



Build-to-order supply chain management: a literature review and framework for development

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Abstract

The build-to-order supply chain management (BOSC) strategy has recently attracted the attention of both researchers and practitioners, given its successful implementation in many companies including Dell computers, Compaq, and BMW. The growing number of articles on BOSC in the literature is an indication of the importance of the strategy and of its role in improving the competitiveness of an organization. The objective of a BOSC strategy is to meet the requirements of individual customers by leveraging the advantages of outsourcing and information technology. There are not many research articles that provide an overview of BOSC, despite the fact that this strategy is being promoted as the operations paradigm of the future. The main objective of this research is to (i) review the concepts of BOSC, (ii) develop definitions of BOSC, (iii) classify the literature based on a suitable classification scheme, leading to some useful insights into BOSC and some future research directions, (iv) review the selected articles on BOSC for their contribution to the development and operations of BOSC, (v) develop a framework for BOSC, and (vi) suggest some future research directions. The literature has been reviewed based on the following four major areas of decision-making: organizational competitiveness, the development and implementation of BOSC, the operations of BOSC, and information technology in BOSC. Some of the important observations are: (a) there is a lack of adequate research on the design and control of BOSC, (b) there is a need for further research on the implementation of BOSC, (c) human resource issues in BOSC have been ignored, (d) issues of product commonality and modularity from the perspective of partnership or supplier development require further attention and (e) the trade-off between responsiveness and the cost of logistics needs further study. The paper ends with concluding remarks.

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1. Introduction

The global nature of the markets and competition has forced many companies to revisit their operations strategy. Companies have moved from centralized operations to decentralized operations in order to take

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advantage of available resources and to be closer to their markets. Consistent with this, firms have undergone numerous changes in terms of strategies, tactics, and operations with the aim of meeting the changing requirements of the market. Currently, companies have to compete based on multiple competitive performance objectives such as quality, price, responsiveness, flexibility, and dependability.

Mass customization has become a major objective of many Fortune 500 companies. Towards this end, firms have developed a build-to-order supply chain (BOSC) to be flexible and responsive. Recently, BOSC has become a popular operations paradigm after the success of its implementation in Dell Computers, BMW, and Compaq. To achieve mass customization, the BOSC model is now being actively pursued in several different industries. One of the first successful build-to-order (BTO) companies was Dell Computers, which gained market share by building customized computers using the Internet as an order fulfillment vehicle. In addition to Dell, BMW also allows customers to make changes to their vehicle within 6 days of final assembly (including a complete change in color, etc.). This allows BMW to build up to 550,000 permutations of the Z3 vehicle.¹ Agility (flexibility and responsiveness) has become a competitive weapon for capturing market share in a global market where products are sold and bought online. Also, Internet technologies have changed the dimension of enterprise operations and management. Companies rely on strategic alliances based on core competencies and information technologies to achieve flexibility and responsiveness in their supply chain.

Today's market environment is characterized by diverse customer tastes and preferences, rapid developments in technology, and the globalization of management (Hsu and Wang, 2004). These factors have led to the need to offer a variety of products, which presents major challenges to production managers. In order to overcome the difficulties posed by a proliferation of products, there has been an increasing emphasis on redesigning products and processes to ameliorate the possible negative impact of offering a large variety of products. Designing to defer product differentiation is a strategy whereby the

final configuration of a product is postponed as much as possible, usually until a customer's order is received (Lee and Tang, 1997). Dell and Gateway have developed a BOSC to capture the variability of demand in the PC industry, recognizing the distinct characteristics and the volatile and difficult-to-predict demand for high-technology products (Hsu and Wang, 2004). An example of a successful BTO is Fujitsu's establishment of a configuration center to precede the final assembly of products in Tennessee. Compaq, for its part, has simplified the structure of its products, and reduced the complexity of its product mix to enhance the implementation of BTO. These moves indicate that several companies have made good progress in implementing BOSC. A BOSC production system has different requirements than are found in standard mainstream production operations. Additional requirements for a BTO system include ending the day with empty tables (no work-in-process), maintaining zero inventories on finished goods, and building products to order only (Wagner et al., 2003).

Apple Computer was unable to fill orders for its new high-end line of G4 computers because of delays in the supply of chips. As a result, the company experienced a devastating 14% drop in revenue in 1999. Apple was able to address these delays and respond to them by managing suppliers and optimal production schedules. On the other hand, Dell Computers proved that Internet-based mass customization is the preferred business model (BOSC) – and the most profitable one – in the PC industry. Dell generated a 160% return on its invested capital by allowing customers to build their own computers online, then successfully manufacturing and delivering these computers with a lead time of 5 days for the delivery of the products (Ghiassi and Spera, 2003).

There have been a number of research reports and magazine articles on BOSC. However, there is some confusion in these writings between make-to-order (MTO) and BTO. The lead times are longer in MTO than in BTO. In MTO, components and parts are made and then assembled. In the case of BTO, the components and parts are ready for assembly. There are a noticeably limited number of research papers on BTO from both academics and practitioners. Nevertheless, BTO is gaining ground not only in selected industries, but across all types of industries. Therefore, considering the importance of BOSC, a review of the

¹ Professor Robert Handfield, Editor-In-Chief, Journal of Operations Management, 2003.

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