Executive Summary
Of

Two Approaches To Buffer Management
Under Demand Uncertainty: An Analytical Process

by

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Today’s telecommunication equipment market is increasingly dynamic and volatile. Accelerating changes in technology, customer preference and economic cycle are changing the market in two aspects: 1) the straightforward—the effect of product obsolescence, difficulty in meeting customers’ personalized requirement in short lead time, shutting down local production and switching to outsourcing; 2) the far-reaching—the effect of regrouping the whole industry that can be caused by profound innovation of information technology or prevailing changes of consumer behavior. These changes challenge traditional operation and control based upon stable supply and demand analysis, whereas nowadays demand is characterized by high uncertainty and volatility. Based on a particular case study of WIDGET X, a optics product family produced by the Telecom, this paper provides two approaches to buffer management under demand uncertainty and evaluates subsequent improvements in terms of cost effectiveness and service level through a series of analyses on demand characteristics, operation process and buffer policy.

WIDGET X belongs to a mass customization product line and represents various finished optics products, which have different features and functions in terms of different combinations and configurations of 305 sub-assembly modules from 6 distinct module families. The customer requirements of final assemblies of WIDGET from the international and domestic market are highly diverse, which result in the demand of sub-assembly modules has 3 outstanding attributes: lumpiness, dispersion and volatility and extremely unstable. Therefore the demand of these modules is hard to forecast according to historical sales data and buffer management on the basis of forecasted demand distribution cannot efficiently handle the demand uncertainty.

Two thoughts are derived from wide arguments for buffer management to deal with the lumpy demand. First, solutions, which can make the production planning respond to customers’ real demand, are more advisable, such as make to order (MTO).
Second, we can aggregate the demand of module family and use buffer policies that utilize forecasted demand distribution to buffer uncertainty of aggregated demand, because the aggregate demand of a module family is relatively stable and has lower coefficient variation compared to individual module.

Based on the two thoughts, two strategic approaches are provided to deal with the demand uncertainty under the specific environment: the first one, make-to-anticipated-order (MTAO), is to use responsive strategy to trace demand rather than to forecast demand to arrange production planning when master production scheduling (MPS) level items are individual modules. The other method is to use postponement strategy by postponing the customization of individual modules from common modules of the module family until the point that actual orders are received.

The mechanism of MTAO is to make use of early purchasing information and signals from potential customers and organize production according to anticipated orders TLT+1 time periods in advance of the expected due date. It has 3 main parts in terms of the process of production decision making. The first part, forecast and planning management, illustrates how to forecast and control orders; the second part, MPS control under uncertainty, deals with MPS changes on rolling horizon basis; the third part, redundant orders and unexpected orders management, focuses on slack and unexpected demand control. The implementation of this method, on one hand, breaks through the precondition of MTO that the total production cycle time should be less than customer desired lead time by making use of an extra time that customers think over purchasing plans before they place actual orders. On the other hand, MTAO enjoys the advantage of arranging production by responding to customers demand to reduce inventory costs and obsolescence risks of MPS level items. MTAO is also called order overplanning for its unique process of buffer control compared to other buffer approaches.

In sum, MTAO is a new paradigm on operations. Under demand uncertainty, it focuses on looking into future of customer purchasing process to direct production by responding to anticipated demands rather than looking behind to arrange buffers by figuring out demand patterns to buffer uncertainty. Thus, when it is hard to forecast according to historical data and customers’ desired lead-time is too short to implement MTO, MTAO brings new opportunities. Moreover, MTAO can enhance trans-functional
collaboration within a company and the implementation of MTAO can stimulate the suppliers to develop closer intercompany operating ties with their customers or to reinforce their customer relationship management. However, since the forecast and planning of anticipated orders are empirically and subjectively decided, MTAO needs more techniques to reinforce its process control and therefore to improve the effectiveness of its implementation.

The second approach to buffer management is to reduce demand uncertainty by implementing postponement and commonality strategy. The basic principle is that aggregate demand is more stable than disaggregate demand. Namely, forecast of aggregate demand is more accurate than that of disaggregate demand. Thus, if a common module instead of various individual modules in a module family acts as MPS item, the demand of the common module will represent the aggregate demand of all individual modules in the module family and more accurate forecast can be made based on the demand of the common module. By making use of the forecast of demand distribution of the common module, we can figure out detailed safety stock policy of the common module to buffer demand uncertainty. On the other hand, the configuration of customized demand is postponed to the time period that actual order is received. In effect, by implementing postponement and commonality strategy, we change the push-pull boundary from the stage of assembly and testing to the stage of common module production and leave more demand uncertainty to the pull part of the system.

Moreover, to implement commonality, we should tradeoff the cost and the anticipated benefits. Commonality may not be applicable to all module families. The most important module family, optics family, which falls in to category of A according to A, B, C analysis has the foremost priority to implement commonality.

In addition, assuming the common module of optics family, common optics, is realized by product design, the next critical step is to optimize multistage inventory placement to achieve minimum holding cost of total safety stock under a certain forecasted demand distribution of the common optics. A base model of the common optics is built to figure out the optimal multistage inventory placement in the supply chain where the forecasted demand distribution is given. Furthermore, we compare the inventory placements in different scenarios and get the conclusion that more savings on
holding cost of total safety stock can be achieved if we implement global optimization based on an integrated supply chain. Finally, we provide a sensitivity analysis to illustrate the relationship between the maximum service time to customers and the corresponding holding cost of total safety stock. According to the analysis, we suggest that the Telecom decides the maximum service time to customers by taking account of both customers’ requirements and the relevant safety stock holding cost, especially when the marginal effect of service time to safety stock holding cost is big.