Chapter 5
Identification of Potential Clients, Providers, and Competitors in Supply Chain Networks

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ABSTRACT

In the last years Small and Medium-Sized Enterprises (SMEs) were driven to aggregate in industrial networks, due to the need to compete in a globalized market, but also to the aspiration to provide sufficient stability for their own small business. SMEs belonging to networks share objectives and strategies with the other SMEs, while preserving their own individual autonomy. One of this network type is the supply chain, where companies collaborate with one or more other companies depending on the sector they belong. A typical problem in this context is to evaluate the place of a new SME inside the network, i.e., the number of potential clients, suppliers and competitors that the SME would have. The goal of this work is to offer an method to analyze the potentiality of existing SME networks based on public information available on the Web.

INTRODUCTION

One of the most significant paradigm of modern business management is that individual businesses no longer compete as solely autonomous entities, but rather as supply chains. In today's global marketplace, rapid technology development, globalization and customers' varied expectations are changing the type of markets' competitions and firms no longer compete as independent entities with unique brand names, but rather as integral part of supply chain links (Min & Zhou, 2002; Boyaci & Gallego, 2004; Farahani et al. 2014).

A supply chain may be defined as an integrated process wherein a number of various business entities (i.e., suppliers, manufacturers, distributors, and retailers) work together in an effort to acquire raw

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materials, convert these raw materials into specified final products, and deliver these final products to retailers (Beamon, 1998). Thus, a supply chain is not a chain of businesses with one-to-one business-to-business relationships, but a network of multiple businesses and relationships, which offers the opportunity to capture the synergy of intra and inter company integration and management (Lambert & Cooper, 2000). Thus far, there has been relatively little guidance from academia, which in general has been following, rather than leading, business practice (Lambert et al. 1998). There is a need for building theory and developing normative tools and methods for successful supply chain management practice.

With the rapid growth of online information, it becomes urgent for search engines to be capable of searching web documents based on their content, rather than based on keywords as the traditional search tools do. The way of representing semantic models in computer science is through the ontologies. An ontology is a hierarchically structured set of terms to describe a domain. In an ontology, concepts, their properties and relationships, constraints and rules are described in a formal language which makes ontologies interpretable to a computer program. A domain ontology provides a vocabulary for representing and communicating knowledge in that domain and a set of relationships that hold among the terms in that vocabulary.

Several manufacturing ontologies have already been proposed in literature, most of them covering the early stages of product lifecycle (Guerra-Zubiaga & Young, 2008; Fiorentini et al. 2007; Young et al. 2007; Lu et al. 2008; Baxter et al. 2009, Antonelli et al. 2013, Bruno et al. 2014), while some recent works addressed the later stages, i.e., the maintenance and sustainability (Borsato, 2014; Igba et al. 2015). On the contrary, ontologies representing supply chains are less frequent (Scheuermann & Leukel, 2014).

In this work, an ontology representing the relationships among activities performed in a supply chain is defined and used to detect the potential relationships among SMEs in a network.

This chapter stems from the need to evaluate the convenience for a SME to join a network by estimating opportunities for collaboration on the basis of public data, available on the web. The procedure to automatically detect the potential relationships among SMEs takes in input the list of companies belonging to the network and proceeds to identify the network graph based on activities performed by the SMEs. To this aim, a semantic model is developed in the form of an ontology to define the activities and relationships among activities existing in a supply chain. Then, the graph of potential collaborations among companies is reconstructed. Once the network graph is build, it is used to evaluate the potential position of a new company inside the network. From the analysis of the network graph and the potential relationships existing inside the network, it is possible to see if some sectors are less developed than others, and thus there is the need of new SMEs in such sectors. In order to show the potentiality of the proposed approach, it was applied on a subset of companies from a specific industrial domain found on the Yellow Pages website, which is an Italian repository of companies collecting several information about SMEs (e.g., name, address, products, phone number, website, category and sector).

BACKGROUND

The European industrial systems are characterized by a large number of Small and Medium-sized Enterprises (SMEs), and recent analyzes report that the percentage of SMEs is equal to almost 90% of the entire park of European companies, with an employed work force of almost 60%.

Individually, SMEs are often unable to capture market opportunities which require large production quantities and homogenous standards, and they experience difficulties in achieving economies of scale