

## Management Insights

### **Researchers' Perspectives on Supply Chain Risk Management**

ManMohan S. Sodhi, Byung-Gak Son, Christopher S. Tang

Supply chain risk is near the top of CEOs' agenda according to surveys by IBM, McKinsey and others. As such, it is an attractive field for supply-chain researchers, who have approached it with diverse viewpoints owing to their different domains. Sodhi, Son and Tang have sought to study this diversity from the perspectives of these researchers themselves in three steps: first, by reviewing the researchers' output, i.e., the recent research literature, second, by surveying two focus groups of researchers, and finally by surveying operations and supply chain management researchers. Their findings characterize the diversity in terms of three "gaps": (1) a definition gap in how researchers define SCRM, (2) a process gap in terms of inadequate coverage of response to risk incidents, and (3) a methodology gap in terms of inadequate use of empirical methods. In the survey in the third step, researchers confirmed these gaps and also suggest ways to close these gaps. Thus, these findings create a basis for researchers to collaborate with each other, with industry and with research journals.

### **Pricing Decisions during Inter-generational Product Transition**

Hongmin Li, Stephen C. Graves

Technology products frequently go through product transitions during which a new generation of product replaces the old generation product. High uncertainty in a new product introduction often leads to extreme cases of demand and supply mismatches. Pricing is an effective tool to either prevent or alleviate these problems. Li and Graves study the pricing decisions in the context of a product transition during which a company sells both the old and new products. Their analysis sheds light on how product replacement, along with substitution, competition, and inventory scarcity, affect the optimal prices for the two products during the transition. In particular, the pricing decisions are strongly influenced by the demand replacement effect. As the new product gradually replaces the old product, the optimal prices of both products decrease initially, and then gradually recover, after

controlling for the impact of inventory and competition. In addition, the authors demonstrate how certain product or market characteristics, such as the speed of the transition, customers' price sensitivity, and the speed of product obsolescence affect the pricing decisions in the transition.

### **Innovation Outsourcing: An Empirical Study at Siemens**

Zhijian Cui, Christoph Loch, Bernd Grossmann, Ru He

It is becoming increasingly common to involve external technology providers in developing new technologies and new products. Two important phases involved in working with technology vendors are vendor selection and vendor management. Based on 31 case studies at Siemens, this study provides guidelines for managing these two outsourcing phases. A selection criterion often associated with successful outsourcing is the provider's "track record" or previous experience. Cui, Loch, Grossmann, He find that there is no absolute "track record" criterion that can be used; rather, the relevant track record needs to constitute a "match" between the client firm's outsourcing motivation and the provider's strengths. As to the second phase – managing the provider – they identify a number of operational project success drivers by comparing five provider types – universities, competitors, customers, start-up companies and component suppliers. They find that some success drivers are common to all providers, while others are relevant only for certain types of provider. For example, detailed process control is particularly important for university and component suppliers as providers, while IP protection is critical for competitors and start-ups. Moreover, drivers in the case of a mature technology are more focused on successful transfer to manufacturing than on development itself.

### **Measuring Seat Value in Stadiums and Theaters**

Senthil Veeraraghavan, Ramnath Vaidyanathan

It is critical for revenue management firms such as stadiums and theaters to make pricing decisions based on consumer perceptions of the value of a seat. The *seat value* might depend on several factors including popularity of the event, the location of the seat

and consumer demographics. Using a proprietary dataset from a professional baseball franchise in Japan, Veeraraghavan and Vaidyanathan investigate how seat location and the frequency of attendance influence consumer perceived seat value. Their research provides firms with a tool to manage seat value perceptions through ticket pricing, seat rationing and seating layout decisions.

### **Revenue Management with End-of-Period Discounts in the Presence of Customer Learning**

Anton Ovchinnikov, Joseph Milner

Firms that practice dynamic pricing became increasingly aware that consumers can learn about past prices and may strategically delay their purchase in hope of obtaining a better price. Ovchinnikov and Milner discuss how firms can strategically respond to such wait-or-buy behavior. They show that firm's response differs drastically depending on the nature of the learning process: if consumers self-regulate then firm should act passively offer some inventory at a discount in all periods, otherwise the firm should take a more active approach and intermix the periods when discounts are offered and those with no discounts. The latter leads to some inventory being unsold, but that is more profitable for the firm, because it discourages excessive waiting on the consumers' side. Finally the authors show how the practice of overselling capacity (and bumping some customers) can also be effective in managing customer waiting. Overall, the authors demonstrate that by following the policies they suggest, the firm can increase revenue quite significantly as compared to some popular managerial heuristics.

### **Sharing Responsibility for Product Recovery Across the Supply Chain**

Brian W. Jacobs, Ravi Subramanian

Extended Producer Responsibility (EPR) legislation is gaining momentum around the world. EPR programs typically designate the producer – a single actor in the supply chain – responsible for the recovery and treatment of end-of-life products. A prominent example is the EU's Waste Electronics and Electrical Equipment (WEEE) directive. Jacobs and Subramanian explore if a two-tier supply chain could perform better if product recovery responsibilities are shared between the tiers. While intuition would say that a supply chain firm not designated as the producer would seek to avoid product recovery responsibilities, the authors demonstrate conditions under which the profits of both the individual firms increase if the non-designated firm assumes

some portion of the recovery cost. To jointly examine the impacts on both economic and environmental performance, the authors devise a measure of overall social welfare and demonstrate that social welfare too can be improved by the sharing of responsibility between the supply chain tiers. These insights are of importance to managers in industries that are either subject to or anticipating product recovery regulation.

### **An Analysis of the Eco-efficiency of Remanufactured Personal Computers and Mobile Phones**

João Quariguasi-Frota-Neto, Jacqueline Bloemhof

Remanufacturing, long perceived as an environmentally-friendly initiative, is supported by a number of organizations, such as original equipment manufacturers (e.g. Microsoft) and governments. Yet, the assumption that adding remanufacturing to the life-cycle of a product is desirable to society has never been systematically investigated. In this paper Quariguasi-Frota-Neto and Bloemhof find that remanufacturing mobile phones and personal computers substantially reduce the energy consumed over the life cycles of these products. However, for certain computer and mobile phone units, adding remanufacturing may actually decrease the eco-efficiency of these products (where eco-efficiency includes both Willingness to Pay (WTP) for the products as well as the energy to manufacture them), the reason being that the WTP for remanufactured personal computers and mobile phones, and consequently, their eco-efficiencies, are function of the prices of the corresponding new products at launch and the years elapsed between launch and remanufacturing. The authors also observe that, on average, for the items that are currently remanufactured (high-end items at the beginning of their life-cycle), remanufacturing increases eco-efficiency.

### **Scheduling Shipments of Containers Overseas**

Byung-Cheon Choi, Kangbok Lee, Joseph Y-T. Leung, Michael L. Pinedo, Dirk Briskorn

In the international trade a very large proportion of the maritime flow of goods goes by container. For example, an enormous number of containers move from ports in Asia to ports in North America. Various shipping lines, e.g., Maersk Line, APL, Hapag-Lloyd, maintain a regular service between the major ports on the different continents. Ships of any given line depart from any given port at regular time intervals. A container enters the docks of the port of departure at a certain date and is expected to arrive at its destination port by some committed delivery date (the goods may, for example, be destined for the shelves of a

department store by the onset of the Christmas shopping season). If the shipping line has vessels leaving the ports at regular intervals, then the question arises: which containers should go on which ship? Containers come in two sizes, namely twenty foot containers and forty foot containers; a twenty foot container is referred to in practice as 1TEU (twenty foot equivalent) and a forty foot container is commonly referred to as a 2TEU container (2 twenty foot equivalent). A container ship can carry a specific number of TEUs. Choi, Lee, Leung, Pinedo, and Briskorn analyze the related packing and scheduling problems. The resulting problems tend to be hybrids between classical packing (knapsack) problems and classical scheduling problems. They find that, from a mathematical point of view, these problems can turn out to be quite complicated, but, fortunately, there are simple heuristics that work quite well. They show, among other results, how the effectiveness of certain heuristics depends on the total loading capacities of the ships as well as on their inter-departure times.

### **Competitive and Collaborative Quality and Warranty Management in Supply Chains**

Yue Dai, Sean X. Zhou, Yifan Xu

Product quality and product warranty coverage are two important and closely related operational decisions. A long warranty protection period or poor product quality often results in a high warranty cost and so reduces supply chain efficiency. Through analyzing a single-supplier, single-manufacturer supply chain with warranty-dependent random customer demand, Dai, Zhou, and Xu find that, if the downstream manufacturer sets the warranty, then product quality is better and the warranty period is longer when the wholesale price charged by the supplier decreases or the retail price increases; in contrast, if the upstream supplier sets the warranty, product quality is often better and warranty period becomes longer when the wholesale price or retail price increases. Furthermore, their study shows that letting the firm with a larger share of total warranty costs determine the product warranty tends to make the whole supply chain better off. To coordinate such a supply chain with quality and warranty decision, the firms need to share properly not only demand risk but also their warranty and quality costs.

### **Controlling Power Retailer's Gray Activities through Contract Design**

Xuemei Su, Samar K. Mukhopadhyay

Channel diversion in a supply chain is the practice of shifting of merchandise from the manufacturer's intended distribution channel to an unauthorized

channel, to evade the manufacturer's control. The practice of diversions, which is a type of gray market activities, is a big business that costs companies tens of billions of dollars every year. Su and Mukhopadhyay study a supply chain with one dominant retailer and a number of fringe retailers where gray market activity can be developed due to asymmetric buying powers and retailing costs. They studied two popular types of supply chain contracts, namely a dynamic quantity discount (QD) schedule (a modified version of the common QD schedule) and a two-part revenue sharing (RS) contract. They found that an RS contract can achieve channel coordination and prevent gray market whereas a dynamic QD contract can engender gray activities, but also achieve near optimal profit for the supply chain. They also found that the dominant retailer's cost of providing extra service to the customers (like call center, customer service etc.) plays a prominent role in deciding which of the contract types is best for the manufacturer.

### **Contingency Strategies in Managing Supply Systems with Uncertain Lead Times**

Panos Kouvelis, Jian Li

The globalization of markets and locations of production facilities, combined with a heavy outsourcing of supply chain processes, has substantially increased the exposure of supply chains to supply lead-times of long and uncertain nature. This is particularly so for supply systems of functional goods (e.g. high volume and low market uncertainty staple items) sourced from far away locations with a substandard supplier base and logistics infrastructure. For these supply chains the most frequent cause in creating supply-demand mismatches is not demand uncertainty but unreliable supply. In this paper, Kouvelis and Li have effectively argued, through our developed stylized models, for the need for global supply chain managers facing operational and disruption risks to move beyond approaches that perform just ex-ante optimization of policy parameters and static execution of policies. It is important to find ways to couple them with contingency plans that appropriately react to the realized conditions. The smart exercise of such recourse actions (or "real options") will truly enhance our traditional "operational hedges" (mostly in the form of excess resources—safety stocks and capacities—and safety lead times) in dealing with significant uncertainties and operational risks. The authors have illustrated this in the case of lead-time uncertainties, and proved that the ex-ante planned and statically executed "safety lead-time" hedge (SL) becomes more powerful when combined with a "disruption safety stock" and/or with a dynamically planned and executed "emergency response", even if the emer-

gency resources are accessed at dynamically fluctuating and potentially positive drift prices.

### **Lead Time and Price Quotation Mode Selection: Uniform or Differentiated?**

Xuying Zhao, Kathryn E. Stecke, and Ashutosh Prasad

Firms in make-to-order manufacturing and service industries often need to quote lead times and prices before customers make purchase decisions. In practice, some firms quote only one uniform lead time and price to all customers. Some firms quote a menu including differentiated lead times and prices for customers to choose. Zhao, Stecke, and Prasad study whether or not a firm should provide multiple differentiated choices to customers when quoting lead time and price. Customers can be lead time sensitive (LS) or price sensitive (PS). The authors find that a firm should not offer differentiated lead times and prices in multiple scenarios. When LS customers do not value the product more than PS customers or when LS customers' lead time reduction valuation is only slightly larger than PS customers', a uniform quotation is better than a differentiated quotation in terms of profits. From another perspective, when PS customers have positive utilities in a uniform quotation or LS customers have positive utilities in a differentiated quotation, then a firm should use a uniform quotation instead of a differentiated quotation.

### **Design of Flexible Multi-Stage Processes**

Amit Eynan and Lingxiu Dong

Demand uncertainty and fluctuations have been a major challenge to manufacturers and service providers when making capacity decisions long before realization of demand. Concerns stem from the trade-offs associated with potential capacity excess and shortage. Lately, increasing number of multiple product firms reduced such burden and gained efficiencies by employing flexible capacity. These results were also supported by academic investigations which mostly

relied on a single stage representation of the whole process. However, it became apparent in recent practice that not all stages should be flexible in order to achieve economic gains. Eynan and Dong investigate the optimal capacity design of such multiple stage processes allowing each stage to be dedicated or flexible. Their findings suggest that all flexible stages should have the same capacity and all dedicated stages should have the same capacity leading to a simple solution procedure. Furthermore, the optimal process structure may not have a transitional point where all stages before are flexible and all stages after are dedicated. Rather stages' designation changes back and forth along the process. The authors use a multi objective function (containing several commonly used goals) to demonstrate the robustness of the results.

### **Newsvendor Pricing Problem in a Two-sided Market**

Mabel C. Chou, Chee Khian Sim, Chung-Piaw Teo, Huan Zheng

The popularity of two-sided market theories could due to the need to explain the workings of the software and related industries. A "platform" intermediary could still accrue profit by heavily subsidizing one side of the market. Chou, Sim, Teo, and Zheng analyze the inventory and pricing strategies of an intermediary platform in a two-sided market. They discovered another strategic option: the intermediary could also charge a surplus to both sides of the market to compensate for supply chain costs, despite the positive indirect network externalities in the markets. This appears to be the preferred strategy in the high-end fashion magazine industry, where both readers and advertisers are charged a surplus despite the positive network externality of readership on the advertising market. This result demonstrates clearly the importance of supply chain operational concerns on the strategic pricing decisions of a firm operating in a two-sided market.