Chapter 6
An Enterprise Ontology Based Conceptual Modeling Grammar for Representing Value Chain and Supply Chain Scripts

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ABSTRACT

In business modeling the focus is shifting from individual enterprises to the supply chains in which they collaborate. Contemporary business modeling grammars should allow each enterprise taking part in a supply chain to develop its own information system and at the same time support the creation of system interoperability and information sharing amongst business partners in the supply chain. This paper presents a conceptual modeling grammar for representing business scripts in a way that is both observer-dependent and independent. That is, value chain information should be represented in a format that is suitable for the perspective of any partner in the supply chain (e.g., enterprise, supplier, customer, customer's customer, supplier's supplier) and for the perspective of a completely neutral third party (e.g., government). The proposed observer-independent conceptual-modeling grammar, which is given strength by grounding it in the mature Resource-Event-Agent model, is shown to represent information about business phenomena of diverse supply chain partners such that it can be integrated across enterprise boundaries

INTRODUCTION

Conceptual modeling in information systems (i.e., the creation of a conceptual-modeling grammar for the purpose of designing information systems (Wand, Monarchi, Parsons, & Woo, 1995)) is a challenging task, especially because - in practice - enterprise (information) systems, which are a subset of information systems (Davenport, 2000), form a small part of a much larger information processing environment. Consequently, *conceptual-modeling grammars*, which provide

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sets of constructs and rules to model real-world domains (Wand & Weber, 2002), for the purpose of designing information systems cannot be considered standalone artifacts. Moody and Shanks (2003) show that significant benefits can be achieved through integration of information systems, and argue that considering individual systems in the context of an overall architecture is critical for developing quality information systems. Within conceptual modeling, the choice of an appropriate representation of data is a crucial task in information systems development, as it is a major determinant of an information system's ability to integrate with other systems (Daniel. L. Moody & Simsion, 1995).

Where the enterprise and its value adding processes have been considered the prime *conceptual modeling context*, which is the setting in which conceptual modeling occurs and conceptual-modeling scripts are used (Wand & Weber, 2002), in the past, the supply chain is becoming more and more important as a modeling context (Min & Zhou, 2002). A continuously faster globalizing world economy and increasing cooperation among supply chain partners increases the need to model the entire supply chain and not just individual partners within it (Cong, Zhang, Liu, & Huang, 2010; Huang, 2012).

In some cases the conceptual-modeling context consists of both the supply chain and the enterprise (e.g., virtual enterprises, strategic alliances, joint ventures). As with all other forms of collaboration, a fair distribution of the added value among the collaborators is primordial. This issue receives a lot of attention with joint ventures, where each parent company expects to receive a fair part of the joint venture's added value, although this added value can be very diverse in nature (e.g., knowledge acquisition, financial returns, cost reduction) (Ariño & Ring, 2010; M. V. S. Kumar, 2010). Fair distribution of added value between supply chain partners is also essential for closed-loop supply chains, where the reprocessing of end-of-life products needs to be profitable too (S. Kumar & Malegeant, 2006). To convince collaborators that added value is distributed correctly, collaborating supply chain partners and parent companies of a joint venture need to make data about their transactions with other supply chain partners or the joint venture available to their collaborators, cofounders or a trusted third party that certifies a fair distribution of added value between supply chain partners or parent companies. Such a certifying body would require an information system that takes the independent-observer view on the data that each trading partner generates about transactions, where the joint venture or the supply chain partner itself needs an information system that takes the trading-partner view on the transactions it participates in. The *independent-observer view* is a supply-chain-centric conceptual modeling context that looks at business from an independent observer perspective or 'helicopter' view (e.g., business seen as flows of goods, services and money between parties that are caused by business events initiated by these parties). The *trading partner view*, on the other hand, is an enterprise-centric conceptual modeling context that covers conceptual modeling scripts for enterprise information systems from the sole perspective of one particular party involved in business, called the 'trading partner' (e.g., an enterprise doing business in its role of customer, producer or supplier).

Although the concept of supply-chain-centric information systems is not new (Curran, 1991) and a lot of work has been attributed to the standardization and formalization of the information that is exchanged between trading partners for a transaction to take place (e.g., ebXML, UBL, RosettaNet), supply chains and enterprises are still considered distinct conceptual modeling contexts when modeling information systems (ISO/IEC, 2007) and most enterprises rely on enterprise-centric information systems (Koh, Gunasekaran, & Goodman, 2011).