



Chapter XVII

Supporting Innovative Competitive Strategies as Mass Customization by Pairing E-Commerce Technologies with Agent Technology

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The Internet has created a tremendous opportunity to conduct business electronically. By this, innovative business concepts—such as virtual enterprises, supply chain management, or one-to-one marketing—and advanced competitive strategies—such as mass customization which encompass these business concepts—may be followed up much more efficiently. However, competitive strategies like mass customization require sophisticated information infrastructures to support the indispensable business-to-business electronic commerce—even for small and medium enterprises taking part in a virtual enterprise that pursues mass customization (MC). Especially electronic data interchange (EDI), understood as a means to exchange business data, is crucial to set up and maintain virtual enterprises. Thus, there is a high demand on software that provides an inter-application system exchange of business data between companies, and which is inexpensive as well as easy to install and use. In this contribution we propose an approach to support distributed, but logically integrated inter-company business processes by applying e-commerce techniques paired with agent technology. Doing so, inter-company data exchange, procurement, and coordination of production in case of MC are improved by means of a multi-agent system. After discussing specific business requirements of companies that cooperatively produce a specific good or service, we show how an automated inter-company communication can be provided, and how this further develops into an agent-based system that automates procurement and inter-company coordination of production. By using the extensible markup language (XML) as

an important cross-section technique, together with common business communication standards, we show how the border of heterogeneity between different (distributed) application systems can be overcome. With this, the business communication protocol is set up. Taking this protocol as a basis, we further present a component framework, which is implemented using the JavaBeans technology, that supports an efficient inter-company communication. In addition, we show how this approach may further develop to a means for inter-company coordination.

ENABLING INNOVATIVE COMPETITIVE STRATEGIES USING E-COMMERCE TECHNIQUES

E-commerce may be defined as “any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact” (ECOM, 1998, p. 2). It “refers to business activities involving consumers, manufacturers, service providers, and intermediaries using computer networks such as the Internet” (Adam, Dogramaci, Gangopadhyay and Yesha, 1999, p. xi). The scope of e-commerce reaches from simple *World Wide Web* (WWW) presence to shared business processes connecting different companies, and it aims on saving time and costs of business transactions. By this, innovative concepts such as virtual enterprises, supply chain management, or one-to-one marketing, and advanced competitive strategies such as *mass customization* (MC) may be followed up much more efficiently.

MC requires a synthesis between mass production and the production of highly specialized and individualized products. It aims at the production of individual products with high quality at cost factors typical for mass production and comparable short delivery times (Pine II, 1993, p. 48). Originally, MC was discussed as a marketing concept, which, following the paradigm of customer orientation, automatically results from a constant market segmentation (Kotler, 1989, p. 13). Starting from a mass market, products for specific market segments are offered to satisfy the needs of special customer groups. A further differentiation of markets leads from micro markets and niche markets to individual markets, which contain the single customer. Above all, small and medium manufacturers were forced so far to follow a strategy of differentiation, as the production of small series was predominant. The number of pieces was not high enough to become a cost leader. Hence, small and medium enterprises, willing to pursue MC, have to focus on a more efficient production process, being customer oriented. On the other side, large manufacturers have to reach a higher flexibility and a higher degree of customer orientation.

Looking at empirical studies, five instances of MC can be classified (Reiß and Beck, 1994): service customization, self customization, splitting of the production process, speed management, and modularization. A variety of cases concerning companies pursuing MC may be found in Piller (1998).

MC as a *competitive strategy* requires (dependent from its concrete instance) that different production types are employed simultaneously—especially single-item production with its usually high demand of inter-company interactions. The approach presented in the following aims at an improvement of these (mandatory) business to business interactions, especially in case of MC. Hereby, we address the problem of an automatic inter-company collaboration involving (legacy) application systems of manufacturers and

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