Information Sharing Strategies in Business-to-Business E-Hubs: An Agent-Based Study

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ABSTRACT
Studies show that supply chain structure is a key factor affecting information sharing. Business-to-business (B2B) e-hubs have fundamentally changed many companies’ supply chain structure, from a one-to-many to a many-to-many configuration. Traditional supply chains typically center around one company, which interacts with multiple suppliers or customers, forming a one-to-many structure. B2B e-hubs, on the contrary, usually connect many buyers and sellers together, without being dominated by a single company, thus forming a many-to-many configuration. Information sharing in traditional supply chains has been studied extensively, but little attention has been paid to the same in B2B e-hubs. In this study, the authors identified and examined five information sharing strategies in B2B e-hubs. Agent performances under different information sharing strategies were measured and analyzed using an agent-based e-hub model and practical implications were discussed.

Keywords: Agent-Based Modeling, Aggregate Information, Business-to-Business E-Hub, Information Sharing Strategy, Supply Chains

1. INTRODUCTION
Information sharing plays an important role in modern supply chain management. Pioneered by industry leaders such as Wal-Mart and Proctor & Gamble, information sharing is now routinely practiced by many companies (Li & Lin, 2006; Zhou & Benton Jr, 2007). For example, through sharing information, Thomson Consumer Electronics reduced its lead times and planning cycles from four weeks to one week, and Boeing was able to cut its cycle times in half and reduce parts defect rate by 56% (Li et al., 2006). With better visibility into operations of the whole supply chain, firms can make better decisions on many aspects of supply chain management, such as inventory replenishment, shipping, pricing, and capacity allocation etc.

One challenge in implementing information sharing is to employ an appropriate information sharing strategy and select the right information to share. A wide range of information can be shared in supply chains, but the effects of sharing different types of information can vary greatly (Li et al., 2006). Information commonly shared
in supply chains include demand information (Hosoda et al., 2008), supply information (Swaminathan, 1997), inventory information (Gavirneni, 2006), cost information (Karabati & Sayin, 2008; Mukhopadhyay et al., in Press), and shipping information (Zhang et al., 2006). Selecting the appropriate level of sharing is also a key aspect of information sharing strategy (Samaddar et al., 2006). Information sharing can be classified as transactional, operational, or strategic, in an ascending order of level of sharing. On the one hand, if the level of sharing is too low, the information shared might not be useful. On the other hand, if the level of sharing is too high, the information might be used against the sharing party in a competitive environment.

One key factor that needs to be considered when deciding on an information sharing strategy is the supply chain structure (Li et al., 2006). First appeared in the late 90s and can be found in almost all industries today, business-to-business (B2B) e-hubs have fundamentally changed many companies’ supply chain structure in the past two decades. B2B e-hubs are Internet-based platforms where multiple trading partners can conduct transactions and collaborate and exchange information with each other (Kaplan & Sawhney, 2000).

B2B e-hubs are fundamentally different from traditional supply chains in structure. Traditional supply chains are usually dominated by one company; while B2B e-hubs typically connect a large number of firms together. In other words, traditional supply chains have a one-to-many structure, where one dominant company interacts with many of its suppliers or customers. E-hubs, on the contrary, have a many-to-many structure where many buyers interact with many sellers. It is not uncommon for an e-hub to have thousands or even tens of thousands of participants. B2B e-hubs create both new opportunities and new challenges for information sharing. On the opportunity side, e-hubs make it much easier for companies to obtain industry-wide information because e-hubs typically connect a large number of companies in the same industry. Facilitating industry-wide information sharing is considered a critical success factor for e-hubs (Powell, 2001). On the challenge side, companies might be unwilling to share information on e-hubs because of increased transparency and competition (Lu & Antony, 2003; Ow & Nickerson, 2002).

Information sharing in traditional supply chains has been studied extensively (Aviv, 2001; Cheung & Lee, 2002; Gavirneni, 2002; Li, 2002; Xu et al., 2001). However, little attention has been paid to information sharing strategies in B2B e-hubs (Shevchenko & Shevchenko, 2005). Many questions remain to be answered. For example, which information should companies share in B2B e-hubs? Are certain types of information more valuable than others? What effects does information sharing have on different aspects of operation? These are the questions that this paper aims to address. Specifically, we examined five information sharing strategies that are formed on the basis of various types of aggregate demand and inventory information in e-hubs. An agent-based e-hub model was constructed and used to simulate agents’ operations under different information sharing strategies. Agent performances were measured and compared between different information sharing strategies.

The rest of the paper is organized as follows: Sections 2 and 3 review related literature, Section 4 describes information sharing strategies examined in this study, Section 5 explains the agent-based e-hub model, Sections 6 and 7 describe and discuss results, and Section 8 discusses limitations and future research.

2. INFORMATION SHARING STRATEGIES IN TRADITIONAL SUPPLY CHAINS

Li et al. (2006) conducted a systematic study of information sharing strategies in traditional supply chains. They examined five information sharing strategies in a linear supply chain: a) sharing order information between adjacent stages of the supply chain, b) sharing end demand with all stages, c) sharing inventory