

Chapter 36

Supply Chain Coordination Based on Web Service

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ABSTRACT

The importance of integrating and coordinating supply chain business partners have been appreciated in many industries. In the global manufacturing industry, supply chain business partners' information integration is technically a daunting task due to highly disconnected infrastructures and operations. Information, software applications, and services are loosely distributed among participant business partners with heterogeneous operating infrastructures. A secure, and flexible information exchange architecture that can interconnect distributed information and share that information across global service provision applications is, therefore, immensely advantageous. This chapter describes the main features of an ontology-based web service framework for integrating distributed business processes in a global supply chain. A Scalable Web Service Discovery Framework (SWSDF) for material procurement systems of a manufacturing supply chain is described. Description Logic (DL) is used to represent and explain SWSDF. The framework uses a hybrid knowledge-based system, which consists of Case-Based Reasoning (CBR) and Rule-Based Reasoning (RBR). SWSDF includes: (1) a collection of web service descriptions in Ontology Web Language-Based Service (OWL-S), (2) service advertisement using complex concepts, and (3) a service concept similarity assessment algorithm. Finally, a business scenario is used to demonstrate functionalities of the described system.

INTRODUCTION

All business today appreciates the value and consequence of building an effective supply chain as part of organizational proliferation and profitability. A supply chain is a network of facilities and distribution options that performs the functions of material procurement, transformation of these materials into intermediate and finished products, and distribution of these finished products to customers (Ganeshan & Harrison, 1995). Supply Chain Management (SCM) aims at improving the allocation, management and control of logistical resources. With its origins in manufacturing, SCM relies on business operations for

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achieving competitive advantage (Vrijhoef & Koskela, 1999). The first signs of SCM were perceptible in Toyota Motor Manufacturing's Just-In-Time (JIT) procurement system (Shingo, 1988). Particularly, JIT was used to control supplies to the factory just in the right quantities, to the right location, and at the right time, in order to optimize system-wide costs and customer affordability. The main goal was to reduce inventory level drastically, and to regulate the suppliers' interaction with the production line more effectively. It consisted of two distinct flows through the supply chain organizations: material and information. The scope of the supply chain begins with the source of supply and ends at the point of consumption. It extends much further than simply a concern with the physical movement of material. Equal emphasis is given to supplier management, purchasing, material management, manufacturing management, facilities planning, customer service, information flow, transport and physical distribution.

Supply chain management tries to bring suppliers and customers together in one concurrent business process. Its main objective is to synchronize the needs of the customer with the flow of raw material from purchasers. This balances Constraint Satisfaction Problem (CSP) with reasonable customer service, minimum inventory holding cost and optimal unit cost. In this complex CSP environment, the design and operation of an effective supply chain is of fundamental importance.

It is worth noting that the purchasing process does not finish when the customer places an order using an existing sales channel. Customers queries, before or after order placement, are inevitable. At the same time, the seller might want to contact customers with purchase confirmation and shipping information. Customer service encompasses all points of contact between the seller and the customer and is an important output of SCM. It results from the accumulated value of all business processes along the supply chain. These business processes are responsible for offering an acceptable level of customer service. Moreover, these business processes are also interdependent; if one business function fails to provide the expected level of customer service, the chain is disrupted, and the scheduled workload in other areas is destabilized. Customer satisfaction is the casualty.

To provide better quality of customer service at no additional cost or workload, all business processes along the supply chain have to be balanced. This requires trade-offs throughout the supply chain. It is essential to think in terms of a single interconnected chain rather than narrow functional business processes when considering effective trade-offs. Seamless integration along the supply chain is challenged when there is a conflict between a company's functional behaviours and objectives, as is often the case. For example, suppliers typically want manufacturers to purchasing in bulk quantities, in stable volumes, and with flexible delivery dates. However, although most manufactures desire long production shifts, they need to be flexible to their customers' requirements and fluctuating market demands. Thus the suppliers' objectives are in direct conflict with manufacturers' wish for flexibility. Indeed, since manufacturing decisions are typically made without accurate information about customer demand, the ability of manufacturers to match supply and demand depends largely on their ability to change supply volume as information about demand arrives. In the same way, the manufacturers' goal of making bulk production batches typically conflicts with the objectives of both distribution and warehouse facilities layout to reduce materials inventory. To make the situation worse, this latter goal of reducing inventory typically implies an extra cost in transportation and distribution.

System fluctuations over time are also critical criteria that need to be considered. Even when the requisition is accurately known because of prior contractual agreements, say strategic decisions need to take demand and cost variations due to changes in market trends, market and sales logistics, competitive movement and the like. These time-varying demand and cost criteria make it more complex to figure out the most appropriate supply chain strategy – the one that optimizes system-wide management costs

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