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Management Insights

Supply Chain Strategies for Perishable Products: The Case of Fresh Produce
Joseph Blackburn, Gary Scudder

The freshness of produce that consumers buy at the market is largely dependent on how the product was handled in the supply chain. For produce such as melons and sweet corn, peak freshness occurs at the time of harvest, but freshness diminishes rapidly if allowed to sit at high field temperatures. We show that the supply chain design that maximizes product value has two stages: an initial stage designed for speed, followed by one based on efficiency. The first stage maximizes product value by rapid transfer of freshly picked product to a cooling facility to remove field heat and arrest the deterioration process. Having established the cold chain, product freshness remains stable and the second stage of the delivery process to the consumer can be designed for efficiency rather than speed. We develop optimal operating policies for both stages of the fresh produce supply chain.

Managing Functional Biases in Organizational Forecasts: A Case Study of Consensus Forecasting in Supply Chain Planning
Rogelio Oliva, Noel Watson

Within the firm, forecast generation and sharing is used to guide the distribution of resources, determine organizational targets, and integrate the operations management function with the marketing, sales, and product development functions. This requires the forecasting process to integrate information from diverse sources that are often subject to functional biases that can impair the forecast accuracy. To manage these biases, it is necessary to go beyond statistical techniques and understand the organizational and political context in which the forecasting process takes place. The authors' analysis of a successful multifunctional forecasting process reveals that well-designed forecasting process, together with the supporting mechanisms of information exchange and elicitation of assumptions, is capable of managing the potential political conflict and the informational and procedural shortcomings. The authors also find that the creation of an independent group responsible for managing the forecasting process, an approach that we distinguish from generating forecasts directly, can stabilize the political dimension sufficiently to enable process improvement to be steered. Finally, the authors find that while a coordination system—the relevant processes, roles and responsibilities, and structure—can be designed to address existing individual and functional biases in the organization, the new coordination system will in turn generate new individual and functional biases.

Demand Forecast Sharing in Supply Chains
Birendra K. Mishra, Srinivasan Raghunathan, Xiaohang Yue

Forecast sharing in both make-to-stock and make-to-order scenarios has important positive implications on supply chain practice. In the make-to-order scenario, a side payment contract cannot induce Pareto-optimal information sharing equilibrium, but a discount-based wholesale price contract can. The social welfare as well as consumer surplus is higher under the discount contract, compared with under no information sharing. In the make-to-stock scenario, the manufacturer realizes additional benefits in the form of savings in inventory holding and shortage costs when forecasts are shared. If the savings from inventory holding and shortage costs because of information sharing are sufficiently high, then a side payment contract that induces Pareto-optimal information sharing is feasible in the make-to-stock scenario.

Forecast Updating and Supplier Coordination for Complementary Component Purchases
Douglas J. Thomas, Donald P. Warsing, and Xueyi Zhang

We study the contractual relationship between an original equipment manufacturer and a contract manufacturer that produces a sub-assembly of complementary components with different lead times. Through mathematical analysis and computational experiments, we study the original equipment manufacturer's use of forecast-update sharing and component overage risk-sharing to positively

influence the component procurement decisions of the contract manufacturer. Our model is formulated from the perspective of the original equipment manufacturer, to minimize its costs given knowledge of the contract manufacturer's cost-minimizing behavior. Across our computational experiments, an original equipment manufacturer policy to provide forecast updates and share overage risk on both long- and short-lead-time component sets captures, on average, over 60% of the improvement in the supply chain costs that would result from a centralized solution that minimizes joint costs of the original equipment manufacturer and the contract manufacturer. Moreover, while we show by an example that it is possible for the original equipment manufacturer to be hurt by providing the forecast update, this never happened in our more general set of computational experiments. Further, our experiments suggest that the relative impact of forecast-updating and risk-sharing on original equipment manufacturer and contract manufacturer costs overall is about the same, and that their combined effect generates significant cost improvements over a no-updating, no-risk-sharing policy.

Incentive Contracts in Projects with Unforeseeable Uncertainty
Svenja C. Sommer & Christoph H. Loch

When an organization undertakes an innovative initiative or project, it has insufficient information at the outset to foresee all events or results of its actions. This makes ''Management by Objectives'' (target setting and measuring target fulfillment) insufficient. The authors suggest that supervising management or the steering committee should consider the following principles when setting incentives for project managers working on such initiatives or projects: first, whenever it is possible to monitor professionalism and effort, provide process incentives, that is, reward managers for ''doing the right thing'' independent of the outcomes. Second, if monitoring is impossible, offer incentives based on project outcomes, but guarantee a compensation floor to protect the manager from the impact of unexpected ''bad luck'' outside his control. In addition, retain the flexibility to modify the contract for the case of unexpected events making goal achievement harder (''bad news'') or easier (''good news''). And finally, offer upward incentives to managers if they reveal and pursue unexpected opportunities not readily observable to supervising management. Such ''finder rewards'' motivate the project manager to go beyond target fulfillment and pursue the project's full potential including unexpected opportunities.

Motivating Retail Marketing Effort: Optimal Contract Design
Samar K. Mukhopadhyay, Xuemei Su, Sanjoy Ghose

A sales agent's marketing effort has direct impact on customer satisfaction and sales performance. Hence, a manufacturer's supply chain management strategies need to include tools for motivating an agent's marketing effort. In reality, manufacturers face the problem of lack of full information and lack of control. Business contracts are made under these situations. Different contract forms are available in practice. It is important for a manufacturer to choose a contract form that can motivate an agent's marketing effort under various scenarios and also can exert certain level of control. This paper investigates the effectiveness of different contract forms for exerting various degrees of control over the agent. It derives closed form solutions on equilibrium marketing effort level, order quantity, and retail price for those contract forms. It also shows how a manufacturer can reduce the information rent— the benefit the agent earns due to holding private information.

Acquisition Management under Fluctuating Raw Material Prices
Jian Yang and Yusen Xia

Raw material price fluctuation is a common phenomenon faced by many firms, particularly those dealing with raw commodities. The task of managing material acquisition activities is even more daunting when price issues are further compounded by inventory management concerns. Our analysis shows that the firm should always acquire raw material to the extent that its raw material inventory level barely touches a target level, which is in turn dependent on the current raw material price. More importantly, we confirm that the target level is decreasing in the current raw material price when two conditions are satisfied. The two conditions are: (1) the mean reversion condition, which says that prices are more likely to climb when the current price is low and more likely to drop when the current price is high, and (2) the time continuity condition, which says that the price is not expected to change drastically in a very short period of time. In the ever more globalizing real world, commodity prices are influenced by worldwide supply/demand shifts, as well as geopolitical affairs that, although seemingly random, possess long-term trends. Also, these prices evolve more or less continuously over time, and so it is realistic to postulate the two conditions.

Using Frontier Portfolios to Improve Make-to-order Operations

Jinfeng Yue, Yu Xia, Thuhang Tran, Bintong Chen

A make-to-order manufacturer may have to use several suppliers for a part because one supplier may not have sufficient capacity to provide all of the quantities required by the due date. When the manufacturer receives a custom order, it can use information about each supplier's quality, available capacity, costs, and processing time to determine the component portfolio for each supplier (that is, which supplier produces what component and in what quantity) to achieve the desired service level and/or to shorten the delivery time. An analytical method Yue and colleagues have developed can be used to develop a portfolio frontier that displays the trade-off between on-time delivery and the replenishment cost reduction. By selecting the suppliers and determining their portfolios, manufacturer may have better control, better product quality, more on time delivery, and higher customer satisfaction for the custom order. The manufacturer can use this method to reduce delivery time for competitive bidding and to answer questions such as the following: To respond quickly to irregular orders with short delivery due dates, why should the manufacturer choose internal processing instead of outsourcing the order? If suppliers' capacity is limited in a booming market, what criteria could the manufacturer use to select single or multiple suppliers for a custom part? Is it possible to provide multiple comparable supplier solutions for decision makers instead of a single optimal solution? For any comparable supplier solution, how are custom part quantities allocated for each supplier to best meet the manufacturer's goal?