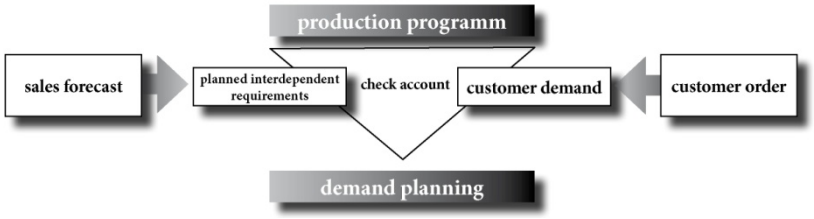

Fig. 1: Customer-order driven demand planning

In the company-specific case the number of salable products is high and it is difficult to reach high forecast accuracy at this level. Therefore, [1] recommend the forming of product groups, as the forecast accuracy at a higher level is often better than at the bottom level of salable products. [5] is concerned with the various methods of forecasting and describe unsurprisingly that on an aggregated level the sales department is able to achieve more accurate forecasts. It is important to consider that it is possible to aggregate according to different aspects (e.g. products, periods, sales channel or geography). It depends on the individual requirements of corporate networks [5]. The case company consolidates various types of salable products to new planning objects.

This process was conducted in workshops in coordination with the sales, logistics and engineering department to benefit from their know-how regarding products, assembly groups or parts as well as logistical coherences. As a result, the existing salable products were consolidated to planning objects according to the highest possible degree of similarity.

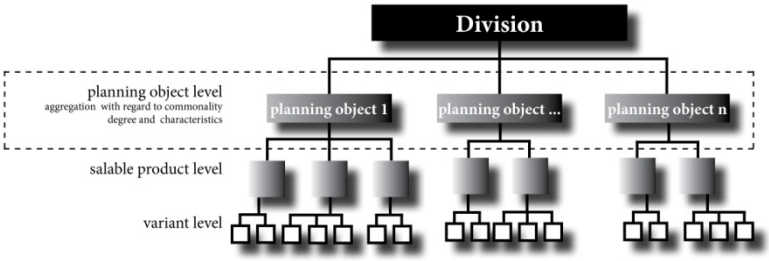

Fig. 2: Planning object level

The aim is to create planning objects with a high degree of commonality to stem the previously described negative effects of excess planning in a high-variety and volatile business environment.

The case company defines a common part as a part or assembly group that appears in several salable products of a planning object in the same quantity with the aim to plan those parts and assembly groups in a more accurate way on the planning object level.

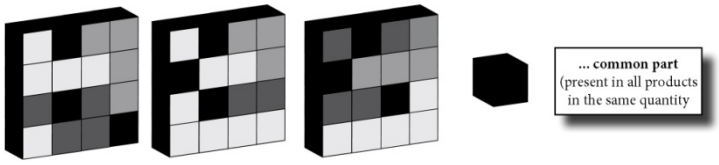

Fig. 3: Description of a common part

On the basis of planning objects and the definition of common parts, an analysis of the planning objects in the ERP system followed in order to identify and label them for planning as common parts. Hence, the parts list of a planning object contains common parts within one planning object only once. Referring to Fig. 4, the black brick is the common part, as it is present in the same quantity in all salable products of the planning object. Therefore, it is listed only once in the related parts list. All other parts are distinct parts and are present within a planning object in various quantities. The new parts list is implemented in the ERP-System and supports the fast and systematic identification of common parts which are considered in the planning process.

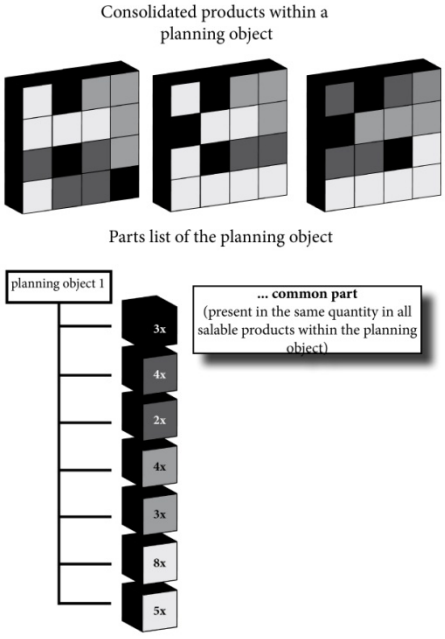

Fig. 4: Parts list of a planning object including a common part

With the aim of increasing the planning accuracy and dealing better with demand uncertainty, the planning was simplified by a higher aggregation level. Beyond that, it seemed to be useful to consider and treat common parts differently. Therefore, a fixed planning horizon for common parts as well as for the others was introduced. Within this defined time horizon within which it is not possible to modify the required quantity. Due to the repetitive appearance of common parts and the resulting higher planning accuracy, the fixed planning horizon for common parts is twice as high as the planning horizon of all other parts.

Fig. 5 illustrates the planning horizon between customer order arrival and customer order fulfillment of a make to order product as well as the stored planning horizons in the ERP system. From now on, the introduced horizons will undergo a continuous review and will be improved steadily.

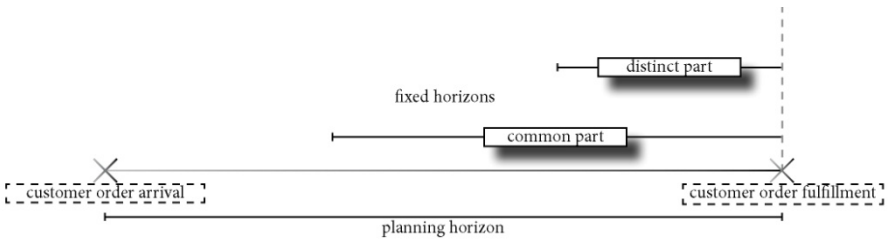

Fig. 5: Fixed planning horizon for common and distinct parts

In the case that parts are not replaceable within the fixed planning horizons, the company has various specific contingency plans to reduce the uncertainty.

- **Demand surcharge as dynamic safety stock**
  A demand surcharge on the relevant raw materials, parts or assembly groups is dispatched in the system.
- **Safety stock at the company's plant or at the supplier**
  If necessary, a physical safety stock of raw materials, parts or assembly groups is available at the own production plant or at the supplier.
- **Relocation**
  As the case company owns several production plants (n=4), a relocation from another plant is possible as long the necessary coverage is fulfilled there.
- **Usage probability**
  In this case, the outbound logistics is responsible for the coverage. They can, due to cross-departmental experiences in logistics and sales either manually surcharge the values or can determine usage probabilities (probability of the percent to which a finished product will be demanded by customers).
- **Deliver time on demand**
  Products with a high lead time in combination with low demand are only produced on customer demand and are only then synchronized with the replenishment time.
- **Lot size parameter**
  In some cases the economic production with predetermined lot sizes is preferable due to economies of scale or other effectiveness or efficiency reasons.

4. Findings

The initially described planning with enormous demand surcharges and the resulting uncertainty was replaced by the new logic of planning. In contrast to the past, the sales department does not plan at the level of salable product but at the planning object level. Due to the aggregation the sales department achieves a better forecast accuracy. The figures of the sales department are immediately conveyed to the outbound logistics who in turn break the figures based on planning object level down into salable product level. In contrast to the sales department they do not work with units but with usage probabilities. The aim is to consolidate the previously carried out, cross departmental qualitative and quantitative forecasts from

marketing, sales and system to a homogenous demand forecast by considering the know-how of markets, customers and logistics [6]. These usage probabilities of the salable products result from the experience of the outbound logistics concerning historical data, country-specific requirements, logistical processes in the corporate network, etc. This circumstance leads to a more precise forecast. Therefore, type and characteristics are still planned, continuously supervised and adapted to new arriving customer orders by the outbound logistics.

The parallel identification of SCM-critical parts of the logistics perspective contributes additionally to the increase in planning accuracy because critical parts that do not comply with the logistical processes are already modified in the engineering phase. In the course of this identification during the engineering phase, the highest possible degree of commonality is intended to ease future planning and to keep costs low.

The created benefits within the company due to the new logic of planning are immediately visible.

- the rolling planning is modified in a customer oriented and therefore leads to a reliable outcome that is visible and available for the corporate network
- more accurate forecasts from the sales department at an aggregated level ease the demand planning
- the different consideration of common parts in the planning process leads to longer fixed planning horizons of common parts and contributes to the increase in delivery reliability
- the fixed planning horizons additionally support the fast identification of and reaction to critical parts

These modifications improve the planning, order quantity as well as the logistical flows. Empiric data analyses and respective simulation runs (using SAP basic data) have yielded strong evidence that support the insights of the present article, especially regarding the synergetic potential achieved by means of salable products. Other companies who intend to identify relevant parameters and define an advisable granularity degree for their own business scenario, should identify and validate their individual data likewise. This improvement was realized on the one hand by a continuous planning, which is going to be permanently modified depending on real-time customer orders and on the other hand, by considering the commonality within the new established levels of planning, as well as the related fixed planning horizons.

5. Acknowledgement

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