Available online at www.sciencedirect.com
ScienceDirect
Journal of Business Research 61 (2008) 1099–1101
JOURNAL OF BUSINESS RESEARCH

Applications of system dynamics in marketing: Editorial ☆

George P. Richardson [a,*], Peter Otto [b]

[a] Public Administration and Policy, Rockefeller College of Public Affairs and Policy, University at Albany - SUNY, Albany, NY 12222, United States
[b] Union Graduate School, School of Management, Lamont House, 807 Union Street, Schenectady, NY 12308

Received 1 March 2007; received in revised form 1 August 2007; accepted 1 November 2007

Abstract

This special issue of the *JBR* illustrates a range of applications of modeling and simulation from the system dynamics perspective to problems in marketing and related areas. The papers pertain to the diffusion of new products and technologies, advertising effectiveness, management decision-making, forecasting, project dynamics, and innovation and leadership. Papers presented in this special issue were selected from submissions to attend a two-day workshop on applications of system dynamics in marketing, held at the Johnson School of Management, Cornell University, Ithaca, New York, in June 2007.

Keywords: System dynamics; System behavior; Management decision-making

1. Introduction

This special issue shows exemplary model-based work in a range of business application areas, revealing a diversity of insights about complex dynamic management problems in marketing. The ten papers in this special issue were selected from submissions to attend a two-day workshop on applications of system dynamics in marketing at the Johnson School of Management, Cornell University, in June 2007. A review board comprising system dynamics and management scholars evaluated the papers. The academic program of the workshop consisted of presentations followed by in-depth discussions of every paper which was presented. Authors were asked to consider the feedback from the panel before they submitted their paper for a final review through the guest editors of this special issue of the Journal of Business Research. The panel also voted on a best-paper award to acknowledge outstanding academic work in the scope of this workshop, which went to Charles F. Nicholson and Harry M. Kaiser for their paper "Dynamic Market Impacts of Generic Dairy Advertising".

The studies in this section employ the system dynamics approach (Forrester, 1961; Sterman, 2000) to show how decisions, policies, system structures, and delays interact to influence growth and stability. A system dynamics model captures the multiple feedback loops underlying the endogenous behavior of a particular problem. Simulation enables exploring "what-if" scenarios and policy tests in something approaching a laboratory setting, leading to growing confidence in particular policies and strategies.

System dynamics has a long history analyzing complex problems in a variety of application domains, ranging from environmental or public policy, corporate strategy, security, healthcare, and operations management, to change management. However, it has not seen extensive application in the marketing literature. The characteristics of the marketing decision environment – multiple inputs and outputs, delayed effects and nonlinearities – are precisely the characteristics that laboratory experiments suggest that managers could not do well intuitively (Morecroft, 1985; Sterman, 2000). These lines of thinking are reflected in the work in this issue, aiming to provide cognitive support for marketing managers in planning, policy analysis, and strategic decision-making.

☆ The editors thank the senior editor of the *Journal of Business Research*, Arch Woodside for his support and encouragement to publish this special issue. The authors thank the Johnson School of Management, Cornell University, for hosting the workshop and in particular Charles F. Nicholson and Eric Eisenstein for their support in organizing the event.

* Corresponding author.
E-mail addresses: gpr@albany.edu (G.P. Richardson), ottop@uniongraduatecollege.edu (P. Otto).

0148-2963/$ - see front matter © 2008 Published by Elsevier Inc.
doi:10.1016/j.jbusres.2007.11.003

2. Overview

The first paper by Fine and Pagani employs system thinking, reflected in the work of Checkland (1981), Senge (1990), and Kim (1978), to analyze adoption of third-generation (3G) telecommunications services by customers. The authors collected qualitative data at 15 communications-industry workshops attended by 190 participants in Europe and then conceptualized extensive causal-loop diagrams to provide insights into the underlying market dynamics to scale 3G services. The causal-loop diagrams not only deepened the understanding of the possible evolutionary paths of the 3G wireless value network but also helped to assess which future scenarios are plausible and what dynamic triggers might make them likely.

The second paper from Khalid Saeed presents a carefully reasoned and well-grounded argument showing how trend forecasting can be improved as a reliable policy tool if we apply it as what engineers call derivative control. In particular, he suggests that the variable forecast must be carefully selected to represent a *tracking* variable. To support his reasoning, Saeed constructs a system dynamics model of a simple supply chain management system, focused on adequately meeting shipment needs by ordering to replenish inventory.

Nicholson and Kaiser detail the market dynamics for generic dairy promotion programs aiming to increase consumer demand for fluid milk and dairy products, enhance dairy farm revenue, and reduce the amount of surplus milk purchased by the government under the Dairy Price Support Program. Their work is a richly documented and validated exposition of market drivers to examine the impacts of generic advertising expenditures for fluid milk and cheese in a multiple-product dynamic simulation model, and examine selected expenditure strategies to increase revenues received by dairy farmers.

Groessler and Löpsinger's paper demonstrates the usefulness of system dynamics methodology for analyzing price and product strategies in the capital goods industry. Their research documents the difficulties managers encounter in making decisions in dynamic settings and provides a number of model-based insights. The dynamic decision-making research reported in his paper illustrates the importance of involving management in the modeling process for obtaining maximum understanding and implementation of model-supported insights.

Rich investigates management problems of corporate growth through adoption and diffusion. His work extends the classical adoption and diffusion models to consider the processes involved in abandoning management innovations. He derives his modeled-based understandings of management fads from the business literature in such areas as quality management, business process reengineering, and knowledge management. The model presented in the paper is based on explicit dynamic theories and market data that lead the author to conclude that incomplete information and bandwagon effects can lead to fad-like behaviors of some management innovations.

Lin's research addresses the marketing and production problem that price, quality and production rate are simultaneous dynamic decision variables under conditions where demand is dynamic, which in turn depends on price, quality, and cumulative sales. The authors develop a well-grounded model to considered price, production rate and quality as the control variables that are determined dynamically to maximize the overall profit. The result from this study could help policy makers to optimize decision variables for determining price, quality, and production rate without being obscured by sub-optimal analysis.

Eisenstein's work is a richly documented exposition of the barriers to stop malicious possession of personal identity data and thus reduce identify theft. His model-based policy analysis investigates levers to control the problem of identity theft through, for example, increased monitoring or changes of security freezes. The evidence from the simulations suggests that prevention is better than reaction, with counterintuitive implications for credit rating monitoring agencies. The insights derive from extensive model tests, comparison to real system data and structure, and much reflection about the policy initiatives.

The work by Otto deals with the market dynamics of launching a new pharmaceutical product and the difficulties to choose an appropriate market entrance strategy. The author describes the efforts to conceptualize a simulation model together with the management team and the results from exercising the model. The results of the study suggests that building the simulation model as a team not only helped the client to feel a sense of ownership concerning the model, but also to better explain and defend the proposed localized market entrance strategy using a computational representation of the causal structure of the system.

Morrison's paper describes a system dynamics model to apply learning curve theory for testing organizational policies when implementing innovation. The model presented in the paper is based on extensions of learning curve theory that incorporates a learner's need to accomplish ongoing work while meeting the challenges of learning new skills. By incorporating a feedback structure to the learning curve theory, Morrison's research provides a new contextualization view of the learning curve. The insights from his research suggest that adding throughput constraints may be a cause for failure to learn and in some regions of the learning curve, learning as a function of experience increases at an increasing rate.

Pavlov, Mellvile, and Plice investigate targeting and filtering measures, which influence the effectiveness of email marketing programs. While email marketing is perceived as an effective and inexpensive way to reach a large audience it is in danger of being overrun by commercial email, or spam. The paper proposes a system dynamics approach to provide a holistic analysis of the system under study. Despite the highly aggregated structure of the research framework, the resulting system dynamics model captures the important relationships in the complex system and to underlying dynamics. Policy experiments with the simulation model reveal unexpected consequences, for example, filtering is increasing the amount of unwanted email. The insights from this research may help the industry and regulators to choose an optimal policy for mitigating information overload.

References

Checkland P. Systems thinking, systems practice. Chichester, U.K.: Wiley; 1981.
Forrester JW. Industrial dynamics. Waltham, MA: Pegasus Communications; 1961.
Kim DH, editor. The systems thinker. Waltham, MA: Pegasus Communications; 1978.
Morecroft JDW. The feedback view of business policy and strategy. Syst Dyn Rev 1985;1(1):4–19.
Senge, P.M. (1990), "The fifth discipline: the art and practice of the learning organization," New York, Doubleday/Currency.
Sterman JD. Business dynamics: systems thinking and modeling for a complex world. Boston: Irwin/McGraw-Hill; 2000.