Chapter 1
Information Systems as the Key Enabler in Engineer-to-Order Supply Chain Management

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ABSTRACT

Engineer-to-Order (ETO) environments are gaining more and more popularity these days with customers demanding custom-designed products to meet their specific needs. ETO enterprises are often having to rely on the combined design capabilities of the entire value chain in order to satisfy customer requirements. Due to the increased level of interaction with customers and between partners in the value chain, it becomes imperative to have an effective means of communication and data storage. Information systems can be leveraged to streamline the communication process and improve data exchange between the members of the value chain. This chapter will examine how information systems can be the key enabler in ETO supply chain management and identify some of the issues involved. The chapter will conclude with suggestions on future direction for research in this area.

INTRODUCTION

Engineer-to-Order environments are increasingly becoming more commonplace these days with the advances in design and manufacturing making it more and more feasible and practical. However, it is not sufficient to have good design software and manufacturing capabilities to be able to succeed in this environment. An integrated information management system is indispensable especially in today's highly dispersed supply chains and uncertain markets in which these companies seek to thrive. The requirements of an information management system in an engineer-to-order environment are vastly different from that of a make-to-stock environment where information about the product variety and manufacturing processes are known ahead of time. In an engineer-to-order system, the product mix is governed by cus-

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tomer choice and hence not all information is available ahead of time. Most of the information processing happens on a real-time basis once the order is received. Besides handling the nitty-gritty details of order management, such information systems also help with knowledge management, production planning, performance measurement, and traceability.

In order to be able to succeed in an engineer to order environment, it is imperative to provide customers with numerous choices for the product. Keeping track of these numerous product variants can be an onerous task in itself in any organization. Moreover, these product variants have to be efficiently translated to manufacturing for quick and speedy implementation. Knowledge management allows companies to leverage the resident knowledge about product variants and their translations to generate automated systems that would efficiently transfer customer design specifications to manufacturing instructions.

Efficient production planning is a key enabler for an agile manufacturing system that responds quickly to changing customer demands. Information systems allow dynamic scheduling based on the inflow of customer orders thus helping manage the plethora of disparate product mixes that are a hallmark of engineer-to-order environments. Decision support systems that leverage the underlying knowledge management systems can be employed to assist in the process.

Performance measurement is critical in such elaborate and complex systems. In order to be effective, performance management systems have to be tailored specifically to the company's environment and its long-term goals. In an engineer-to-order environment, it is important to have specific key performance indicators in order to track innovation and its rate of transfer from engineering to manufacturing. Besides these, it is also important to monitor the efficiency and reliability of manufacturing logistics in fulfilling highly customized orders, which is the mainstay of engineer-to-order environments.

Information systems also help bridge the gap between engineer-to-order and mass customization, which aims to improve the organization's competitiveness in a customer-centric market. While engineer-to-order focuses on tailor-made products for specific customers, mass customization aims to expand this to the larger population by providing enough choices so that most customers get their desired product features from the available product mix.

With the growing popularity of sustainable practices in manufacturing, life cycle management is of paramount importance in improving the company's sustainability quotient. This becomes more complicated in an engineer-to-order environment due to the sheer variety of customer-centric products and the complexity of manufacturing logistics. This is further compounded by the disparate systems employed by partners in the supply chain. Technologies such as RFID help with improving traceability but require an underlying information system to manage all the data collected. Information systems need to be able to communicate with one another and be seamlessly integrated to facilitate efficient exchange of data to improve traceability throughout the life cycle of each product.

Thus, it can be seen that information systems has a vital role to play in the success of an engineer-to-order environment. In this chapter, we will review the different types of information systems currently being used and identify some of the salient features of these systems. We will also identify benchmark features that are indispensable for a fully integrated information system that facilitates seamless exchange of data across all of the organization's partners while monitoring the performance of the entire supply chain. Specifically, we will examine how information systems act as the key enabler in implementing manufacturing paradigms such as lean and agile principles, quick response manufacturing and mass customization with a particular interest in sustainability.