The Marketing Engineering Imperative: Introduction to the Special Issue

As we enter the new millennium, we are at the end of the era when firms could gain and sustain competitive advantage merely by having market data. Today large firms have access to more market and customer data than they can use. Having too much data without the models and systems for discovering what is important and what can be discarded can be as bad (or worse) than having too little data. Indeed, at least one survey [Wierenga and Van Bruggen 2000, p. 5] found that managers reported that they were receiving increasing quantities of information and half of those interviewed reported that they were unable to cope. Those managers reported ill health and worsening personal relationships, along with other symptoms, such as paralysis of analytic capacity, increased anxiety, self doubt, and a tendency to blame others. Increasingly marketing managers are being asked to clear the same budget-justification hurdles imposed on other types of investments firms make. It is not surprising, therefore, that more managers are seeking help in turning their data and knowledge into improved decision making.

Over the years, the marketing field has produced a number of successful decision models and decision-support tools that facilitate sophisticated thinking about marketing problems. Several have been successful Edelman Prize entries, such as Gensch, Aversa, and Moore's [1990] use of choice models at ABB Electric, Lodish et al.'s [1988] work at Syntex Laboratories, and Wind et al.'s [1989] use of conjoint analysis to design the successful Courtyard-by-Marriott chain. These applications represent what we call marketing engineering: the systematic process of putting marketing data and knowledge to practical use through the planning, design, and construction of decision aids and marketing management support systems.

Until recently, the models and the approaches that marketing engineering embraces have been available only to those few managers in large organizations who have had strong motivation to access them and a large budget to support them. With the wide availability of computers on networks and emerging user-friendly software, however, organizations increasingly apply these modeling approaches. We have discussed elsewhere [Lilien and Rangaswamy 1998; Lilien and Rangaswamy 2000; and Lilien, Rangaswamy, Van Bruggen, and Wierenga forthcoming] a number of trends that are enhancing the ability of organizations to benefit from the marketing engineering approach. Those trends are all associated with wider availability of hardware, software, and networking and the decentralization of both corporate knowledge and corporate decision making. Yet it is largely the IT and systems builders who are getting credit for leading that trend, oftentimes reinventing marketing engineering methods or failing to use readily available and well-tested approaches.

0092-2102/01/3103/S001/$05.00
1526-551X electronic ISSN

MARKETING
DECISION ANALYSIS—SYSTEMS

Years ago Peter Drucker noted that marketing was too important to be left to marketers. That statement is true today more than ever before. Marketing-engineering tools can be viewed as digital networked knowledge assets and are too important to be left to software developers. Indeed we need detailed, scientific understanding of what types of systems work, in what circumstances, and why. Wierenga and Van Bruggen [2000] lay out a framework to help managers understand successes and failures, but that framework needs to be forged in the crucible of practice. The challenge, to use a medical analogy, is to develop the detailed set of clinical trials that demonstrate when, how, and why marketing engineering works and what can be done to improve effectiveness while limiting the cost and the potential harm to the user organization.

Managers seek help in turning their data and knowledge into improved decision making.

Leeflang and Wittink [2000], in a special issue of the *International Journal for Research in Marketing* dedicated to "Marketing modeling on the threshold of the 21st century," outline a 12-point research agenda. Their top three items are

(1) Document model use and nonuse in practice,

(2) Determine success and failure rates in practice, and

(3) Quantify real-world validation results.

These points, emerging from leading academics, reflect the underpinning of marketing engineering, which links marketing theory to marketing practice. In marketing, practice without theory teaches little, while theory without practice means even less. In the same vein, marketing software designed without embedded marketing concepts and theories or marketing concepts without potential software implementations will have little impact. Today's practicing managers, pressured to operate in complex and risky markets, increasingly depend on the concepts and tools of marketing engineering, which serve as distribution channels from marketing science to marketing practice.

The Special Issue

The forces we outlined above (along with an invitation to us from the editor of *Interfaces*) provided the genesis for this special issue. We clearly need more reports on marketing-engineering-application experience in our literature, and *Interfaces*, the INFORMS journal of OR practice, provides the logical venue. In our personal solicitations and our call for papers we sought three types of contributions:

(1) Multiple applications (M), papers in which authors review the lessons of numerous similar applications across a broad client base;

(2) Single applications (A), papers in which authors provide detailed case histories of individual applications and the impact of that work; and

(3) Commentaries (C), papers in which authors reflect on the important lessons they learned through years of applying marketing engineering.

As editors, we decided that the former two types of contributions would be refereed while the latter would not be, and the associated articles are so labeled. We

are delighted to have coaxed some of the best people in our field to write for this issue, in spite of their hyper-busy schedules. Most authors have academic affiliations, but all are marketing-engineering practitioners. The articles that we have been privileged to put together appear in the following order:

Prabha Sinha and Andy Zoltners (M) tell the compelling story of 25 years of building and implementing over 2,000 sales-force models with several hundred client organizations in over 50 countries. They provide rich and profound insights, particularly in the domain of implementation; they point out how their own beliefs about the role of models in support of business decisions have evolved from a model-dominated perspective to a more balanced view:

> "Our belief in the power of models is still strong, but our appreciation of the softer elements of problem solving and change management is much stronger. Models help shape judgment and judgment helps insure that models are implemented successfully. The combination of modeling and judgment can be very powerful."

We couldn't agree more.

Len Lodish (C) provides a catchy title: "Building marketing models that make money." And he backs that up with substance. The application at Syntex Labs that he described [Lodish et al. 1988] won the Edelman Prize and returned over $25 million to the company on a $30,000 investment, an attractive ROI indeed. Len has had extraordinary experiences in building successful models, including some in which he relied primarily on judgment for parameterization (at Syntex and at United Airlines, an earlier Edelman Prize finalist [Fudge and Lodish 1977]) and some in which he relied primarily on empirical data. He summarizes the lessons as follows: "Do the best with what you have." That philosophy means that marketing engineering, echoing Sinha and Zoltners, must blend art with science and recognize that "good," while not as good as "best," is much better than "fair" or "poor."

Paul Green, Abba Krieger, and Jerry Wind (M) tell the story of 30 years of conjoint analysis, one of the most popular and powerful marketing engineering tools (and the featured methodology in Wind et al.'s [1989] contribution to the Edelman Prize competition). They describe the basic ideas behind conjoint analysis and the evolution of the conjoint platform of methods. They also give brief summaries of how conjoint led to the development of the Courtyard by Marriott and the EZ Pass system, showing the interplay between theory and practice. Most of the initial developments in conjoint analysis occurred in academia, but the impetus for its continuing refinement and enhancements came from the requirements of practice. Conjoint analysis will continue to be a leading weapon in the marketing-engineering arsenal for decades to come.

The next article is Ed Brody's (C) commentary. He reflects on the evolution of marketing applications within INFORMS and how the marketing science function at BBDO developed three influential applications. He firmly believes that the best of marketing engineering lies ahead.

Frank Bass, Kent Gordon, Teresa Ferguson, and Mary Lou Githens (A) describe the planning and launch of DIRECTV. They discuss the use of the

Bass [1969] model, a major and popular marketing-engineering tool, as the core of their forecasting tasks. In line with Lodish's comments, no hard data can be used to calibrate that model before launch when the forecasts are needed. So they relied on a combination of managerial judgment and customer surveys to drive the calibration. The documentation of the process that led to the model's successful implementation shows how much can be done with careful modeling when few hard data are available but managers support the marketing-engineering process.

"Do the best with what you have."

Pete Fader and Bruce Hardie (A) introduce a new forecasting model in an e-commerce environment, studying repeat buying at CDNOW. They model the underlying stochastic process to capture nonstationarity in repeat-buying. Remarkably they show how this rather rich model can separate the trial and repeat components of an aggregate sales series and yet can easily be implemented in a standard spreadsheet environment. They show the value of models for generating excellent medium-range sales forecasts and demonstrate the applicability of marketing-engineering concepts in emerging areas.

Josh Eliashberg, Sanjeev Swami, Chuck Weinberg, and Berend Wierenga (A) bring a tricontinental team to an application of SilverScreener, a marketing-management-support system (MMSS). They applied the system, designed to help theater-programming managers in their task of optimally choosing movies for their limited screen capacity, to help a movie distributor in the Netherlands. The application of the model (in conjunction with managerial judgment) led to significant operating improvements and to managerial satisfaction at the movie chain. The authors provide a number of useful comments on implementation success, all of which complement the theme of the balance between models and managerial judgment that other contributors have emphasized.

Berend Wierenga returns with Gerrit Van Bruggen (C) to describe the issues associated with building a successful MMSS, BRANDFRAME, for a fast moving consumer goods company in the Netherlands. They emphasize the need for system customization, the need to ensure that system users remain in charge, and the recognition that different types of MMSSs are needed to support different decision makers.

Murali Mantrala and Surya Rao (A) describe an MMSS called MARK, designed to assist fashion-retail buyers to review and mark down individual items optimally during the season. The system provides an integrated resolution of the two preseason planning issues that a fashion buyer typically faces, namely, how large should the order quantity be and what is the anticipated markdown plan and budget. As the season progresses, MARK updates the initial demand forecasts and determines the optimal timing and magnitude of markdowns based on actual sales and inventory positions. Mantrala and Rao also present a case study that compares the profit impact of the system to that of several more conventional policies; more

important, they show how markdowns, widely viewed as mechanisms to correct mistakes, are exactly the type of mechanisms needed to cope with the unpredictable world of fashion goods.

Dennis Gensch (A), Edelman Prize winner in 1989 for his work with ABB Electric, closes this special issue by reflecting on his work on a new product-planning model for a manufacturer of heating and cooling systems. Remarkably this model has remained the core of the firm's product-planning process for over 25 years. Gensch ascribes the success of the model over time to the close relationship between the model builder and the managerial users in developing the model structure and in generating the necessary judgmental inputs.

Creating the Future: A Call for More Research on Marketing Engineering

So what is ahead for marketing engineering? A profound change is underway in how knowledge is being generated. Ever since Edison established his industrial lab at Menlo Park in 1876, organized research, whether at research labs, at academic institutions, or at private think tanks, has played a central role in generating new knowledge. However, the emergence and growth of the Internet is decentralizing the generation and dissemination of knowledge. Consider the human genome project, which involved scientists and practitioners in 16 institutes worldwide in government, universities, and the private sector, all collectively contributing to the generation, synthesis, and dissemination of knowledge. The Internet speeded up data and information sharing among members of this group and both contributed to reducing the duration of the project by several years and speeded up applications of the gene database made possible by the project.

> "Let knowledge come from all quarters."

We make three projections about the knowledge-generation process:

(1) The time between the origination of an idea and its application will continue to shorten,

(2) Knowledge advancement will accelerate as researchers undertake problem-focused activities (for example, mapping human genes or searching for bandwidth improvements on the Internet), and

(3) Previously independent entities in academia, industry, and government will find it increasingly more effective to work together than to work independently.

The development of new marketing knowledge will be driven by these trends. Newly published concepts and theories will get tried ever more rapidly by practitioners looking for an edge. And new types of data generated by industry will trigger almost immediate in-depth searches for new insights, theories, and methods within academia. The boundaries between theory and practice blur as marketing academics increasingly engage in practice through consulting work or industry advisory boards, becoming scientist-consultants and consultant-scientists. The articles in this issue are from such authors.

The ancient Indian text Rig Veda [verse 1.89.1] proclaimed: "Let knowledge come from all quarters." New marketing knowl-

edge is generated not only through contemplation, experimental manipulation, and empirical analysis, but also through systematic attacks on real business problems. Increasingly, the process of applying knowledge itself triggers the generation of new knowledge.

We expect and hope to see more research at the interface between marketing theory and marketing practice, that is, more work on marketing engineering. Both scientists and practitioner-consultants like challenging and important problems. But consultants have neither the time nor the economic incentive to create new solutions, while scientists do. Marketing scientists will increasingly be aided by practitioners in selecting problems and testing solutions. Promising academic solutions will be ever more quickly tested in the years to come.

We will all be better off when we blend our skills. With apologies to Herbert Simon, "We have to humanize the scientist and simonize the humanist." In doing so, we can expect to see more effective marketing-engineering applications and more exciting marketing-academic breakthroughs than could be produced by either group alone.

Acknowledgments

We editors appreciate the invitation that Editor-in-Chief Terry Harrison extended to us; we hope that the results do not disappoint. We thank the referees below for their work in improving the papers: the authors were generally astonished at receiving constructive and supportive reviews. And to press the constructive point a bit, the authors marveled at the energy and persistence of Mary Haight, scourge of jargon and the passive voice. Though some small pockets of resistance remain, the papers are, as is the norm for Mary's work, accessible. Mary Wyckoff kept things running on schedule by pestering both authors and referees and allowing us to meet deadlines. Thanks to all!

Robert J. Dolan, Harvard University; Peter S. Fader, University of Pennsylvania; Sunil Gupta, Columbia University; James D. Hess, University of Illinois; Sidney W. Hess, Chadds Ford, Pennsylvania; Aradhna Krishna, University of Michigan; Lakshman Krishnamurthi, Northwestern University; James M. Lattin, Stanford University; Leonard M. Lodish, University of Pennsylvania; Vijay Mahajan, University of Texas, Austin; John M. McCann, Duke University; Donald G. Morrison, University of California, Los Angeles; Frank Mulhern, Northwestern University; Narakesari (Das) Narayandas, Harvard University; Stephen M. Shugan, University of Florida; Joel H. Steckel, New York University; Gerrit Van Bruggen, Erasmus University, Rotterdam; Charles B. Weinberg, University of British Columbia; Berend Wierenga, Erasmus University, Rotterdam; Dick R. Wittink, Yale University; and Fred S. Zufryden, University of Southern California.

References

Bass, Frank 1969, "A new product growth model for consumer durables," *Management Science*, Vol. 15, No. 5 (January), pp. 215–227.

Fudge, William K. and Lodish, Leonard M. 1977, "Evaluation of the effectiveness of a model-based salesman's planning system by field experimentation," *Interfaces*, Vol. 8, No. 1, Part 2 (November), pp. 97–106.

Gensch, Dennis H.; Aversa, Nicola; and Moore, Steven P. 1990, "A choice modeling market-ing information system that enabled ABB

Electric to expand its market share." *Interfaces*, Vol. 20, No. 1 (January–February), pp. 6–25.

Leeflang, Peter S. H. and Wittink, Dick 2000, "Models for marketing decisions: Postscriptum," *International Journal of Research in Marketing*, Vol. 17, Nos. 2–3, pp. 237–253.

Lilien, Gary L. and Rangaswamy, Arvind 1998, *Marketing Engineering: Computer Assisted Analysis and Planning*, Prentice Hall, Englewood Cliffs, New Jersey.

Lilien, Gary L. and Rangaswamy, Arvind 2000, "Modeled to bits: Decision models for the digital, networked economy," Comment on "Building models for marketing decisions: Past, present and future" by Peter S. H. Leeflang and Dick R. Wittink, *International Journal of Research on Marketing*, Vol. 17, Nos. 2–3, pp. 227–235.

Lilien, Gary L.; Rangaswamy, Arvind; Van Bruggen, Gerrit; and Wierenga, Berend forthcoming, "Bridging the marketing theory-practice gap with marketing engineering," *Journal of Business Research*.

Lodish, Leonard M.; Curtis, Ellen; Ness, Michael; and Simpson, Kerry M. 1988, "Sales force sizing and deployment using a decision calculus model at Syntex Laboratories," *Interfaces*, Vol. 18, No. 1 (January–February), pp. 5–20.

Wierenga, Berend and Van Bruggen, Gerrit 2000, *Marketing Management Support Systems; Principles, Tools and Implementation*, Kluwer, Boston, Massachusetts.

Wind, Jerry; Green, Paul E.; Shifflet, Douglas; and Scarbrough, Marsha 1989, "Courtyard by Marriott: Designing a hotel facility with consumer-based marketing models," *Interfaces*, Vol. 19, No. 1 (January–February), pp. 25–47.

Gary L. Lilien
Arvind Rangaswamy
Smeal College of Business
Pennsylvania State University
University Park, Pennsylvania 16802
g5l@psu.edu
arvindr@psu.edu