

DM NEWS

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DecisionPower Inc. *MarketSim*

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Agent-based modeling uses computer programs to simulate quasi-independent entities as they interact with their environment and each other. It is frequently used to model things like ecosystems and network traffic, although it is probably most familiar from computer games such as SimCity. In an agent-based model, the actions of each entity (agent) are determined by rules that process inputs including the agent's own state ("hungry"), external factors ("food on that rock"), and other agents ("crowd around the food"). Results over time can produce complex patterns of behavior that are not explicitly defined in the rules themselves. In the example I just gave, the creature might balance how hungry it is, the distance to the food, and the size of the crowd to decide whether to move towards or away from the rock.

MarketSim (DecisionPower Inc., 408-379-9200, www.decisionpower.com) applies agent-based modeling to consumer behavior. In particular, it is used to predict results in a product category such as snack foods or headache remedies. In a model of this sort, the primary agents are consumers, while the environment includes brands, products and channels. Rules describe how consumers make purchase decisions, taking into account factors such as product attributes, consumer preferences, marketing activities, distribution, and external influences like the weather. When the model is run with specific inputs such as particular set of products and marketing activities, the system simulates what consumers will buy over time and generates outputs for market share, revenue, profits, unit sales, and other business measures.

This may sound quite simple, but in practice it is not. *MarketSim*'s must match the results of actual consumer markets with enough accuracy for businesses to determine the likely results of a particular marketing plan or product launch. This means modeling all the competitors in a product category, as well as the different distribution channels and types of customers. Each has its own characteristics.

The most complex entity is the consumer. *MarketSim* provides over 100 prebuilt rules, of which 25 or so might be used in any particular model. These rules describe how customers make their purchase decisions, taking into account their preferences for different product attributes; information gathered from advertising and personal contacts; consumption volume and frequency; shopping behavior such as channels used and responsiveness to in-store displays and price differences; responsiveness to coupons; and previous experiences. Each model includes multiple customer segments with their own settings for rules such as the weight assigned to different product attributes.

The number of agents assigned to a segment would be proportionate to the size of that the segment in the actual marketplace, although the total number of agents need not equal the number of actual customers. A market of many millions could be accurately modeled with 100,000 to 150,000 agents.

A model would also include dozens or even hundreds of specific products, depending on the complexity of the marketplace and the degree of detail required. Products are linked to brands. Each brand will have its own attributes, which use the same categories as consumer preferences. This provides the connection between brands and consumers that is needed to model consumer choice. Each brand also has a marketing plan with price, display, distribution, media, and coupon details for each time period.

All these rules and attributes must be set so they result in an accurate prediction. DecisionPower does this by gathering historical data—typically three year's worth—for actual sales, marketing activities, product attributes, distribution, and external factors. This data covers all competitors, not just the model sponsor. It is fed into the model and the rules are tuned until the system gives acceptably realistic results. Modelers usually feed in two and a half years of actual data and then compare simulated results for the final six months with the known actual results for the same period.

This calibration process occupies most of the three to four months it takes to build a major *MarketSim* model. Most of the work involves adding new data sources or events to reduce anomalies in results. A calibrated model can give reliable predictions about one year into the future, and will remain

valid—assuming the inputs such advertising spend are updated—for one or two years before it must be rebuilt.

Constructing a MarketSim model is largely a task for experts, either employed by DecisionPower or in the research department of a client. The system offers a graphic user interface that is more than adequate for such purposes. A separate module called BrandManager lets non-technical users specify model inputs, such as alternative marketing plans, on an Excel spreadsheet. BrandManager then imports the spreadsheet, loads the data into MarketSim proper, and runs a model with the new assumptions. Users can save their inputs as scenarios, allowing them to easily compare different options. They can view results on the screen, selecting the scenarios, products and measures to compare, and displaying them as a table or graph. Results can also be exported back to Excel for further analysis.

MarketSim was introduced in 1996 and has been the primary focus of DecisionPower's business since 2001. The end-user portion of the system runs on a Windows PC, while data—which can be quite voluminous because of the all the historical detail—is typically stored on a central server. Small models can run on the end-user system but larger ones are often sent to a separate modeling server. DecisionPower offers hosted options for clients that prefer not to install the system in-house. Running a single scenario may takes about ten minutes for a simple model and 45 minutes to an hour for a very complicated one. Companies often run multiple scenarios—sometimes hundreds—as they explore alternatives to identify optimal marketing strategies.

DecisionPower charges from \$100,000 to \$300,000 to develop a MarketSim model, depending on the project. Clients can license the completed model to run in-house for \$100,000 per year. DecisionPower has sold 60 to 80 MarketSim models to date, mostly to consumer package goods manufacturers. A lower cost option, MarketSimExpress, is available for quicker, simpler projects.

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