Chapter 3.11
Applications of Agent-Based Technology as Coordination and Cooperation in the Supply Chain Based E-Business

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ABSTRACT

This chapter explores the utilization of a multi-agent system in the field of supply chain management for electronic business. It investigates the coordination and cooperation processes, and proposes and discusses a newly developed model for an enhanced and effective cooperation process for e-business. The contribution made by this research provides a theoretical solution and model for agents that adopt the enhanced strategy for e-business. Both large organizations and SMEs will benefit by increasing and expanding their businesses globally, and by participating and sharing with business partners to achieve common goals. As a consequence, the organizations involved will each earn more profit.

INTRODUCTION

Today's Internet-connected world has created an enormous revolution among business organizations. Nowadays, running a global business electronically is one of the most important emerging issues. Many researchers and software developers have been investigating and developing software tools and mechanisms that allow others to build distributed systems with greater ease and reliability for conducting e-business. When a computer system acts on our behalf, it needs to interact with another computer system that represents the interests of another party, and these interests are generally not the same. In this context, Wooldridge (2002) specifies:

It becomes necessary to endow such systems with the ability to cooperate and reach agreements with the other systems, in much the same way that we cooperate and reach agreements with others in everyday life. This type of capability was not studied in computer science until very recently. (p. 3)

Traditional purchasing and selling for business-to-business (B2B) and business-to-consumer (B2C) have been conducted through different complex processes involving negotiation, as well as cooperation and coordination. It was quickly realized that e-commerce represents a natural, and potentially very lucrative, application domain for multi-agent systems. Artificial intelligence (AI) has been largely focused on the issues of intelligence in individuals, but surely a large part of what makes us unique as a species is our social ability. Not only can we communicate with one another in high-level languages, we can cooperate, coordinate, and negotiate with one another. As many species have a strong social ability (e.g., birds) like this, we also need cooperation and coordination in multi-agent systems to conduct fruitful, successful, and sustainable e-business.

It has been found that cooperation and coordination are important issues in conducting e-business. In recent years, there have been many research studies in e-business negotiation, but there is little work in e-business negotiation through cooperation and coordination. For example, large organizations mostly have enough products to sell. On the other hand, small and medium enterprises (SMEs) that are suffering from a lack of capital cannot compete with large organizations. However, some SMEs want to purchase products from large organizations and sell them to their customers. Another example is supply chain management (SCM) where at each and every stage (for instance, procurement of material, transformation of material to intermediate and finished goods, and distribution of finished products to customers) cooperation and coordination are needed. In these cases, they can cooperate with each other by exchanging products, and a deal between them can be made because both participants are able to "fine-tune" their profit. That means they can work together to achieve particular goals.

Therefore, if we can perform this type of activity electronically, it will be easier and faster, and, at the same time, very complex issues can be avoided. To perform these activities electronically using a cooperation and coordination process, models need to be investigated for performing flexible and reliable tasks. Many different disciplines including sociology, political science, computer science, management science, economics, psychology, and system theory are dealing with fundamental questions about coordination in one way or another. Furthermore, several previous writers have suggested that theories about coordination are likely to be important for designing cooperative work tools (Finnie, Berker, & Sun, 2004; Holt, 1988; Winogard & Flores, 1986). Therefore, it is possible to develop computer-supported cooperative work with the prospect of drawing on a much richer body of existing and future work in the application of multi-agents in supply chain based e-business.

The main objective of this chapter is to explore the operation of a multi-agent system in supply chain management for electronic business. It focuses on the coordination and cooperation processes, and discusses a newly developed model for an enhanced and effective cooperation process for e-business. The main contribution of this research is a theoretical solution and the model for agents that adopt this strategy for their e-business transactions. Both large organizations and SMEs will benefit, as the strategy will enhance their global business by participating and sharing with other businesses to achieve common goals. As a consequence, the organizations involved will be more profitable and competitive.

The chapter is organized as follows: first, factors in conducting e-business are discussed.

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