

## Management Insights

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### Measuring Corporate Social Performance: An Efficiency Perspective

Chien-Ming Chen and Magali Delmas

A novel methodology can be used to evaluate corporate social performance (CSP) based on data envelopment analysis (DEA). CSP has been recognized as a multi-dimensional concept, and one of the salient features of DEA is that it can systematically aggregate multiple qualitative CSP indicators into a single and intuitive efficiency index. From the DEA score, investors can easily derive a CSP ranking of firms, and use this information to improve their investment decision-making. Ming and Delmas illustrate the DEA approach through an application to the widely-used CSP database developed by Kinder, Lydenberg, and Domini Inc. Using firm-specific examples, they demonstrate that the DEA approach has the advantage of being more statistically robust and easier to interpret in practice, when compared with other competing aggregation approaches used in the CSP literature.

### An Analysis of Monopolistic and Competitive Take-Back Schemes for WEEE Recycling

Fuminori Toyasaki, Tamer Boyacı, Vedat Verter

Toyasaki, Boyacı and Verter study two prevailing types of take-back schemes for electrical and electronic equipment waste (WEEE) recycling: monopolistic and competitive. They address key market and operating factors that make one scheme preferable to the other from the viewpoints of recyclers, manufacturers, and consumers. They find that the competitive take-back scheme often accomplishes a win-win situation, that is, lower product prices, and higher recycler and manufacturer profits. Exceptionally, recyclers prefer the monopolistic scheme when the substitutability level between the manufacturers' original products is high or economies of scale in recycling are very strong. They show that consolidation of the recycling industry could benefit all stakeholders when the economies of scale in recycling are strong, provided that manufacturer's products are not highly substitutable. Higher collection rates also render recycler consolidation desirable for all stakeholders. They also identify a potential free rider problem in the monopolistic scheme when recyclers differ in

operational efficiency, and propose mechanisms to eliminate the discrepancy. Their results and insights are robust to the degree of competition within the recycling industry.

### Revenue and Cost Management for Remanufactured Products

Anton Ovchinnikov

Demand cannibalization is a major concern for firms that consider offering lower-priced remanufactured (refurbished) versions of their products together with the higher-priced new products. Anton Ovchinnikov presents a new model for analyzing demand cannibalization and supports it with a study of consumer behavior. He shows that there exists a segment of consumers who use the price of the remanufactured product to infer about its quality, and thus pricing the remanufactured product below a certain threshold can, in fact, decrease cannibalization and persuade such quality-cautious customers to purchase the higher-priced new products, while still attracting new price-cautious consumers who will purchase the refurbished products. He then embeds this logic into the firm's price and quantity optimization and shows that as a result the firm remanufactures under broader conditions, charges a much lower price, and typically remanufactures more units – leading to an increase of profits from remanufacturing by up to a factor of two as compared with making decisions based on standard approaches.

### Cost Allocation in Manufacturing–Remanufacturing Operations

L. Beril Toktay, Donna Wei

Remanufacturing is a process by which value is recovered from used products. Examples of remanufactured products include copiers, cell-phones, computers, automobile parts, printers, toner cartridges, etc. In firms that offer remanufactured versions of their products, the division responsible for the production/sales of the new products is typically different from the one in charge of remanufactured products. The natural question arising for such firms is: Since the same inputs (materials, parts, etc.) may be used twice to generate revenues in different divisions, who should bear the

cost of these inputs? A wide variety of cost allocation practices between the divisions responsible for manufacturing and remanufacturing exist in practice. Toktay and Wei provide cost allocation guidelines for manufacturing and remanufacturing operations. They determine that a cost allocation mechanism that allocates a portion of the initial production cost to each of the two stages of the product life-cycle should be used. They also conclude that cost allocation should be implemented as a fixed cost allocation, where charges to the remanufacturing division should be determined independently of the actual quantity of units remanufactured.

### **The Impact of Variability and Patient Information on Healthcare System Performance**

Peter A. Salzarulo, Kurt M. Bretthauer, Murray J. Côté, Kenneth L. Schultz

In outpatient health care facilities, the method of scheduling patients is an important operational activity as it affects both the patient waiting time and the facility's resource utilization. Obtaining the proper balance of these two measures of performance is made difficult by the presence of variation in both the patients' arrival and service processes. Of the different sources of variation possible, unplanned visits by the patient to the facility's laboratory or X-ray services in particular has a severe detrimental impact on the utilization of facility resources, such as a physician's time. From the patient's standpoint, their average waiting time is affected a great deal by how their physician prioritizes completing ancillary tasks, such as telephone calls, relative to examining patients. One promising method to improve the patients' waiting time and the facility's resource utilization is the use of patient information to create more complex appointment schedules. For example, classifying patients and then scheduling patients in specific sequences according to their classification can yield significant improvements in the facility's performance.

### **Linking Task Conditions to Physiology and Judgment Errors in RM Systems**

Elliot Bendoly

Stress related judgment errors may be common in the increasingly complex computerized work that revenue managers and those below them engage in. Specifics of the work context such as remaining unfilled capacity in advance of a designated period of potential use, as well as the number of distinct capacity types managed, can greatly impact RM behavior and performance. Dynamic approaches to managing workload may be possible however. One solution could be artificially lowering the apparent amount of

capacity that needs filling. Such an adjustment might involve a reallocation of some of that capacity task to another revenue manager or an individual cross-trained sufficiently to deal with it, or even to a more automated AI mechanism. Alternately, portions of capacity might be held in buffer, beyond the purview of RMs, until other capacity units are allocated and the threat of stress-related errors mitigated. These interventions however depend on the ability of higher level managers and analysts to either clearly associate capacity conditions with an individual RM's tendency to make specific kinds of errors. As biometric technologies become more pervasive certain workers may be willing to have stress unobtrusively monitored with an interest in allowing management to take action to reduce it.

### **When Should a Firm Open Its Source Code: A Strategic Analysis**

Peter M. Kort, Georges Zaccour

Why do some firms give their source code away for free whereas others sell it? Kort and Zaccour deal with this intriguing question in a context where two firms provide both software and a complementary product, where the latter can only be used if consumers have also bought the software of the firm. They find that it is in the best interest of a company to give its software away for free if this market is highly competitive, the complementary-product market is less competitive, and when the complementary product is of high quality. Furthermore, it is more profitable for a firm to give its software away for free if its competitor also does so.

### **Optimal Enhancement and Lifetime of Software Systems: A Control Theoretic Analysis**

Yonghua Ji, Subodha Kumar, Vijay S. Mookerjee, Suresh P. Sethi, Denny Yeh

Large organizations are faced with the problem of continually enhancing existing software systems, quickly and at low cost. Ji, Kumar, Mookerjee, Sethi, and Yeh address this problem by developing a dynamic model. There are three important decisions to be made: choosing the optimal number of features at the time of adoption, choosing the optimal effort level to add more features after the release, and optimizing the lifetime of the system. Clearly, these three decisions are interrelated, and cannot be optimized separately. They, therefore, optimize these decisions simultaneously. They find that when the initial number of features in a released system is below a threshold, then maximum enhancement effort should be spent in the beginning. Otherwise, the organization should not put any effort to enhance the product right

after its release. Moreover, new features should not be added near the end of the lifetime of the software. Their analyses also show that the time at which the new system becomes available has a crucial impact on the enhancement strategy when the new system is highly valuable (compared to the existing system) and the enhancement cost is moderate. Hence, in this region, it is important to estimate accurately when the new system would become available.

### **Impact of Demand Uncertainty on Stability of Supplier Alliances in Assembly Models**

Greys Sošić

Assembly systems in general include two parties, the assembler and the suppliers. The structure of those systems has several important operational and strategic implications. If the assembler can correctly predict the number of suppliers he deals with, the structure of alliances they form, and the composition of the resulting kits, he can improve his profit, and sometimes even modify the design and variety of his final product. On the other hand, if a supplier of a particular component has the ability to predict stable outcomes, he can better evaluate whom to align with and what is the long-term stability of his decisions. In this work, the authors analyze how these results depend on the uncertainty levels of the demand, the elasticity of the demand, and its curvature.

### **The Newsvendor Problem and Price-Only Contract When Bankruptcy Costs Exist**

Panos Kouvelis, Wenhui Zhao

Often, retailers are constrained by working capital. If they do not want their procurements limited by working capital, they can borrow short-term bank loans. To get competitive interest rates, they might pledge available assets to the bank as the collateral. When cannot repay the loan obligations, retailers have to declare bankruptcy and incur bankruptcy costs (portion of sales, depressed collateral value, and fixed administrative fees). Through the interest rate, the bank eventually transfers bankruptcy costs to retailers

as the purchasing costs in addition to the wholesale price. If the coefficient of the collateral value loss is not too large, retailers should use all available assets as the collateral. Depending on the wealth level (in terms of working capital and collateral), medium rich retailers should only borrow the collateral secured loans, and poor retailers should borrow with bankruptcy risks. Also, retailers' optimal order quantity decreases in their wealth level, even if they can order with bank loans. For the upstream supplier, the optimal wholesale price stays the same for rich retailers, decreases in retailers' wealth for medium rich retailers, and increases in the retailer's wealth for poor retailers. The supplier should work with retailers with more wealth in the supply chain.

### **A Framework for Analysis of Production Authorization Card-Controlled Production Systems**

Corinne MacDonald, Eldon A. Gunn

The PAC system is a token-based system that controls the flow of information and material in a production system. The system can be configured to perform as one or a combination of common control strategies, such as Kanban, base stock, or CONWIP. Selecting the appropriate strategy parameters (i.e. number of Kanban cards for each component, WIP caps at each cell, etc.) is a difficult problem. Often decision makers must first estimate costs, such as stockout costs and carrying costs at different stages of the process. Then, a selection of strategies can be tested and the one that enables the system to operate at the least overall cost is considered best. These costs are often difficult to ascertain, and the strategy selected may only be good if the estimated costs are accurate. MacDonald and Gunn provide a framework for modeling complex production systems, leading to the generation of trade-off curves that directly compare two performance measures for different control strategies; for example, average WIP levels vs. percentage of demand met immediately from stock. From these curves, the strategy that provides performance levels most closely aligned with the company's desired operational policy can be selected.