



Chapter 15

Approaches to a Decentralized Architecture for an Electronic Market - A Study for the Air Cargo Business

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This chapter proposes a decision support model for electronic markets using software agents. The model is based on the value chain concept applying to interorganizational information technology (IT), and the consideration of new coordination mechanisms to increase the efficiency of business processes. The proposed framework is used to design an electronic air cargo market. Companies involved in air cargo have lagged in recent years to adapt to the needs of their customers. Our framework suggests the decentralized implementation of software agents to support the transaction process. These autonomous software agents will support users to accomplish the various phases involved in a business transaction from information gathering to negotiation.

INTRODUCTION

The development of electronic markets (EM) has gained enormous interest among both, academics and practitioners. EM mechanisms are expected to increase market transparency, transaction speed and allocation efficiency while reducing biased decisions and time intensive routines. However, current EM can at

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best be described as an automated version of non-Internet-based market transactions with focus on information delivery (e.g., WEB homepages as information centers) and on data transactions (e.g., WEB browser-based ordering, sales auctions, and customer support). As such, current EM implementations fail to take advantage of the well-proven potential of decision support technology. Furthermore, existing EM are typically designed following a centralized clearinghouse approach with all transactions being performed at the server site with traders accessing the EM via remote clients. In this chapter, we describe a different type of EM that fundamentally departs from the microeconomic model of market competition (with perfect atomicity among buyers and sellers) and which requires a well-defined mode of business processes. To address this particular type of EM, we propose the use of software agents.

To facilitate the discussion of the use of software agents in the design of EM, we report a case study pertaining to the air cargo business. The next section presents an overview of the air cargo business, its market characteristics, and the specific requirements for an effective electronic air cargo market. The following section presents a taxonomy of software agents and presents an agent-based approach to design EM. Then the next section highlights the key implementation aspects of the electronic air cargo market and is followed by a short illustration. Lessons learned and directions for future research are presented in the last section.

SPECIFITIES OF AIR CARGO BUSINESS

For most of the major airlines, cargo business has been insignificant compared to that of passenger transportation. The volume of goods to be shipped by air is, however, predicted to double by the year 2000 compared to 1995 (Alt & Cathomen, 1995). Airline companies have started to adapt their strategic goals accordingly, i.e., to find new computer-supported market mechanisms to competitively respond to their forwarders.

The business process itself will be affected by the introduction of computer support. Potential benefits of such an effort would be even greater for the forwarders. So far, transactions in the cargo business have relied mainly on informal relationships between officers-in-charge on either side of the market. Long term agreements have dictated general conditions including prices. As communication by telephone and fax still dominate the coordination process between a forwarder and its airlines, only a very small choice of airlines are considered for a shipment. Consequently, forwarders tend to stick to airlines they know and have successfully done business with before. As such, preferences of officers-in-charge of the requesting forwarder dominate the choice of an airline transporter instead of the goal to find an efficient fit between supply and demand. Thus, the reduced number

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