Comment on

"The Implementation Challenge of Pricing Decision Support Systems for Retail Managers"

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We are pleased to see continued academic interest in software for Demand Based Management (also known as Consumer Demand Management, or CDM). DemandTec's modeling approach has its roots in the research of several academicians [1] [2], and we continue to collaborate with members of the academic community in order to keep current with research and enhance our technologies.

Montgomery's list of CDM providers is comprehensive. Our experience based on discussions with retailers is that the vendor offerings do differ substantially, both in terms of the underlying science and in terms of presentation (user interface, workflow, and embedded analytics). Some companies appear to aggregate data in order to deal with outliers and improve model stability. While this is occasionally necessary, our experience has been that Bayesian methods can successfully provide robust and adaptive modeling for the majority of retailers in a variety of verticals.

Montgomery is correct that both the retail and consumer goods manufacturer markets finally seem ready for Pricing Decision Support Systems (PDSS), as evidenced in the 2003 surveys of two popular trade publications. The Retail Information Systems/Gartner 2003 survey indicated that 20% of retailers had already updated their initial price optimization technology, and another 27% planned to upgrade in the 2003-2005 timeframe [3]. And, according to a Consumer Goods Technology trends study [4], 30% of consumer goods companies had price/promotion/profit optimization technology in place in 2003, while another 21% planned on making this investment in 2004. While both surveys likely suffer from a bias in "planned" versus "actual" realization of software implementation and in sampling from their particular reader base, these numbers bode well for the CDM provider space.

The list of requirements for a PDSS in Montgomery's article is fairly comprehensive. Perhaps the largest science challenge in developing CDM software is developing accurate forecasts in the face of incomplete information. Incomplete information comes in the form of sparse scan history (low volume products), sparse causals (products with little pricing and/or promotional information), missing observations (due to error, stock-out, or low volume), missing causals (e.g. display information is infrequently tracked by retailers), and a constantly changing product mix. Some additional required components that we would emphasize are:

- A platform or mechanism for thoroughly cleansing and validating data, since implementing a PDSS is often the first time that much of a retailer's data is leveraged for analysis
- Provision of infrastructure to process large amounts of store level and transaction level data, including strategies for archiving and purging data from the system
- A comprehensive system for creating, applying, and ranking business rules that must be taken account when defining the feasible space in which to search for optimized prices or promotions; since many rules may conflict with each other, a mechanism for resolving these conflicts is also a necessity
- Provision of a "what-if" capability so that analysts can create and compare many pricing and promotion scenarios quickly, allowing users to form scenarios easily, choose among multiple objectives, serve up relevant supporting information in context, offer a customizable set of business rules, and rapidly optimize scenarios
- An integrated framework for responding to changes in costs, competitive prices, and new product introductions, all of which may occur on a daily basis; this operational requirement of PDSS is often overlooked, but is essential in providing a consistent and coherent price management structure
- A framework for addressing forecast adjustments due to changes in the aforementioned category dynamics
- Replication of workflow of the pricing and promotion processes of the retailer - systems must be capable of recognizing different roles and responsibilities within organizations and match them with appropriate personas and permissions within the software (e.g. those with permission to approve prices)

Addressing all of these requirements in a scalable manner that integrates with a customer's existing processes is what differentiates the CDM software of today from the one-off consulting solutions of the past.

As Montgomery mentions, perhaps the hottest area for practitioners in CDM is determining where there are significant effects across categories – in other words, when a retailer leverages a particular merchandising strategy in a category, how are sales in other categories and store traffic in general impacted. Transaction-level data are becoming more and more available on the retailer side, and many have the hardware and software in place to generate summary analyses (e.g. frequent sets, where products frequently purchased together are enumerated). At DemandTec we use a

combination of store-level data and market basket data to estimate the extent of these cross-category effects in pricing and promotion. With access to loyalty card information, PDSS can leverage additional insight into product switching as well as the classification of consumers and segments into "cherry-pickers" (customers who purchase primarily promoted items) and "high-value" (customers who purchase some promoted items but many non-promoted items as well); this information can be used be used in identifying merchandising strategies that drive pull-through across many categories and increase store revenue and margin. Furthermore, with the incorporation of panel data, PDSS could potentially assist in tailored merchandising recommendations that maximize share of wallet for a particular retailer. The challenge for CDM practitioners (and researchers) will be in determining which analyses can be made actionable in the context of pricing and promotion software, and which ones are simply interesting and informational.

Finally, an additional area of interest to CDM practitioners is how these solutions can be made effective for both retailers and manufacturers, streamlining the trade funds process and facilitating collaboration. In theory, one set of models could be leveraged by both parties, with proper security masking sensitive information while forecasts for both demand planning and the supply chain are shared. While this may sound like a distant (or unrealistic) utopia, we are seeing a trend of manufacturer interest in this vision. PDSS in CDM can potentially shift the balance of power, giving retailers a tool for evaluating the offers that the typically more analytical manufacturers put forth, and manufacturers are eager to capitalize on the same technologies.

1. Fader, P, Hardie, B. Modeling Consumer Choice Among SKUs, *Journal of Marketing Research*, 1996; 33: 442-452.

2. Rossi, P, Allenby, G. Statistics and Marketing, *Journal of the American Statistical Association*, 2000; 95: 635-38.

3. "RIS/Gartner 13th Annual Retail Technology Study", a supplement to *RIS News*, June 2003, page 32. (Survey consisted of 221 retail executive respondents. For more information on the organization, see www.risnews.com.)

4. "Consumer Goods Technology/AMR Research Tech Trends Report", a supplement to *Consumer Goods Technology*, October 2003, page 10. (Survey consisted of 73 consumer goods executive respondents. For more information on the organization, see www.consumergoods.com.)