



Chapter XI

An Agent-Based Collaborative Negotiation System for Global Manufacturing Supply Chain Management

Jianxin Jiao

Nanyang Technological University, Singapore

Xiao You

Nanyang Technological University, Singapore

Arun Kumar

Nanyang Technological University, Singapore

Abstract

This chapter applies the multi-agent system paradigm to collaborative negotiation in a global manufacturing supply chain network. Multi-agent computational environments are suitable for dealing with a broad class of coordination and negotiation issues involving multiple autonomous or semi-autonomous problem-solving agents. An agent-based multi-contract negotiation system is proposed for global manufacturing

supply chain coordination. Also reported is a case study of mobile phone global manufacturing supply chain management.

Introduction

Economic and industrial communities worldwide are confronted with the increasing impact of competitive pressures resulting from the globalization of markets and supply chains for product fulfillment. More and more manufacturing enterprises are being driven to pursue a global manufacturing strategy that aims to transcend national boundaries in order to leverage capabilities and resources worldwide (Pontrandolfo & Okogbaa, 1999). Next generation manufacturing calls for new forms of manufacturing strategies, which are based on global networks of self-organizing, autonomous units (Anderson & Bunce, 2000). These units may be part of a single company located globally or several companies cooperating together to address customers' requirements coherently within extended and virtual enterprises (Bullinger et al., 2000). Since global manufacturing activities might be dispersed and carried out in diverse locations, coordination decisions have been identified as crucial for the successful implementation of global manufacturing strategies (Fawcett, 1992).

A global manufacturing supply chain is a network of suppliers, factories, subcontractors, warehouses, distribution centers, and retailers, through which raw materials are acquired, transformed, produced, and delivered to end customers (Fox et al., 2000; Ho et al., 2000). In a global manufacturing supply chain, a number of autonomous or semi-autonomous business entities are collectively responsible for procurement, manufacturing, and distribution activities associated with one or more families of related products (Pontrandolfo et al., 2002). Performance of any entity in a supply chain depends on the performance of others and their willingness and ability to coordinate and negotiate activities within the supply chain of product fulfillment (Swaminathan, 1996). A global manufacturing supply chain usually involves heterogeneous environments (Tso et al., 2000). Such a supply chain network is much more complex than that for the procurement, production, and delivery of a simple commodity, not only for the volume and complexity of transactions but also due to its dynamic and heterogeneous manufacturing environments (Gaonkar & Viswanadham, 2001).

The rapidly expanding Internet provides a promising networking medium, while the agent technology lends itself to the management of global supply chain networks within a distributed environment. An agent is a computer system situated in a certain kind of environment and is capable of autonomous action in order to meet its designed objectives (Jennings & Wooldidge, 1998). Moreover, a multi-agent system is a loosely coupled network of software agents that interact to solve problems that are beyond the individual capacities or knowledge of each problem solver (Barbuceanu & Fox, 1996). Agent-based technology has emerged as a new paradigm for conceptualizing, designing, and implementing software systems. Multi-agent systems (MAS) enhance overall system performance; in particular, along such dimensions as computational efficiency, reliability, extensibility, responsiveness, reuse, maintainability, and flexibility. They also are ca-

27 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/agent-based-collaborative-negotiation-system/19246

Related Content

An Empirical Investigation on the Use of Buffers and Incentives in Non-Hierarchical Networks

Roberto Pinto, Fabiana Pirola and Tobias Mettler (2011). *International Journal of Applied Logistics* (pp. 29-43).

www.irma-international.org/article/empirical-investigation-use-buffers-incentives/60544

Strategic Perspectives of the Digital Supply Chain

Hanns-Christian L. Hanebeck (2019). *Technology Optimization and Change Management for Successful Digital Supply Chains* (pp. 1-16).

www.irma-international.org/chapter/strategic-perspectives-of-the-digital-supply-chain/223321

Information Management in the Logistics and Distribution Sector Using Metaheuristic Techniques

Pengbo Yang (2022). *International Journal of Information Systems and Supply Chain Management* (pp. 1-21).

www.irma-international.org/article/information-management-in-the-logistics-and-distribution-sector-using-metaheuristic-techniques/305850

Ambidextrous Learning in Buyer-Supplier Relationships: The Role of Strategic and Operational Information Sharing

Ryan Atkins, Yuliya Yurova, Arvind Gud and Cynthia Ruppel (2022). *International Journal of Information Systems and Supply Chain Management* (pp. 1-19).

www.irma-international.org/article/ambidextrous-learning-in-buyer-supplier-relationships/290355

A Coordinated Revenue-Sharing Contract for a Two-Stage Supply Chain with Linear Stepwise Inventory Holding Costs

Jing Hou, Amy Z. Zeng and Lindu Zhao (2009). *International Journal of Information Systems and Supply Chain Management* (pp. 1-23).

www.irma-international.org/article/coordinated-revenue-sharing-contract-two/37590