Chapter 17
Control Model for Intelligent and Demand-Driven Supply Chains[1]

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ABSTRACT

Orchestrating supply chains is challenging. This chapter describes how to control a supply chain to make it truly demand-driven – based on the assumption that all relevant information is made available to all partners in real time. The chapter explores the elements of a framework for intelligent and demand-driven supply chain control, with regards to the overall concept and associated principles, and demonstrates these in a case example. Challenges to the realization of the proposed control model include trust and power, supply chain dynamicity and uncertainty, and required investments in competence, standardization, and information and communication technology. Some of these can be met through initial small-scale implementations of the proposed model, to demonstrate effects, and by exploiting facilities for information sharing and collaboration, like supply chain dashboards and control studios. Future research within operations management, technology and information and communications technology (ICT) will support broader realization of the proposed control model.

INTRODUCTION

Integrating and coordinating supply chain and network operations are considered prerequisites for achieving high efficiency and competitiveness. Focusing on the performance and competitiveness of the supply chain, rather than the single company is a trend in several industries. Increased outsourcing and globalization greatly expands the complexity of supply chain operations and planning and control processes. A supply chain often has a decentralized geographical structure with complex logistics, where the various organizational units have a high degree of autonomy.

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Thus, supply chain operations require a well-defined orchestration of a broad set of activities, resources and companies, with the common goal of fulfilling the demand of the end customer.

Designing supply chains is challenging due to their heterogeneous system characteristics, diversified product and material flow structure, trade-off situations, and conflicting interests and goals of the participants. Products vary in value, volumes and shelf life. Today, offering high customer service means either maintaining a high stock level or having frequent deliveries. Conflicts of interest often arise when a manufacturer aims to utilize economies of scale by producing large volumes and buffering products in stock, only to discover that there is end customer demand only for a minor part of the volume. Meanwhile, the wholesaler strives to keep stock levels low and buy only according to end customer demand.

A number of challenges related to supply chain and network operations can be identified. First, operations of supply chains require development of a unified set of control principles which simultaneously harmonize the interests of the involved companies and the entire network. These control principles should also adapt operations to end customer demand, and provide for the right balance of cost, time and service performance measures for each product and the supply chain as a whole. Second, a number of technical challenges are related to the information and communication technology (ICT) solutions that are required to provide supply chain members with access to real-time information on network operations. This includes data capturing technology, communication platforms, visualization technology, and decision support tools which require solutions to standardization issues and considerable investments. Third, the aspects of trust and companies' lack of willingness to share market and demand information is an obstacle to achieving demand-driven collaboration. Many companies perceive demand information to be a key element in protecting their own power position and staying competitive.

The main focus in the work described in this chapter is the interplay of the first two challenges; *how to control a supply chain to make it truly demand-driven,* based on the assumption that all relevant information is made available to all partners in real time. The objective is therefore to explore the elements of a framework for intelligent and demand-driven supply chain control with regards to the overall concept and associated principles, and to demonstrate these in the case of a supply chain for processed salads.

In this chapter, a concept and a number of associated principles are illustrated, in the form of a control model based on the use of real-time information. The chapter contributes to theory and knowledge through its description of an integrated framework for supply chain control and associated principles and the demonstration of these in a practical case. The aim of the framework and principles is to assist managers of supply chain organizations by highlighting and exploring possibilities and some key issues related to control of supply chain operations. A further contribution to practice is derived through the exemplification of how the framework and proposed control model can be applied in an actual supply chain.

The work is based on the *control model methodology* (Alfnes, 2005; Alfnes & Strandhagen, 2000). Viewing network and supply chain operations from a control model perspective is a systematic approach that enables integration and network partnerships for increased competitiveness. This methodology has been applied in numerous industrial cases over the past decades, with the experiences and results serving as a practical platform for a deductive research approach. This action-based, reengineering type of methodology, focusing on visual presentation and communication between involved supply chain members, also enables them to meet the challenges related to lack of trust and understanding between supply chain partners.