USING DSS FOR MARKETING DECISION-MAKING: THE MDSS

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ABSTRACT

The development and deployment of a marketing decision support system (MDSS) represents an emerging trend in the field of marketing in which the increased application of decision support system (DSS) technology enhances decision-making. This research reviews recent advances in MDSS applications and technology in order to identify potential benefits and limitations of MDSS. The research supports the consideration of an MDSS as a valuable decision-making tool.

Keywords : Marketing decision support, MDSS limitations, MDSS benefits, expert systems, fuzzy logic, artificial neural networks

INTRODUCTION

An emerging trend in the realm of marketing has been the increased application of decision support system (DSS) technology to aid with decision-making. The concept of a MDSS addresses this need for decision-making support. Developing a sound and robust marketing strategy has never been an easy task. The success or failure of a company's marketing effort depends on the interaction of numerous internal and external factors, combined with the knowledge and intuition of the decision-makers themselves. Marketing decision-making requires a comprehensive analysis of environments both inside and outside the firm. It requires a wide range of strategic information, including hard and soft information, and it requires managers to deal with issues that involve a high degree of uncertainty, subjectivity, and ambiguity. Marketing also involves managers' intuition, judgment, and personal vision (Li and Davies, 2001).

These characteristics of marketing decisions present a real challenge to decision-makers. While managers certainly possess specific strengths and advantages in handling such decisions, they are often nonetheless limited by their knowledge and background, a lack of the analytical skills necessary to undertake systematic strategic analysis, and a lack of time to focus intensively on strategic issues (Li and Davies, 2001). Given these barriers, along with the growing complexity and competitiveness of the marketing environment, the need for tools to assist the marketing decision-maker could not be greater. This research reviews MDSS decision making, examines the growing importance of such technology within the marketing field, illustrates current applications, and discusses relevant benefits and limitations of existing systems.

WHAT IS AN MDSS?

The earliest traces of the MDSS took shape in the 1960s, as decision-makers started to develop rudimentary models from which marketing decision could be made (Buttery and Tamaschke, 1995). Yet it was not until 1979 that J.D.C. Little actually coined the term MDSS as a

"coordinated collection of data, models, analytic tools, and computing power by which an organization gathers information from the environment and turns it into the basis for action." (Cassie, 1997).

MDSS help decision-makers utilize data and models to solve unstructured problems based on management science, decision theory, systems science, behavioral science, computer science, and information technology (Li and Davies, 2001). They are used to improve the quality and timeliness of marketing decisions by improving the effectiveness of decision-making (Buttery and Tamaschke, 1995). They focus on supporting, rather than replacing, managerial judgment, and ultimately, it is the harmony created between the strategic analysis of the system and the intuition of the manager that helps achieves a synergy during the decision-making process (Li and Davies, 2001).

As one would expect, MDSS consist of the same essential set of components—the same identifiable generic architecture—that characterizes virtually any DSS. These components include the user-system interface subsystem, the database management subsystem, and the model base management subsystem (Cassie, 1997). These three components work together to give the marketing manager the system necessary to aid with decision-making.

MARKETING DECISIONS SUPPORTED BY MDSS

Marketing decision support systems can be developed to support a wide range of decision-making issues and problems on a variety of levels (Cassie, 1997). Undoubtedly, the main thrust of MDSS is to support marketing decision-making in a strategic planning context, which includes product design and planning, research and development, large-scope forecasting, customer profile analysis, and so forth (Rao, 2000). The "what-if" capability that is common among most DSS allow managers to explore the consequences of a particular strategy or set of options before committing time and money to the strategy (Sisodia, 1992). These simulation models support what-if scenario analysis, which highlight important business factors and variables that come into play with regard to various marketing strategy options (Li and Davies, 2001).

PepsiCo, for instance, effectively uses an MDSS to optimize its marketing mix. Managers interact with the system in a question/answer mode, and information obtained from such sessions and from external databases is analyzed with various models to arrive at decision recommendations. The system can support what-if analyses and can draw upon textual information from the databases and display quantitative results with graphical and descriptive interpretations (Amaravadi, 1995). PepsiCo's MDSS uses a plethora of models, including models for product-mix, revenue gain forecasting, product cost optimization, pricing, customer and channel promotion, and market share change, along with several others (Amaravadi, 1995).

In addition to supporting strategic marketing decisions, MDSS can support marketing decisions on the tactical and operational levels as well (Cassie 1997). Decisions regarding basic pricing, perishable-asset revenue management, budgeting, sales forecasting, and inventory control tend to fall into this category. Certain MDSS can also help facilitate the environmental scanning process, where data from the external environment is filtered, tailored, and interpreted into customized, meaningful information, and then used in conjunction with managers' experience and intuition to

aid decision-making (Xu and Kaye, 1995). The MDSS can also automate news finding and assess the possible impact of that news on a firm's strategy (Cassie, 1997).

MDSS can indeed support an array of marketing decisions. As will be discussed next, several advanced technological tools are available to further provide optimal MDSS for particular problem situations.

THE ROLE OF SPECIFIC TECHNOLGIES IN CREATING MDSS

By incorporating advanced technology into MDSS, even greater support can be gained for the marketing decision-making process.

Expert Systems

Strategic marketing decisions require extensive domain knowledge and expertise (Li and Davies, 2001). Because expert systems (ES) can be designed to capture the knowledge from experts and make that knowledge available for problem solving, they can play a role in support of marketing decision-making. They often have built-in explanation facilities to explain how they arrived at their conclusions. ES are most widely used to support decisions regarding new product development, media planning, promotional strategies (Amaravadi, 1995). Specific MDSS that use expert system capabilities include:

- STRATEX – a knowledge-based MDSS for strategic market planning in the export trade of fish and fisheries products.

- COMSTRAT – a prototype system for strategic marketing decisions with a special emphasis on competitive positioning.

- Woodstrat – an MDSS with expert capabilities to serve as a support system for action program activities on the corporate, divisional, and business unit levels in Finnish forest and wood industries (Li and Davies, 2001).

Fuzzy Logic

Fuzzy logic is designed to deal with imprecise "linguistic" concepts or fuzzy terms (Li and Davies, 2001). It aims at modeling reasoning that plays an important role in the human ability to make rational decisions in an environment of uncertainty and imprecision (Proctor, 1992). In recent years, this technology has been incorporated into MDSS models to address semi-structured and fuzzy issues in strategic marketing decisions. Two examples include:

- AMOS – a probability-driven, customer-oriented DSS for target marketing of solo mailings.

- Fuzzy Team Decision Model – a conceptual framework for the design of new computer-based decisions and information systems which support the decision processes for new product introduction (Li and Davies, 2001).

Artificial Neural Networks

Artificial neural networks (ANN) are distributed information-processing systems that are important in modeling fuzzy and uncertain phenomena and forecasting non-linear systems (Li and Davies, 2001). They have shown their greatest success in forecasting and in learning patterns from noisy or incomplete data where experts are unavailable or where clear rules cannot be easily established. Some examples of MDSS that use ANN include:

- Market Segmentation – ANN were employed as a new methodology for industrial market segmentation classification.

- Neural Network Model for Predicting Market Responses – applying the back-propagation neural network to model market responses on the basis of a number of marketing variables.

- Neural Network Model for Decision Support – neural networks were used as a tool for analyzing market share using the PIMS (Profit Impact of Market Strategy) database (Li and Davies, 2001).

When combined with the basic MDSS models available, the support of marketing decisions can be greatly enhanced, leading to increased effectiveness and specificity.

AN MDSS IN ACTION

In 1992, a major division of one of the world's largest pharmaceutical manufacturers was looking to double its sales growth, yet marketing professionals were flying blind relative to understanding their existing market share and targeting high potential markets for their products. Marketing managers needed to better understand their existing markets and market potential, and finance and manufacturing needed to improve their forecasting (Gaskin, 1994).

As the organization discovered, a MDSS tailored to a specific situation can be truly useful in a dynamic organization. The company first created a data warehouse that contained both internal and external data and provided information to a wide variety of users. After running into a few roadblocks at first, the system evolved into an intuitive and easy-to-navigate tool to provide analysis capabilities. Using the expertise of specialists in the area of decision support, a prototype system was built to demonstrate to management how these enhanced capabilities could streamline data collection and analysis processes to improve decision-making (Gaskin, 1994).

The company also realized the critical role that users play in the successful implementation of a system; users were involved throughout the development process. Once the data warehouse was complete, models were added to help integrate, consolidate, and summarize information, and to provide tools to support business tracking and management activities. The system used information about competitive market share, promotional spending, environmental trends, pricing agreements, and so forth to aid with marketing decision-making. The company then had the ability to monitor the impact of promotions, the activity of the sales force, and the bottom-line impact of marketing programs. The sales, distribution, and manufacturing departments were able to eliminate back-order and over-production situations, and improve forecasts (Gaskin, 1994).

As reported by Gaskin (1994), "The MDSS allowed sales management to assess the effectiveness of the sales organization by monitoring actual vs. quota performance, and evaluate forecasting effectiveness. Prescription volume activity and derived market share estimates provide sales with the ability to monitor the competition. Knowledge of the market, the competition, and their own sales performance gave managers the ability to change course and initiate new programs if necessary."

Overall, the MDSS has had a tremendous impact on the company. Information that was previously too difficult to derive was now readily available to users. Information flows throughout the organization much faster, and the MDSS modeling capabilities has increased the speed and quality of key marketing and sales decisions. Most importantly, the company has seen a 50% improvement in the accuracy of sales forecasts and a significant return on investment (Gaskin, 1994).

As with many of the companies that successfully implement a MDSS, this pharmaceutical firm can now design and control its marketing programs more intelligently. The competitive barriers it establishes will change the nature of marketing in the industry as a whole.

BENEFITS OF MDSS

As is evidenced by the previous case study and the discussion to this point, marketing decision-makers can benefit immensely from MDSS. First of all, MDSS are able to ferret out impartial data for analyzing marketing problems (Cassie, 1997). They can help organizations cope with information overflow by combining and homogenizing information sources and by increasing the speed and ease of data retrieval (Wober and Gretzel, 2000). Modeling capabilities and other advanced technologies that characterize MDSS also enable marketing managers to experiment with various marketing mix strategies and analyze the effectiveness of different scenarios (Cassie, 1997). MDSS therefore help marketers tackle many of the complex issues that they face, such as forecasting, new product launches, and evaluation of marketplace trends.

MDSS are also flexible and adaptive over time, allowing the decision-maker to add, delete, combine, change, or rearrange basic elements, providing fast response to unexpected situations (Cassie, 1997). This capability makes possible timely and quick ad hoc analysis, and gives marketers the ability to confront changing situations quickly. In fact, the application of the MDSS permits, and even welcomes, a process of constant reevaluation and refreshing, given the dynamic nature of marketing variables and strategies (Rao, 2000).

While working in conjunction with the knowledge and intuition of the marketing manager, an MDSS helps create a powerful synergy for the decision-making process (Cassie, 1997). This leads to a quicker evaluation of alternatives and a higher quality of marketing decisions.

LIMITATIONS OF MDSS

While it is true that using an MDSS can provide excellent decision support to marketing managers, it is quite apparent that the full potential of MDSS has yet to be reached. In fact, researchers and marketing practitioners alike have found that MDSS frequently fall short of their promise and that users often become dissatisfied with the results (Li and Davies, 2001).

Although marketing is often viewed as one of the lifeblood activities of an organization, it has been one of the last and least successful to benefit from the DSS revolution (Cassie, 1997). In other words, the MDSS is less evolved than those DSS used to support decision-making in other functions.

While current marketing decision support systems offer tremendous assistance for data retrieval and analysis, less support is available for the decision support itself (Li and Davies, 2001). MDSS currently rely on limited quantitative models, and they are therefore not as good at handling missing data or situations requiring expertise (Amaravadi, 1995). This shortcoming can be addressed somewhat, however, by combining basic MDSS models with the advanced intelligence technology discussed earlier that can mimic human reasoning and utilize fuzzy logic. Researchers have also frequently found that MDSS developers tend to pay more attention to technological aspects rather than the nature of the strategic marketing decisions and managerial needs (Li and Davies, 2001). Fortunately, involving decision-makers more throughout the development process can reduce this problem.

Perhaps the biggest and most expensive shortcoming an MDSS can have is that it is not used (Wober and Gretzel, 2000). On the other hand, an accepted MDSS that caters to the needs of its users is more likely to be applied in all stages of the decision-making process, and it can thus lead to improved marketing decisions. This is true, in spite of the limitations that currently exist in the MDSS realm.

SUMMARY AND CONCLUSION

Though not without its limitations, the MDSS is a valuable tool available to the marketing decision-maker. MDSS allow marketers to make objective and consistent decisions by supporting the fast solution of complex and semi/unstructured problems. They allow decision-makers to combine their own expertise and intuition with complimentary application models to enhance the quality of marketing decisions. In addition, given the fact that the field of MDSS is relatively young and evolving, MDSS are likely to play an increasingly important role in marketing decision-making in the years to come.

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