

## Strength in Numbers

A new generation of software is helping companies calculate their way to more efficient, more profitable supply chains

We're old enough to remember when NASA's forays to the moon epitomized arithmetic complexity. Never before had scientists attempted to devise a trajectory between points on two globes, each of them rotating on its own axis at tremendous speed while also orbiting around the other, both moving as a duo around the sun. Miscalculate the return trajectory by even two degrees, or mistime the firing of a retrorocket by a few milliseconds, and the Apollo module would skip off the Earth's atmosphere like a rock on a pond-or incinerate. Small wonder that rocket science became synonymous with the most extreme, brain-addling calculations.

Thirty-five years later, global businesses are starting to tap into a new class of applications that embody today's version of rocket science. Representing the next generation of supply-chain management software, these programs apply sophisticated planning algorithms and statistical models to help companies contend with hugely complex relationships between such variables as inventory levels, product pricing, customer demand, and production schedules. Much as **i2 Technologies** revolutionized the factory scheduling business with its enormously successful finite-capacity planning scheme, these companies are out to improve their clients' ability to model, analyze, and optimize broad swaths of activity up and down the supply chain. In general, their goal is a more global optimization of activities than previous approaches have enabled.

The areas of focus run the gamut. Profit-optimization vendors **DemandTec** and **ProfitLogic**, for example, help retailers factor in labor and transportation costs, overhead, and profit margins when deciding how to price individual products and plan their promotions. **Metreo** applies similar algorithms to the problems of suppliers, who need to determine how to respond to a specific customer's request-for-quote (RFQ), or whether it's even worthwhile.

### Financial times

PowerMarket isn't the only company to have commercialized many of the risk management and statistical analysis techniques used by economists. Like PowerMarket, **Rapt** also contends that managing global inventory and pricing strategies can be as complicated and costly as managing a financial portfolio. But in addition to using well-tested financial models for risk management, Rapt relies on internally developed theories of something called demand-statistical arbitrage to improve decision making amidst massive uncertainty.

### Wrapped to go

Rapt's two primary applications address each end of the chain. Rapt Buy helps manufacturers such as Sun Microsystems model how components will be consumed across multiple product lines, see how inventory levels affect the margins and profits of each line, and determine which product lines can afford a tight supply of parts and which cannot. Rapt Sell helps suppliers of complex products price their offerings according to which business goals they wish to pursue at that moment-for example, maximizing margins, preventing similar products from cannibalizing each other, grabbing market share in specific regions, or phasing out aging products. The company sells its software under a perpetual license but declines to discuss pricing specifics. In many ways, Rapt Sell competes with software from startup Metreo, which also targets those suppliers who are trying to get a handle on how to

price multiple, complex products. The issue is more difficult than it sounds, as seen in the case of Metreo customer Eaton, which makes hundreds of thousands of electrical components for five different industries. Every year, about 60 employees at Eaton's Cutler-Hammer division must evaluate about 200,000 RFQs for its electrical-control and power-distribution products. That volume prevents most RFQs from getting more than a cursory look. Too often, sales reps and pricing professionals accept prices that leave money on the table.

### **Ringside seats**

With Metreo's software, Eaton executives make up-front decisions about whether to emphasize margins, market share, profit, service-level agreements, or customer relationships for groups of products. They then assign each criterion a value. Metreo's software applies those values, along with data on inventory and plant capacity, to grade each sales request as it comes in. Pricing managers may see that a request for four items totaling 40,000 pieces earns a grade of 65, but they must hit a target of 85 before they can accept the order. To reach the higher grade, Metreo may suggest substituting similar but higher-margin components, delaying delivery by a few days or adding pennies to the price-in various permutations. Annual licensing fees for the software start at \$250,000.

On the face of it, Metreo and Rapt might appear to compete with revenue-optimization applications from **KhiMetrics**, **Manugistics** (with its acquisition of Talus Solutions), **Zilliant**, and others of that ilk. But those apps focus on maximizing revenues or profit margins by figuring out how to variably price the same products sold to different customers. (Think yield management, as traditionally applied to hotel rooms or aircraft seats). The issue is how long it will be before Manugistics begins to compete more directly with Metreo and Rapt. Its profit-optimization capabilities have become key to its struggle with rival i2. Manugistics has not yet released a product for addressing manufacturers' more complex pricing and profit-optimization issues; only a blueprint exists.

### **Supersize it**

DemandTec also helps customers optimize their pricing using financial modeling, cost-based analysis, Bayesian statistics, and advanced algorithms developed by co-founder Professor Hau Lee of Stanford. Instead of targeting manufacturers, DemandTec serves large retailers, such as the Long's drugstore chain-which happens to be the flagship customer of another Hau Lee startup, **Nonstop Solutions**, specializing in optimizing inventory flows. What's more, DemandTec hosts only Long's software because few potential customers have the massively parallel super-computer required to run it. DemandTec's software explores so many variables, in fact, that the company reckons it goes through one billion permutations per store to come up with the optimum price for each product the store sells.

The software first calls for building a demand model based on customers' point-of-sale data, product costs, labor rates, and costs for product storage and shipping. It then combines that data with a host of variables, including promotional prices, competitive prices, seasonality factors, and household-stocking habits, to predict how pricing changes will affect volume for every item at every store in a chain. DemandTec then adds the fruits of its domain expertise, such as the knowledge that a cashier takes 8.3 seconds to check and bag each item, or the time needed to stock a palette of Kleenex boxes vs. a carton of canned peaches. The company tells us it takes three minutes to run calculations that show customers how lowering the price of a certain size of Crest toothpaste by 20 cents will affect sales of dental floss and Listerine. DemandTec has not yet set a price for its service.

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