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Management Insights

Managing a Remanufacturing System with Random Yield: Properties, Observations, and Heuristics
Zhijie Tao, Sean X. Zhou, Christopher S. Tang

As a company extracts usable raw materials from returned products, it needs to develop a plan to make uncertain supply to meet uncertain demand of raw materials. Supply uncertainties mainly come from the uncertain quantity of returned products and the uncertain recovery yield of the extraction process. Zhijie Tao, Sean Zhou, and Christopher Tang develop a cost effective plan for managing inventories of the extracted materials and the returned products under demand and supply uncertainties. By analyzing a discrete time model, they show that the optimal inventory planning policy is highly complex. However, by exploiting the underlying structure of the optimal policy, they develop a near-optimal heuristic that can be efficiently solved and implemented in practice.

The Role of Revenue-Focused Managerial Performance Measures in Supply Chain Coordination
Liwen Chen, Stephen M. Gilbert, Xiaohui Xu

In practice, the performance measures that are applied to high level managers are often heavily influenced by sales revenues, causing them to worry more about generating revenues than about containing costs. Although such incentives seemingly misalign the interests of these managers from those of the firm owners, Liwen Chen, Stephen M. Gilbert, and Xiaohui Xu provide a game theoretic analysis of the role that revenue focused managerial performance measures can play in coordinating the investment decisions of two trading partners in a supply chain. For both the buyer and the supplier in the relationship, when their managers have revenue focused performance measures, they tend to invest more in promotion / capacity than they would with incentives that encourage them to maximize profits. This helps to overcome the chronic underinvestment issue that plagues most decentralized supply chains. When only the buyer firm uses a revenue focused performance measure, it is a perfect substitute for an appropriately specified price only relational contract and complements a price and quantity relational contact.

On the Use of Buy Up as Model of Customer Choice in Revenue Management
William L. Cooper, Le Li

One of the simplest models of customer choice in airline revenue management relies on the notion of "buy up." A buy-up model typically cannot accurately describe the full range of choice behaviors of customers in revenue management; that is, the buy-up model is typically misspecified. Nevertheless, a revenue manager may select booking limits based on solutions from such a model owing to its simplicity and to the hope that it will nevertheless produce reasonably good decisions. It is also typically the case that such a revenue manager will dynamically update estimates of the buy-up model's parameters as more data are accumulated. Working within a framework in which the buy model is misspecified, William L. Cooper and Le Li study the evolution of booking limits and parameter estimates. The analysis reveals that the buy-up model often works reasonably well even when it is misspecified, and also reveals the importance of understanding how parameter estimates of misspecified models vary as functions of decisions.

A Sales Forecast Model for Short-Life-Cycle Products: New Releases at Blockbuster
Casey Chung, Shun-Chen Niu, Chelliah Sriskandarajah

Accurately forecasting demand for short-life-cycle products is important for the efficiency of retail operations because it can avoid costly over- and under-stocking of products. Under-stocking leads to lost sales and over-stocking leads to unwarranted high inventory cost. In the DVD and electronic game industry, the prevalent forecasting tools are typically confined to rudimentary heuristic methods that are dependent on both historical analogies and personal expertise, as in the Delphi method. Consequently, the results are typically not reproducible and have an inherent degree of error, which is often significant. Casey Chung, Shun-Chen Niu, and Chelliah Sriskandarajah demonstrate the benefits of

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a scientific-modeling approach to forecasting DVD sales on the retail operations at Blockbuster.

Appointment Overbooking in Health Care Clinics to Improve Patient Service and Clinic Performance
Linda R. LaGanga, Stephen R. Lawrence

The problem of patients who do not show (arrive) for scheduled appointments is a significant challenge for health care clinics where reported no-show rates vary widely from 3 to 80%. Despite the best efforts of clinics to reduce no-show rates, they remain an intractable problem. However, it is possible to judiciously use appointment overbooking to balance the benefits of seeing more patients with the costs of increased patient waiting time and clinic overtime that can arise with overbooking. Experiments demonstrate that, contrary to common intuition, appropriate overbooking significantly improves both patient access and provider productivity with minimal impact on patient service. Approximations of clinic costs and operating characteristics are sufficient to obtain effective overbooked appointment schedules, but accurate estimates of patient show rates are critical for best results. These findings are easily extended to accommodate patient show rates that vary by time of day and can be applied to other non-medical service operations.

End-of-Life Inventory Decisions for Consumer Electronics Service Parts
M. Pourakbar, J.B.G. Frenk, R. Dekker

The end-of-life phase of the service life cycle starts as soon as the production of parts stops and finishes when the last service contract or warranty expires. While service satisfaction is a prime priority due to service obligations, excessive parts stocks render extra carrying cost and obsolescence risks. Firms resort to various measures to sustain service operations during this phase. The most popular one is placing a final order, just before the cessation of the part production. M. Pourakbar, J.B.G. Frenk, and R. Dekker consider the final order quantity decision for consumer electronic service parts which are sold in large quantities and have a rather short life cycle. The authors argue that since these goods face remarkable price erosion, servicing customers by repairing defective products is not always the best policy in the end-of-life phase and a switching to an alternative service policy such as swapping the defective product with a new one, might be more cost efficient. The authors develop various policies to determine the optimal final order quantity and policy switching time. They show that having a sound inventory system coupled with an accurate demand forecasting model results in a remarkable cost reduction and a substantial decrease in the obsolescence risk.

Should an OEM Retain Component Procurement when the CM Produces Competing Products?
Ying-Ju Chen, Stephen Shum, Wenqiang Xiao

Ying-Ju Chen, Stephen Shum, and Wenqiang Xiao consider a large original equipment manufacturer (OEM) who relies on a contract manufacturer (CM) to produce its product. In addition to the OEM's product, the CM also produces for a smaller OEM. Both the larger OEM and the CM can purchase the component from the supplier, but their purchase prices may differ and are unknown to each other. The main question the authors address is whether the larger OEM should retain component procurement by purchasing components from the supplier and reselling to the CM (buy-sell), or outsource component procurement by letting the CM purchase directly from the supplier (turnkey). The authors show that, under buy-sell, the larger OEM's optimal strategy is to resell components at the highest possible component purchase price of the CM (i.e., the street price). By comparing buy-sell and turnkey, the authors find that a CM with low component price is better off under turnkey, even though under buy-sell he receives more profits through the products sold to the smaller OEM. Furthermore, the larger OEM's preference between buy-sell and turnkey depends on the manufacturer's component price, the volatility of the CM's component price and substitutability between the two products.

An Evaluation of the NERJIT Priority Rule in a Kanban-Controlled Flowshop
Alireza Ardalan, Rafael Diaz

Alireza Ardalan and Rafael Diaz compare the performance of the priority rule "Net Requirements, Just-In-Time", NERJIT, with the conventional JIT process in a kanban-controlled flowshop. The statistical analysis of the simulation experiments shows that the use of NERJIT reduces customer wait-time significantly and lowers inventory slightly. NERJIT considers the current unsatisfied customer demand for each product and the total number of units of that product in production process to determine the net requirements for each product at each work center. Work center operators assign higher production priority to those products that have larger net requirement. As a result units are produced to satisfy current demand rather than just filling the empty containers in each work center with no immediate demand.

Workload Control and Order Release: A Lean Solution for Make-To-Order Companies
Matthias Thürer, Mark Stevenson, Cristovao Silva, Martin J. Land, Lawrence D. Fredendall

A simple yet effective production planning and control concept called "Workload Control" (WLC) is presented for use in low-volume high-variety manufacturers, which typically produce on a make-to-order basis. An essential element of WLC is its order release mechanism. Orders do not enter the shop floor immediately - they go to a pre-shop pool which protects the shop floor from order arrival rate variability. Traditionally, WLC research has focused on mechanisms which release orders from the pool periodically, according to urgency and the need to balance workloads across resources. Thürer, Stevenson, Silva, Land and Fredendall show that substantial delivery performance improvements can be achieved if this is combined with a continuous pull mechanism which prevents work centers from becoming idle between periodic releases. Even in low-volume high-variety contexts, this allows companies to effectively protect throughput from variance whilst reducing lead time and inventory buffers thus obtaining benefits equivalent to lean. The insight facilitates more successful implementations of WLC in practice. Unlike many alternative concepts, WLC is particularly suitable for embedding in small organizations as its core principles are simple to use and do not require significant investment in technology.

Pricing and Logistics Decisions for a Private-Sector Provider in the Cash Supply Chain
Mili Mehrotra, Milind Dawande, Vijay Mookerjee, Chelliah Sriskandarajah

The U.S. Federal Reserve's (Fed) new currency recirculation policy, effective since June 2007, is designed to encourage depository institutions (e.g., banks) to reuse the physical cash they receive from customers. For secure-logistics providers (SLPs), the Fed's policy presents a new business opportunity of offering cash fit-sorting services to depository institutions. In "Pricing and Logistics Decisions for a Private-Sector Provider in the Cash Supply Chain," the authors have important messages for an SLP that desires to provide fit-sorting as a new line of business, in addition to its traditional business of offering transportation services. While considering this opportunity, the SLP must examine how logistics and pricing decisions get intertwined in profit maximization. Not only are the two lines of businesses – fit-sorting and transportation – partial substitutes of one another, supply side forces that arise from the logistics network affect both these pricing decisions. Incorporating detailed logistics decisions (such as facility location, assignment, capacity decisions) significantly impacts the pricing of the provider's services. At a deeper level, nonlinearities in the cost of producing the service offerings further increase the influence of detailed logistics considerations on pricing decisions. Such nonlinearities are common across businesses with multiple capacitated service centers and volume-dependent production costs. Moreover, the influence of logistics decisions varies substantially depending on the structure of the pricing (e.g., volume-discount pricing, bundled pricing, etc.).