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BOOK REVIEW

Modeling the Supply Chain

Jeremy F. Shapiro

Duxbury Thomson Learning, California, 2001.

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586 + xxii pages

Organizations face data deluge with the ubiquitous implementations of online transaction processing (OLTP) systems, which perform query processing and day-to-day transactional operations across organizational functions. ERP systems, order processing systems, and billing systems are typical of such implementations. While such systems facilitate faster and cheaper transmission of data, they do not automatically lead to better decision-making as they lack analytical capability. Appropriate models and modeling techniques, and their seamless integration into information system infrastructure, would increase usefulness of data for supply chain decision-making. Modeling the supply chain is difficult due to the complex interaction of multiple forces. Supply chain management (SCM) encompasses a wide range of disciplines such as economics, marketing, finance, production and operations, logistics, corporate strategy, operations research, and information management. Use of analytical models and modeling techniques by an organization depends upon the fit between relevant models, available data, information system infrastructure, cost of implementation, and ability of human resources. Therefore, pragmatic modeling must take into consideration all of the above disciplines as well as organizational concerns. In this context, Jeremy Shapiro's *Modeling The Supply Chain* makes a unique contribution to understanding practical supply chain modeling.

Shapiro examines the roles of data, models, and modeling systems in helping companies improve management of their supply chains for competitive advantage. He shows that when properly applied, quantitative methodologies and optimization techniques can contribute to accurate and comprehensive models of great practical value. The book illustrates the importance of harmonizing qualitative and quantitative perspectives. It highlights the importance of strategic, tactical, and operational aspects of decision-making, provides context-specific spreadsheet based frameworks, and substantiates the key concepts with relevant examples and cases.

The preface of the book highlights the importance of a balance between quantitative and qualitative analyses in supply chain decision-making, identifies the intended audience, overviews the contents of the book, and advises the readers to make use of the supporting website. The website contains modeling exercises, data files, discussion questions, white papers, and hotlinks to other relevant websites. The book is then organized into four sections: Part I is the Introduction to Supply Chain Management; Part II presents Modeling and Solution Methods; Part III demonstrates "Applications of the Methods" to typical SCM problems; and Part IV presents the Future of Supply Chain Modeling in the context of organizational, technological, and human issues. Each chapter is followed by an exhaustive list of references and the book has a comprehensive index at the end.

Part I consists of two chapters. Chapter 1 highlights the fundamental elements of SCM: supply chain structure, the importance of functional, spatial and temporal integration of supply chain planning, the broad characteristics of descriptive and normative models, the holistic nature of supply chain modeling, and the important role of information technology in the adaptation of supply chain modeling by organizations. Chapter 2 distinguishes between transactional and analytical information systems and identifies the key role of analytical information systems in model-based decision-making.

Part II contains four chapters that illustrate applications of spreadsheet based mathematical programming models in the context of SCM. The complexity of successful implementation and the subsequent usage of modeling systems are described in detail. This involves elaborate collection, organization, validation, and transformation of data from disparate transactional sources; loading of these data into relevant supply chain decision databases; integration of these databases with decision support software; and development of efficient, effective, and interactive user-interfaces for the sustained usage of these modeling and information systems.

Part III consists of five chapters that discuss the applications of modeling systems to strategic, tactical, and operational decision-making in the supply chain. Chapter 7 discusses the significance of qualitative issues and identifies the scope and limitations of incorporating such issues into models while formulating logistics and manufacturing strategies in light of the resource-based view of the firm. Relevant examples are included on redesigning a distribution network by an electronic products company, global sourcing by an industrial chemicals company, and post-merger consolidation of a paper company. Chapter 8 deals with applications for supply chain integration and demand management. The author identifies specific challenges in developing such applications. The scope and approaches of optimization models under uncertain situations, such as price competition or planning for new product introduction and growth, are also illustrated. Chapter 9 discusses models for corporate financial planning and their integration with models for supply chain optimization. These models enable managers to connect decisions involving financial flows with those involving physical flows. Chapter 10 demonstrates applications for short term operational planning such as vehicle routing, production scheduling, and human resource planning. The examples include an e-commerce company and a semi-conductor company. The chapter also discusses the utility of simulation models in capturing the system dynamics in operational planning. Modeling for inventory management is discussed in Chapter 11.

Part IV discusses human and organizational behaviors that may prevent the implementation of data based modeling systems for SCM. This section suggests approaches to overcome such barriers in the context of organizational decision-making ecology, IT infrastructure, business process redesign, and incentive contracts for supply chain coordination. It also explains the key stages of a time-phased supply chain study in order to enable practitioners to develop a realistic assessment of the implementation of supply chain modeling systems. The chapter concludes with a promising outlook for the future of modeling systems and their applications over the next ten years.

Overall, the author has thoroughly addressed concerns such as cost minimization, cycle time reduction, and revenue maximization in the optimization models presented. However, the discussion is limited to the physical goods supply chain, and the modeling approaches are restricted to cardinal decision variables. In practice, supply chain managers may have to deal with many ordinal variables. The discussion on the harmonization of qualitative and quantitative perspectives in supply chain modeling, and the details of some implementation aspects of the decision models are limited in scope. Nevertheless, *Modeling the Supply Chain* is extremely useful to practicing managers, consultants, and MBA-level students of SCM because of its pragmatic and lucid presentations of the hierarchical and integration aspects of supply chain modeling in the physical goods supply chain.

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