Knowledge Management in Collaborative Business Networks

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INTRODUCTION

Modern global companies have to build collaborative business networks that provide maximum flexibility and can optimally respond to changes in their environment (Gunasekaran, Lai, & Cheng, 2008; Gunasekaran & Ngai, 2005; Christopher & Towill, 2001). The emergence of build-to-order collaborative business networks is one of the consequences of these changes in the automotive industry. Collaborative business networks can be seen as a step beyond the linear supply chain topography. The automotive industry is a good example of this phenomenon. Today one of the most important competitive advantages for car makers is their ability to manufacture customised cars with a reduced lead time. At the same time, it is necessary to avoid significant inventory levels in order to keep costs lower. Such a strategy is called Build-to-Order (BTO) and stands for the capability to quickly build customized products upon receipt of customer orders without precise forecasts, inventory, or purchasing delays. In the BTO supply chain, customer orders are introduced in advance of, or at the start of the production process. An opposing strategy is build-to-stock (BTS), whereby the product is built prior to demand (Sen et al., 2000).

In order to support the BTO strategy the collaborative business networks have to be flexible (Garavelli, 2003; Lummus, Duclos, & Vokurka, 2003; Pujawa, 2004). In other words they have to quickly readjust relationships between their members responding to changes in the environment (e.g., market needs and requirements, appearance of new technologies). This presents a number of problems. Among the options for maximizing a value from collaborative business networks there are two major strategies: (i) postponement (delayed differentiation until customer's demand for specific end products) and (ii) information sharing (for faster and more accurate information flow across the collaborative business network). In this chapter the information sharing strategy is considered as is more appropriate for collaborative business networks.

The approach presented in this chapter also relies on the ontological knowledge representation for its sharing. Ontologies facilitate information retrieval over collections of distributed and

DOI: 10.4018/978-1-4666-5202-6.ch124

heterogeneous information sources; they help to provide for semantic integration of information and facilitate interoperability between heterogeneous knowledge sources at high level of abstraction (Boury-Brisset, 2003). The conceptual model of the proposed ontology-driven knowledge sharing is based on the earlier developed idea of knowledge logistics (Smirnov et al., 2004). It correlates with the conceptual integration developed within the Athena project (Ruggaber, 2005). The ontology describes common entities of the enterprise systems and relationships between them. As a result, it is possible to treat all available knowledge and competencies as one distributed knowledge base.

Besides, the dynamic nature of the collaborative business networks requires considering the current situation in order to provide for actual knowledge or information. For this purpose, the idea of contexts is used. Context represents additional information that helps to identify specifics of the current transaction. It defines a narrow domain that a particular person is working with.

BACKGROUND

The most significant problem is coordination of a large number of independent network members. While dealing with multiple organizations and processes within a complicated collaborative business networks, identifying and locating a member that has responsibility and/or competence in a particular part of the network can be a laborious and time-consuming process (Lesser & Butner, 2005). Developing and maintaining a common distributed knowledge directory for all relevant parties associated with troubleshooting and potential problem solving can significantly reduce the production lead time and network flexibility. Moreover, linking this directory to key decision points and frequent problems can further enhance its effectiveness (Smirnov, Shilov, & Kashevnik, 2008).

Efficient profiling has become one of the major requirements for efficient sharing of knowledge in collaborative business networks (e.g., Sandkuhl et al., 2007). The major components of the profile include competences (a possibility to perform business processes that are supported by necessary resources, practice and actions), preferences (e.g., types of tasks the network member prefers to perform), contact and auxiliary information (e.g., time zone and supported languages). Usage of this information significantly increases the speed and accuracy of the negation processes related to collaborative business network configuration.

Knowledge sharing and exchange in a collaborative business network are highly important and should be achieved at both technical and semantic levels. The interoperability at the technical level is addressed in a number of research efforts. It is usually represented by such approaches as e.g., SOA (service-oriented architecture) (SOA, 2007) and on the appropriate standards like WSDL and SOAP (Web Services, 2007). The semantic level of interoperability in the collaborative business network is also paid significant attention. As an example (probably the most widely known), the Semantic Web initiative is worth mentioning (Semantic Web, 2006).

MAIN FOCUS OF THE CHAPTER

Proposed Approach

The ontology forms the core of the model. It describes common entities: objects, facilities, products, processes, etc. of the collaborative business network members, and relationships between them. In order for the ontology to be of reasonable size it includes only most generic common entities of the participating companies. For modern decision support systems, personalized support is important. Usually it is based on application of the profiling technology. For organization of multi-tier collaborative business network, a profile structure including description of company's responsibilities and competences is proposed. The access to internal data models of the collaborative

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