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Management Insights

Mass Customization in the Automotive Industry: Comparing Inter-Dealer Trading and Reconfiguration Flexibilities in Order Fulfillment
Philip Brabazon, Bart MacCarthy, Andrew Woodcock, Robert Hawkins

Mass Customization has proved challenging in the volume automotive sector. The authors use simulation to compare two types of flexibility that can help the producer and its dealers supply each customer with the specific vehicle variant requested. One type of flexibility allows the specification of a vehicle planned for production to be reconfigured. A second type of flexibility allows trading of vehicles between dealers. Two performance metrics - lead time and stock holding - are studied across a wide spectrum of product variety. Both flexibilities are beneficial but reconfiguration flexibility outperforms trading. The impacts on performance depend greatly on the level of product variety. For example, there is a variety ''sweet spot'' at which trading has its maximum impact. At low variety levels, a small amount of reconfiguration flexibility is very beneficial and less is to be gained by becoming more flexible. However, at high variety levels the opposite is the case. In respect of dealers, large dealers gain the most from reconfiguration flexibility and least from trading. The findings are relevant to sectors that build to forecast but that seek to respond to customer demands for exact specifications within acceptable lead times.

Perceived value of the mass-customized product and mass customization experience for individual consumers
Aurélie Merle, Jean-Louis Chandon, Elyette Roux, Fabrice Alizon

Operations Management mainly focuses on evaluating the trade-offs between customization and such dimensions of operational performance as cost, delivery time, and quality. However, we argue that providing efficient customization is not sufficient *per se* and that consumer value results from a trade-off between perceived costs and benefits. Thus, more can be done than reducing the costs of customization to deliver value. We focus on the benefits that consumers can perceive while customizing a product. We identify five benefits, three of which are related to product value—utilitarian value, uniqueness and self-expressiveness—and two of which are related to a specific way of revealing consumer preferences (the co-design process)—hedonic and creative achievement. The Consumer Perceived Value Tool (CPVT) is proposed to measure these benefits directly from the consumer. This tool can help companies to decide whether to offer a mass customization program and choose the appropriate settings (e.g., degree of customization, type of customization). The CPVT also has the potential to measure the value of a configuration toolkit.

The Impact of Organizational Structure on Mass Customization Capability: A Contingency View
Xiaowen Huang, Mehmet Murat Kristal, and Roger G. Schroeder

Mass customization (MC) provides exciting competitive benefits but also imposes great operational challenges. It is important for practitioners to understand the existence of various MC strategies and proper actions that can be used to develop MC capability accordingly. Towards that end, our study shows that organizational structure is one factor that influences the development of MC capability, especially when the degree of internal manufacturing uncertainties and complexity are high as the full customization strategy is adopted. Under this scenario, managers should take the leadership to assess their organizational structure and devote time and resources to develop an organic structure even though the changes may be difficult. Specifically, the managers should start with providing extensive cross-training to employees and expanding their responsibilities to cultivate expertise of the employees. In the meantime operational decision-making authority should be decentralized to allow employees to access information and respond immediately to unforeseen problems and opportunities. This change should also be accompanied by reducing the number of hierarchical layers to promote efficient and effective communication and coordination. An organic structure will promote effective collaboration and organizational flexibility, which helps mass customizers to handle frequent changes while improving operational performance.

Lowest Cost May Not Lower Total Cost: Using "Spackling" to Smooth Mass-Customized Production
Kyle D. Cattani, Ely Dahan, Glen M. Schmidt

Profitable production of textiles in high-labor-cost countries is increasingly a challenge. One manufacturer (Timbuk2) has found a profitable niche producing mass-customized bicycle messenger bags in a San Francisco factory. Mass customizers, such as Timbuk2, provide a product tailored specifically to customer needs/desires, but typically face an uneven demand stream, since the timing of custom orders is unpredictable. To smooth production, firms may quote a long lead time, or carry slack capacity. Motivated by our work with Timbuk2, we present an alternate strategy, which we call *spackling*, where a flexible facility is run at capacity to produce both custom make-to-order products as well as standard make-to-stock products. Daily priority is given to the custom products, and any slack capacity is filled with production of the standard items, thereby spackling (smoothing) the daily production schedule. We can identify an optimal production strategy as determined by the tradeoff between the cost premium for flexible (as opposed to efficient) production capacity and the opportunity costs of idle capacity. Spackling amortizes fixed costs of capacity more effectively and thus has the potential to increase profits from mass customization vis-à-vis a focus strategy, even though it uses higher cost production for the standard goods.

The Effect of Product Variety and Inventory Levels on Retail Store Sales: A Longitudinal Study
Zeynep Ton, Ananth Raman

Higher product variety and inventory levels at retail stores are typically associated with higher sales. Having more products increases the probability that customers will find what they want and having more inventory increases service levels and stimulates customer demand. But this paper shows that increasing product variety and inventory levels also has an indirect negative effect on sales through their effect on in-store logistics. When product variety and inventory levels increase, the complexity and confusion in the operating environment increase and store employees make more errors in performing in-store logistics activities such as shelving and replenishing merchandise. Such errors result in phantom products—products that are in backrooms or other storage areas but not on the selling floor. Phantom products are common in a wide range of retail settings and reduce store sales by causing stockouts. Hence, this study highlights the importance of taking store execution into account when making assortment and inventory planning decisions.

Stochastic Optimization for Natural Disaster Asset Prepositioning
Javier Salmeron and Aruna Apte

This research focuses on optimal strategic prepositioning of disaster relief assets such as warehouses, medical facilities with personnel, ramp spaces, shelters and transportation. These decisions need to be made well in advance of the occurrence of a disaster and under uncertainty about its location and severity. Emergency planners may use our mathematical model to gain insights into their own planning problem (based on the region of study, possible scenarios of disaster, population affected, etc.) Our notional test case posits two geographically separated regions with several areas in each, and a hurricane striking either region with different severities. The results suggest a modest budget should be first used to match existing transportation capacity and health capacity for critical population (in need of emergency evacuation), unless their survival rate is very low or there exists a much higher mortality rate among stay-back population (in need of commodities). As more budget becomes available, expansion of warehouses and delivery of commodities takes priority, because the cost for additional special transportation and health facilities for the last pockets of critical population is too expensive.

A New Dynamic Programming Decomposition Method for the Network Revenue Management Problem with Customer Choice Behavior
Sumit Kunnumkal and Huseyin Topaloglu

An interesting feature of network revenue management systems is the customer choice behavior, where a customer arriving into the system observes the itineraries that are available for purchase and makes a choice among the itineraries that can satisfy its needs. Traditional revenue management models have generally ignored this customer choice behavior and simply followed the assumption that each customer arrives into the system with the intention of purchasing a fixed itinerary: If this itinerary is available for purchase, then the customer purchases it; otherwise, the customer leaves the system without purchasing anything. However, modeling the customer choice behavior is particularly important nowadays with the online sales channels offering easy access to a large variety of itineraries. The authors introduce models that can explicitly address the stochastic and dynamic nature of the customer choice behavior.

When compared against traditional models, they report performance improvements on the order of 5-6% with reasonable computation times.

Impacts of Information and Communication Technology Implementations on Employees' Jobs in Service Organizations in India: A Multi-Method Longitudinal Field Study
Viswanath Venkatesh, Hillol Bala, Tracy Ann Sykes

Service organizations in India are implementing enterprise-level information and communication technologies (ICTs) to support service processes. The authors used socio-technical systems theory to analyze the effects of ICTs on the five job characteristics, i.e., skill variety, task identity, task significance, autonomy and feedback, in the job characteristics model (JCM) in a bank in India. They found that although the ICT enriched employees' job characteristics, employees reported significantly lower job satisfaction and job performance. To understand this puzzling finding, they conducted a qualitative study and identified four contextual forces that contribute to these results and hinder successful implementation of ICTs in the service sector in India and possibly, other developing countries: environmental barriers, learning difficulty, culture shock, and employee valuation.

Proactive Planning of the Timing of a Partial Switch of a Prescription to Over-the-Counter Drug
Gila E. Fruchter and Murali K. Mantrala

In a bid to extend the lifecycles of branded prescription (Rx) drugs beyond their patent expiration dates, many pharmaceutical companies are considering partial switches to over-the-counter (OTC) status within the Rx drug's patent-protected life. Key issues under debate are whether and when to make this switch with or without the grant of a 3-year OTC market exclusivity period by the US Food & Drug Administration. This paper investigates this issue and establishes the precise conditions under which it is profit-maximizing to make the partial Rx to OTC switch before patent expiry. The study finds that the grant of market exclusivity is neither necessary nor sufficient to make this switch. Indeed, the denial of OTC market exclusivity may mean that the firm *advance* rather than *delay* the partial switch, thereby yielding greater savings for Rx drug consumers (payers). Also, depending on the relative size of the OTC market opportunity, it can be optimal to make an early partial switch regardless of the provision of 3-year OTC market exclusivity. Thus, the relevance of this regulatory incentive for early Rx to OTC switches aimed at lowering costs for payers is questionable from the viewpoints of both managers and payers.