2000

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Supply Chain Management in the Emerging Context of Electronic Commerce
Extended Abstract for Doctoral Consortium

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This research will examine the different kinds of supply chains by providing modeling variations that include coordination mechanism, production planning and scheduling, and logistics management in the emerging context of electronic commerce. In contrast to most of the supply chain literature that takes the existing supply chain as given and attempts to optimize material flows or information flows, the research will focus on emerging forms of supply chain enhanced by new technologies such as open EDI, the Internet, intranets, and extranets.

An observation in supply chain management, which recently gained popularity, the bullwhip effect, suggests that demand variability increases as one moves up a supply chain. Solutions for bullwhip effect include supply chain integration through information sharing and supply chain partnership. However, in emerging business-to-business electronic commerce, a perfectly competitive market is possible, where many suppliers and buyers can keep track of real-time demand and supply of a product, thus the price being adjusted promptly by market itself. Although problems such as quality assurance and increasing transaction/coordination cost may arise in return for reliable supply chain partners, causes of bullwhip effect such as demand forecast update, order batching, price fluctuation and shortage gaming may diminish in electronic marketplaces due to immediate information about the availability of products as well as price and demand. Such information is costly and difficult to get, unless strong partnership and information sharing exists between many supply chain parties. Hence, the first research question is:

In terms of bullwhip effect, will market mechanism coordinated by electronic intermediaries reduce the demand distortion in upstream supply chain? If so, how effective is it compared to the hierarchy mechanism with vertical integration or information sharing?

Enterprise resource planning (ERP) systems have become popular in 1990s with business process reengineering practices. ERP systems attempt to automate and integrate all functions in an enterprise's value chain. With the burst of the Internet and electronic commerce, companies using or planning to use ERP, are beginning to demand interface functions that enable flexible communications among supply chain partners. Moreover, in electronic marketplaces, computerized agents (e.g. searching agent, purchasing agent) and intermediaries are expected to be the solution for controlling huge amount of information and material flow. The second research question regarding this issue, thus, is:

What kinds of information systems or technologies are needed in order to support a firm's supply chain or supply chain as a whole, in particular in electronic markets?

While optimizing supply chains with regard to information flows and/or material flows, we expect that the following components for supply chain management will clearly be identified as enablers of successful supply chain management.
- ERP extensions/modules that link adjacent supply chain partners
- Supply chain reengineering and Web-enabled supply chain via intranet and extranet
- Agents/intermediaries that control the costs (purchasing, sales, distribution), quality (parts, finished product), and time (on-time delivery, online demand information)

Planned Methodology / Research Plan

1. Challenges in Modeling of Supply Chain
   - Identifying variables that affect supply chain (number of supplier, lead time, centralized/decentralized control of information, etc.) based on real world cases as well as existing models in the literature.
   - Applying market mechanism (market between manufacturer and suppliers and market between retailers and manufacturers) where buyers and suppliers optimize their costs and benefits.
   - Defining performance measures of a supply chain (e.g. time spent by an order in information flow, inventory level from material flow)

2. Queueing System Models
   - Analytical models to represent information flow and material flow in a supply chain as an integrated queueing system.

- Performance comparison that depends on variations (e.g. demand uncertainty, warehouse pooling, market vs. hierarchy) in supply chain models.
- Simulation of whole supply chain as a dominant method.

Relevant Theories / Research Context

Transaction Cost Theory, Queueing Theory, Simulation, Business Process Reengineering, Electronic Market Hypothesis

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