Chapter IV
Open Variant Process Models in Supply Chains

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ABSTRACT

The following chapter will elaborate on complexity in supply chains and the implications on supply chain design. It investigates the specific requirements of supply chain processes in terms of flexibility versus standardization, evaluating the feasibility of designing, customizing, assessing, and improving logistics processes within a framework provided by process reference models. Mass customization and, in particular, the configuration approach developed by Winter for financial services will be discussed for their applicability for reducing complexity in a process environment. Process reference frameworks will be used as elements of an “open variant process model”. The Supply Chain Operations Reference (SCOR) model defined by the Supply Chain Council as the major cross-industry standard for supply chain management will be discussed for its usefulness and shortcomings in “process mass customization”, with a focus on systems implementation.

INTRODUCTION

As a consequence of increasing market volatility and globalization, most companies are facing a rising complexity within their supply chain regarding the supplier and the customer interface as well as their internal procedures. In addition to that, demand individualization at the customer side and shortened market cycles enabled through the latest technological achievements are causing the necessity to not only manage a higher amount of complexity but also to handle upcoming matters within shortening schedule frames, while still providing a high reliability. With the logistics focus moving from micro-level optimization to integrated supply chains and supply chain commu-
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nities, the difficulty in coordinating the logistics activities within and among firms is expected to increase, with the number of network nodes and interfaces growing as well. Axelrod and Cohen (2000, p. 26) expect: “systems to exhibit increasingly complex dynamics when changes occur that intensify interactions among the elements”. Christopher (1998) describes customer service explosion, time compression, globalization of industry, and organizational integration as the major factors in the changing logistics environment and notes that: “the complexity of the logistics task appears to be increasing exponentially” (p. 54). A recent study on the factors traditionally influencing supply chain performance by the European Logistics Association / A.T. Kearney Management Consultants (2004) finds dramatic changes driving the complexity of all supply chain activities. The complexity drivers identified are lead time, requirements on delivery reliability, internationality of business partners, product life cycles, and number of stock-keeping units (SKUs).

Being embedded in such a dynamic and complex supply network or, as Adam and Johannwille (1998) are stating it, being caught in the “complexity trap” and as a consequence experiencing disproportionately-increased cost per unit, a company has to meet contradicting targets: a sufficient ability to perform a manifold range of products and services on a high quality and reliability level, in other words, a satisfying stability towards unforeseen changes, failures, and risks, and at the same time an appropriate sensitivity and situation-related flexibility towards individual customer requirements. In order to achieve an adequate balance between the mentioned performance abilities at acceptable economic conditions (effort, cost, return, etc.), implementing mass customization in existing mass or serial production is still a major challenge. Products, services, production organization, and logistics systems typically have evolved individually, often induced by specific customer requirements, creating a high degree of variability and complexity not only regarding the product itself, but often also inducing sophisticated procedures for either the company-internal value creation or the services that are accompanying a product. Although theoretical approaches are available (for example, Blecker, Friedrich, Kaluza, Abdelkafi, and Kreutler (2005) have developed a: “comprehensive framework encompassing the main conditions for achieving mass customization” (p. 40) based on an elaborate literature review), the implementation of the mass customization concept in practice still is a major challenge for a high amount of companies.

This chapter discusses the role of complexity in supply chains with increasingly individualized products and services and the conflict between standardization and flexibility requirements. The mass customization paradigm is applied to processes and analyzed for its implications on information systems and interface design. Process reference models and standards are assessed for their potential to reduce complexity and enable open process mass customization.

Furthermore, the authors investigate whether the Supply Chain Operations Reference model (SCOR) provides the functionality and features in terms of scope and modularity to support an “open variant process model”, and whether it is flexible enough to build individual, customer-centered processes.

**COMPLEXITY IN SUPPLY CHAINS**

Supply chains typically consist of a complex network of business units and facilities that source raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through various distribution channels. Technical development has, in many cases, enhanced product and process complexity, whereas price development has made many complex (and formerly expensive) products available also for the mass market far beyond individually-produced volumes. At the same time, current trends like