BOOK REVIEWS

Engineering Quality by Design: Interpreting the Taguchi Approach by T.B. Barker, M. Dekker, ASQC Quality Press, New York, 1990, 250 pp.

It is frustrating to have a product fail prematurely or not perform as advertised – even though it worked properly at the factory. This type of failure is the concern of Dr. Genechi Taguchi's philosophy and experimental design methods. His approach seeks to achieve 'robust' designs that perform well under actual operating conditions.

The Taguchi approach is based on statistical Design of Experiments (DOE) theory. DOE is a systematic process for experimentally varying the levels of combinations of controllable variables to measure the effects on a response variable. These experiments tend to be designed and analyzed by statisticians, supporting the efforts of engineers in determining effective design values. Dr. Taguchi simplified and systematized the DOE methods, in an effort to make them understandable and usable by practicing engineers. Thomas Banker aids this effort with a well organized, clearly written book that is a valuable reference for engineers and a comprehensive text book for upper level engineering and manufacturing students.

Barker first introduces the Taguchi concept of quality and his use of the Loss Function, which measures the total cost of poor quality to the firm, the customer, and society. The balance of the book describes in detail the techniques employed by Taguchi to minimize the expected value of the Loss Function. This is achieved through designs that perform consistently on target, despite the presence of unfavorable environmental conditions, or 'noise'.

This is a book for serious students of experimental design – either practitioners or academics. The writing is clear and concise, and is supported by excellent examples, but the material is detailed and cumulative, requiring diligent study. A variety of formulas, tables, and graphs is used, requiring analytical skills that both engineers and upper level students should be comfortable with. An understanding of rudimentary statistical concepts such as variability, distributions, mean and standard deviation, and expected value is assumed.

Despite the many documented successes of the Taguchi approach, his simplification of DOE methods is viewed as overly simplistic by some statisticians. They object to what they view as Taguchi's absence of randomization in the sequence of experimental runs, an inadequate concern for interaction effects among variables, and the questionable validity in some cases of the Signal-to-Noise Ratio (S/N) as a response variable.

Banker discusses the first two objections, justifying the Taguchi methods based on the use of engineering judgement to minimize potential difficulties and the favorable cost/benefit trade-offs. He does not address the S/N validity. Pignatiello discusses the shortcomings of the S/N performance statistic in the September 1988 issue of the IIE Transactions, pages 247–254. He puts the statistical controversy over the Taguchi approach into perspective by concluding that: 'Apparently any reasonable systematic experimentation, however flawed, can yield important information on how to design a new product...'.

Engineering Quality Design is recommended to anyone interested in studying the systematic Taguchi approach to experimental design.

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Managing the Global Supply Chain by Philip B. Schary and Tage Skjøtt-Larsen, Handelshøjskolens Forlag, Copenhagen Business School Press, Copenhagen, Denmark, ISBN 87 16 13278 5, 396 pp., US$57.

Applying the principles of the global supply chain to gain competitive advantage

- Global supply chain;
- International logistics;
- Procurement;
- Production;
- Distribution;
- Transportation management.

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The concept of the global supply chain

The authors, one American and the other one Danish, collaborate to provide a cogent perspective of the modern global supply chain which, in the opening chapter, they define as 'a system, requiring a broad perspective and the emphasis on system management, which is becoming the central characteristic of logistics management'. The authors are cautious in warning us that they are presenting 'a transitory view' which is continuously undergoing change. The traditional functional areas of logistics, i.e., transportation and inventory are no longer the only issues that shape its direction. Now, what is central are production technology and information systems to which the authors devote a whole chapter. Indeed the authors emphasize that today's most successful enterprises use supply chain management as their strategic weapon. They are able to integrate operating systems as information-connected units to include all organizations within the supply chain.

Information and supply chain management

Supply chain management is more than logistics management. In the context of this text, supply chain management takes responsibility for the entire supply process, beginning with supplier operations and ending with customer operations. Two parallel tracks exist: the product flow and the corresponding information flow that manages it. One cannot ignore operations necessary for international operations such as customs relations and trade documentation, global production allocation and currency exchange management. The international dimensions and the changing world market must be taken into account to appraise the changes in organization and in technology which are needed to cope with the global perspective. Schary and Skjøtt-Larsen state that the Logistics Information System is driven by data. It shapes the supply chain because it provides information on demand, connects operations across organizational boundaries, enlarges the span of effective control and coordination, reinforces centralization, and distributes decision-making power to local units which become aware of the impact of their decision on other units. Global requirements place unique demands on the information system which are determined by the complexity of the network and the set of cultural differences, including local customs and business practices. The authors depict several companies' worldwide logistics-management systems. They describe the corresponding data interchange and the information technology which underlie the supply chain management. Over time, the concept of the latter has evolved. It both anticipates and reflects a redefinition of business organization. As a concept, it first embraced the organization as an integral unit, and later, expanded to encompass a chain of specialized organizations linked to pursue a common objective. Today's objective is a form of 'supraorganization' defined by information connections, rather than by organizational boundaries. Information has become the central driver in supply chain management.

The grand design: structuring the global supply chain

Competition among global corporations is a contest of strategies combining product innovation, marketing and supply. The global network includes all functions and activities that add value to the product, including delivery. It extends beyond the formal boundaries of the corporation to include other cooperating organizations like suppliers, intermediaries performing logistics services, even customers. The structure of the supply chain is concerned with the value system which underlies the supply chain. The global supply chain must deal with a set of economic and geographic, as well as cultural forces that demand adaptation to meet international requirements of host countries. Two cases in the text illustrate these concepts: the Japanese Steel Industry and Benetton.

The supply organization

The authors of this text argue for the implementation of network relationships upon which the success of the organization depends. A network is a set of connections among activity centers. The network is effectively an organization for the lead firm because it captures the available resources from other firms. Boundaries among firms are penetrated through interpersonal actions and telecommunications. The supply chain becomes an organizational network for a specific purpose, linking suppliers, production, distribution and customers across corporate boundaries for the purpose of furthering product flow. There are several forms of networks. Relationships can be classified in

terms of markets and hierarchy, as well as in terms of game theory (i.e., zero-sum or non-zero-sum games). Schary and Skjøtt-Larsen state that the question of control in networks is complex. Questions of degree of overlap and jurisdiction arise. The authors discuss network structures, management networks, network types (e.g., stable, internal and dynamic networks). When discussing organizational boundaries, the authors utilize transaction cost theory as developed by Coase in 1937, and later by Williamson, in 1979 and 1981. According to this last author, governance structures must be matched to the type of commercial transactions and investment characteristics. This gives rise to different types of contracting. Network relations are intermediate between markets and vertical integration. Partnerships and alliances, which form a deeper relationship than normal business, can also be considered. The discussion then turns to governance and the extent of trust and risk in different forms of contracts, and to boundary management which implies that, to be successful, the use of networks must cross organizational boundaries. In global networks one can obtain decentralized or centralized control and linkages. Finally, the role of logistics in networks, and the newer roles of logistics management are covered.

The supply process and the procurement process

One chapter is devoted to each of these processes. In the first, the authors introduce the operation of the supply chain. They describe the product and production, suppliers relations, distribution and the supporting functions which must accommodate product characteristics and production processes. It is here that strategy choice starts. The key elements are inventory and response to change. The direct effects of choosing a production scheduling system are difficult to assess. In a world of rapidly altering markets, the ability to respond to changes in demand becomes a key issue. This chapter ends with a discussion of just-in-time supply relationships. In the second chapter, the subject of the procurement process is presented with a detail account of the international supply system. It discusses strategic purchasing classes depending on their importance and difficulty. Examples are given of single sourcing and parallel sourcing. Excellent comparisons show the difference in net profit of two companies with the cost of the various elements in sourcing decisions that will affect profit. It is detailed but highly enlightening. It is also shown that currency exchange rates are an important element of international sourcing because of the financial risks involved. Finally, reference is made to free-trade zones where goods can be landed, held and processed without payment of duties until they are released to the host country. The chapter is a thorough reference for global sourcing which has become such a commonplace activity in the modern corporation.

Distribution management and transportation systems for the European market

Distribution interacts with the organization and technology of production. Effective distribution utilizes tools of demand management, time and flexibility. The objective is to meet the customers requirements, with the most effective use of resources. The Philips Consumer Electronics case is used to illustrate two different European distribution systems. In Atlas Copco Tools we can also appreciate the difference between the former and the newer distribution systems. In the case of Bang & Olufsen A/S, the order and product flow in two systems are discussed.

Concerning transportation in the European market, the authors concentrate their efforts to discuss the intra-European transport network. This discussion is thorough. It encompasses the scope of the transport industry, the major changes which the transport patterns and problems of transportation have suffered in the last few years, and the need for infrastructure investment. The book then presents a chronicle of the deregulation of the transport market as well as the structure of the transport industry in Europe. There is a classification of the services of transport by third party operators and a detailed discussion of what transport strategy should be used, depending on the type of goods flow which is being considered. Readers will even find illustrations of modal analysis which show the various costs for different modes of transport, for modes which depend on the shipment sizes, the purchasing criteria for evaluating third party logistic providers which depend whether they are assert based, hybrid or management based. Four cases, namely, Caterpillar, DFDS FedEx Business Logistics and Value Link Services are illustrated.

The strategic role of the supply chain

Supply chain strategy has three components: structure, organization and process. Process is a key com-

ponent, both using and determining structure within a framework of organizational relationships. In a global marketplace, the ability to deliver a variety of products to meet customer needs through a dispersed production-distribution network becomes a competitive necessity and, in some cases, a source of competitive advantage. In relation to the strategy role of the supply chain, the authors of this text discuss the characteristics of the supply chain, the corporate role of logistics strategy, the development of strategy, developing its structure, its location, its process, organizational networks, partnerships and alliances, the tools of strategy, the role of flexibility, information and organizational design and the supply chain in an international context. This book definitely takes a different approach to the supply chain than traditional logistics textbooks. The primary focus is on supply chain management as an integral part of corporate strategy. While oriented to a European context, it becomes universal with the addition of references to American and Japanese management practices.

The text closes with larger cases such as IKEA, Coloplast A/S, Lego A/S. As the shorter cases which close the various chapters, they are well written, challenging and raise the key elements of logistics organization and management, as well as the application of the main principles of the global supply chain presented earlier.

The book is designed to serve executives who have an important stake in the international market and seek to gain competitive advantages through better management of the components of the global supply chain. The authors bring a blend of American practicality and Danish scholarship to their endeavor. The result is a scholarly presentation which will also attract savvy entrepreneurs who need to extract the most from their operations and who are looking for ways 'to improve the bottom line' of their international investments. The important points are duly referenced and interested readers will be able to obtain further insights in the up-to-date bibliography. The book is not easy to read. It is meant to be digested slowly. However, the efforts should be highly rewarding for dedicated readers. As a final note, the undersigned reviewer would like to clarify that the text of the review is entirely made up from liberal quotes from the text. There is no claim of authorship or of originality made here.

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