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Management Insights

Tradeoffs in Manufacturing? A Meta-Analysis and Critique of the Literature
Eve D. Rosenzweig, George S. Easton

There has been a considerable debate among operations strategists concerning whether managers should be advised to focus on only one of the four competitive performance dimensions—quality, delivery, flexibility, or cost. Some operations strategists argue that when a manufacturer attempts to achieve an advantage on more than one of these dimensions at the same time, a lack of strategic focus and ultimately poor performance will likely result. Thus, these operations strategists claim that tradeoffs among the dimensions of quality, delivery, flexibility, and cost are necessary. Other operations strategists argue that manufacturers do not necessarily experience these tradeoffs. Instead, they believe that manufacturers can focus on and attain an advantage on multiple dimensions of performance simultaneously. Numerous research papers in the operations strategy literature have studied aspects of the tradeoffs issue. In this paper, we analyze the results in the body of literature and find that the preponderance of evidence indicates that manufacturers, on average, do not report experiencing the claimed tradeoffs among the key competitive dimensions of quality, delivery, flexibility, and cost. The conclusion is that manufacturers should not necessarily be deterred from attempting to improve on and achieve an advantage on more than one of these dimensions simultaneously.

Optimal Planning Quantities for Product Transition
Hongmin Li, Stephen C. Graves, Donald B. Rosenfield

This paper addresses the tactical inventory planning decisions during a transition from an existing to a newer generation product. In a product transition, the uncertainties in demand and in the new product release date often lead to demand and supply mismatches, and thus lost revenues or increased obsolescence cost. The authors determine the optimal planning quantities for the old and the new products for the transition, while allowing the company to dynamically substitute the new product for the old when the old product stocks out. The findings in the paper indicate that substitution reduces the inventory-related costs for the old product and can increase the overall profitability from the transition. The authors also find that growing uncertainty in the new product release date does not necessarily result in more substitutions or more new product inventories, which is counter to our intuition. Finally, when faced with potential excess inventory of the old product, a company might consider delaying the release of the new product and deferring its revenues, so as to consume the old-product inventory; the authors propose a method to determine the optimal delay.

Statistical Process Control and Condition-Based Maintenance: a Meaningful Relationship through Data Sharing
Sofia Panagiotidou, George Tagaras

Statistical process control and preventive maintenance of manufacturing equipment are usually closely related and thus their coordination through data sharing can greatly improve their efficiency. Although the interrelationship between these two functions has been widely recognized by both practitioners and research community, they are typically treated independently, leading in suboptimal operation of the combined process control – preventive maintenance system. The authors emphasize this interrelationship and provide a tool for the optimal joint design of process control and condition based maintenance, which can be applied in a broad range of industrial applications. The objective is to prevent the manufacturing equipment from both quality deterioration and complete failures in the most effective way. The authors' findings show that taking into account rather than ignoring the close relationship between process control and maintenance may result in considerable economic benefits.

The Effect of Delayed Incentives on Supply Chain Profits and Consumer Surplus
Moutaz Khouja, Jing Zhou

Delayed incentives in the form of consumer cash mail-in rebates are popular among manufacturers and retailers. The authors examine the use of consumer cash mail-in rebates offered by a manufacturer. Rebate re-

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demption rate increases in rebate value. The authors' analysis indicates that rebates are profitable for manufacturers if consumers are inconsistent in the sense that their rebate valuation when they make purchase decisions is independent of their redemption probabilities when they make redemption decisions. The retailer responds to rebates by increasing the retail price, which increases the margin paid by consumers who do not redeem the rebate. The increase in the retail price offsets much of the increased demand and profit benefits the manufacturer seeks. Therefore, incentive schemes which limit the retailer's price increase are useful. In those incentive schemes, the manufacturer suggests a retail price and a rebate value to the retailer and if the retailer agrees to use this price, then the manufacturer offers and pays for the rebate. If the retailer uses a larger price than suggested, the manufacturer reduces the rebate. The manufacturer determines the suggested price and the matching rebate. The retailer determines the retail price. Some of these schemes improve supply chain profits.

Pre-orders for New To-be-released Products Considering Consumer Loss Aversion
Xuying Zhao, Kathryn E. Stecke

Many retailers encourage consumers to preorder new to-be released products by offering a price discount. Through preorders, retailers not only increase sales but also have better ideas about demand in the selling season. On the other hand, when a consumer preorders a to-be-released product, he is uncertain about the product valuation and may realize negative surplus (loss) later. So he may hesitate to buy early, especially if he is loss averse. The authors study three possible strategies: no advance selling allowed (NAS), moderate advance selling with a moderate discount for pre-orders (MAS), and deep advance selling with a deep discount for pre-orders (DAS). They find that if a retailer sells high profit margin products, then she should always use DAS. If a product has a medium profit margin, a retailer should always use MAS except when consumer expected product valuation is high, then a retailer should consider DAS. If a product has a low profit margin, a retailer should use NAS, MAS, and DAS, respectively, for situations with low, medium, and high consumer expected valuation, respectively.

Single-Period Two-Product Assemble-to-Order Systems with a Common Component and Uncertain Demand Patterns
Yongbo Xiao, Jian Chen, Chung-Yee Lee

Manufacturers that adopt an assemble-to-order (ATO) strategy may deal with multiple large customers who usually want tailored solutions, fast delivery and quick responses. Due to long procurement lead times, manufacturers need to stock the inventories for each component before the actual demands are realized. The stocking decisions need to take into consideration the possible arrival sequences of customers, since different customers have different profit margins and the manufacturer has to make a commitment on how many end-products to deliver immediately upon the receipt of each customer order. The authors consider a single-period ATO system that produces two types of end-products to satisfy two independent and stochastic customer orders that may realize one after another, and investigate the impact of the uncertain demand patterns. Major findings include: (i) the first show-up of the low-priority customer has a negative impact on the magnitude of the potential risk-pooling effect; (ii) the uncertain demand pattern has a significant impact on the manufacturer's optimal decision and performance, especially when the high-priority customer has a low probability to confirm her order size first; and (iii) "split fulfillment" could be an efficiently way to cater for the risk that arises from the uncertain demand arrival sequence.

An Analysis of Dual-Kanban Just-In-Time Systems in a Non-repetitive Environment
Rafael Diaz, Ali Ardalan

Advances in production technology and innovative improvements in management of operations have created the opportunity for application of operations management techniques that were originally designed for one type of production process to other types of production processes. Specifically, a number of practitioners and researchers have considered modifying the just-in-time system that was originally designed for mass production of very similar products and applying it to batch and job shop production systems. One such modification is done by including the information about the number of customers waiting for each type of product in determining production priority for each product in each work center in a non-repetitive process. Products with larger number of customers waiting have higher priority over products that have fewer customers waiting for. Ignoring the information about customer waiting lines may result in producing components and products that may have no immediate demand. The system will be using the information provided by kanbans only, producing component and products to fill containers waiting for customers demand. Incorporating the customer line information helps the system produce products that have immediate demand. The result is shorter customer wait time and lower inventory in each work center.