

Management Insights

Misplaced Inventory and Radio-Frequency Identification (RFID) Technology: Information and Coordination

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While several retailers have popularized RFID (Radio-Frequency Identification) technology, recent surveys indicate that many firms are still skeptical about it. In addition to variable costs of investment due to RFID tags, firms adopting this technology face significant expenses in upfront fixed costs due to system integration, installation of equipment and so on. Allocation of benefits from this technology over supply chain partners has been a puzzling issue for practitioners. Considering both fixed and variable costs of RFID adoption, the authors find that a characterization of the incentives by an all-or-nothing scenario may lead to a partial representation of the problem. In fact, they show that arrangement of incentives of retailers and manufacturers to adopt the technology can result in win-win, lose-lose or win-lose scenarios depending on the value of unit tag price and the distribution of the fixed costs of investment over the retailer and the manufacturer. They show that vertically integrated supply chains can afford higher costs of investment than decentralized supply chains. Their research further indicates that firms with greater expectations in market demand have more incentives to adopt the technology whereas changes in the variance of the demand distribution may result in decisions in positive or negative directions.

Optimal Pricing and Production Planning for Subscription-Based Products

Woonghee Tim Huh, Soulaymane Kachani, Ali Sadighian

The authors address the problem of maximizing the profit of companies in subscription-based industries. This work was motivated by a close collaboration with Columbia Journalism Review, a leading journalism publication. They consider two major sources of revenue: advertisement revenue and sales of the magazine in the form of either direct sales at the newsstands or subscription sales. They consider three decision variables: production quantity, subscription price and newsstand price. They analyze both monopolistic and duopolistic settings and use specific

behavior for subscription and retention dynamics in order to derive explicit solutions that bring insight to the problem. Based on the cost structure of the firms and the loyalty of their customers, different types of equilibria emerge. They show that even if firms do not consider the full range of their choices and just act with the best response to their competitor's choice, they will eventually converge to the equilibrium policy. They observe that when the cost structures of the two firms are very different, a firm might produce more than the upper bound of its initial demand in anticipation of the overflow of the unsatisfied demand from the other firm. On the other hand, in the case where the firms are not radically different, they both produce within the bounds of their original demand.

Optimal Dynamic Pricing of Perishable Items by a Monopolist Facing Strategic Consumers

Yuri Levin, Jeff McGill, Mikhail Nediak

Dynamic pricing is a common revenue management practice in markets for perishable goods like airline tickets or hotel reservations. In many of these markets, repeat-customers can learn the pricing strategies used by a supplier and time their purchases strategically to periods of lower price; thereby undermining the potential benefits of revenue management. These tendencies may be reinforced by third-party web-sites that provide pricing histories of suppliers, comparative prices, and other relevant information. The authors develop a model of dynamic pricing that incorporates strategic consumer behavior. They show that such behavior can significantly reduce profits, even when a supplier holds a monopolistic advantage, and that dynamic pricing policies that are optimally adjusted for strategic behavior can recover some, but not all, of the loss. They further show that it may be possible for a monopolist to recover most of the losses by optimal dynamic pricing in conjunction with appropriate control of initial inventory.

Optimal Acquisition Quantities in Remanufacturing with Condition Uncertainty

Michael R. Galbreth, Joseph D. Blackburn

The condition of the used products acquired by remanufacturing firms is often widely varying and

uncertain. Since each product's condition affects its remanufacturing cost, condition uncertainty has an important impact on the profitability of remanufacturing. A remanufacturer may manage this uncertainty by adjusting the quantity of used items acquired on the open market: by acquiring more items than needed to meet demand, a firm can be selective and remanufacture only those items in better condition. In a model with linear costs, the optimal acquisition quantity increases with the square root of the degree of condition variability.

A Flexible Evaluative Framework for Order Picking Systems

Chien-Ming Chen, Yeming Gong, René B.M. de Koster, Jo A.E.E. van Nunen

The authors develop a novel framework to evaluate the integral performance of order picking systems with different combinations of storage and order picking policies. The framework combines data envelopment analysis, ranking and selection, and multiple comparisons to provide an efficient method to simultaneously analyze several interrelated problems in order picking systems with multiple performance attributes, such as service levels and operational costs. The framework facilitates search for the group of superior policy sets and allows managers to participate in the process for the final selection. Warehouse managers can therefore select order picking policies with increased flexibility in a changing environment. The authors demonstrate their approach through comprehensive evaluations of order picking policies in three low-level, picker-to-parts rectangular warehouses facing demand variations.

Scheduling Truck Arrivals at an Air Cargo Terminal

Jinwen Ou, Vernon N. Hsu and Chung-Lun Li

In a typical air cargo terminal, cargo delivery trucks arrive at the truck dock randomly and are served in a first-come first-served manner. For those trucks carrying cargoes to be loaded onto the outbound flights, they typically arrive at the time close to the flight departure. This creates potential congestion during the busiest air cargo traffic hours, which may delay either the flight departure time or the shipping time for those cargoes that miss the flights. The authors propose a model that can potentially relieve some of these problems. In their model, the terminal operator would schedule the arrivals of the delivery trucks, so that some of the shipments can be transferred directly to the departing flights without requiring extra handling and storage at the terminal, while other shipments

will be stored at the terminal's storage facility. The authors develop a mathematical programming based heuristic solution method for this proposed model. The authors demonstrate that their method can lead to substantial cost savings.

Network Game and Capacity Investment under Market Uncertainty

Qiaohai (Joice) Hu

This paper investigates the impacts of competition and market uncertainty on airlines' network structures and capacity investment on a simplified three-city network that includes a hub city and two side cities. Hub-and-spoke networks fly passengers to and from hub cities, while point-to-point networks provide nonstop flight service for all passengers. The main insights derived include: (a) if market is highly uncertain and capacity costs are high, then both airlines tends to adopt hub-and-spoke network, (b) if market is less uncertain, the market between the side cities is relatively large, unit capacity cost is not so high, at least one airline adopts a point-to-point network, and (c) passengers traveling between side cities benefit most from having an airline that adopts point-to-point network and pay the lowest price when both airlines adopt point-to-point network.

Analysis of Revenue Maximization under Two Movie-Screening Policies

Milind Dawande, Inna Drobouchevitch, Tharanga Rajapakshe, Chelliah Sriskandarajah

The authors examine the problem of selecting and screening movies at a multiplex under a variety of real-world constraints such as release dates and obligatory screening durations imposed by distributors. Two popular movie-screening policies are examined. In the preempt-resume policy, the screening of a movie can be preempted and resumed in its post-obligatory period. In the non-preempt policy, a movie is screened continuously from its release time until the time it is permanently withdrawn from the multiplex. The authors present models to optimally screen movies for a multiplex under both these policies, with the aim of maximizing the total revenue generated over the planning horizon. They present mathematical methods to obtain optimal or near-optimal screening schedules under both policies, thus offering managers of multiplexes a useful tool for selecting movies during the pre-season bidding process. The revenue generated from following the preempt-resume policy can be significantly higher than that from the non-preempt policy.