

Environments for VE Integration

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INTRODUCTION

Most definitions of virtual enterprise (VE) incorporate the idea of extended and collaborative outsourcing to suppliers and subcontractors in order to achieve a competitive response to market demands (Webster, Sugden, & Tayles, 2004). As suggested by several authors (Browne & Zhang, 1999; Byrne, 1993; Camarinha-Matos & Afsarmanesh, 1999; Cunha, Putnik, & Ávila, 2000; Davidow & Malone, 1992; Preiss, Goldman, & Nagel, 1996), a VE consists of a network of independent enterprises (resources providers) with reconfiguration capability in useful time, permanently aligned with the market requirements, created to take profit from a specific market opportunity, and where each participant contributes with her best practices and core competencies to the success and competitiveness of the structure as a whole. Even during the operation phase of the VE, the configuration can change to assure business alignment with the market demands, traduced by the identification of reconfiguration opportunities and constant readjustment or reconfiguration of the VE network to meet unexpected situations or to keep permanent competitiveness and maximum performance (Cunha & Putnik, 2002, 2005a, 2005b)

The implementation of the VE model should assure reconfiguration dynamics, which is dependent of (1) the reduction of reconfiguration costs and effort, that is, requires a balancing between reconfiguration dynamics and reconfiguration time and costs, and (2) the capability to preserve the firms' private knowledge on products or processes.

Considering that the VE concept aims to represent a new organizational paradigm for enterprises in general and, in that way, permeating virtually the whole economy and even society (through the concept of virtual organizations), we could talk about the social costs of ineffective and inefficient integration of VE. However, many authors recognize that the present

solutions for VE integration are either inexistent or insufficient. Therefore, there is a need for further effort by the community towards satisfactory and competitive solutions.

In the article, we introduce some of the most recent developments and environments to cope with the VE requirements, such as the electronic marketplaces, including the recent generation of collaborative electronic marketplaces, breeding environments, virtual clusters, and so forth, and present the market of resources as a tool for managing, controlling, and enabling networking and dynamics in VE integration.

ENVIRONMENTS FOR VE INTEGRATION

Value chains have been supported by a wide variety of technologies to communicate, but the pace of competition requires more intelligent and effective information and communication systems and technologies. The literature suggests that "traditional" Internet-based tools (such as WWW search engines, directories, e-mail, electronic marketplaces, etc.), can support some activities of VE integration, helping from procurement processes until the search of partners for a partnership, including electronic automated negotiation, electronic contracting, and market brokerage (Cunha & Putnik, 2003a; Dai & Kauffman, 2001; Dogac, 1998; Hands, Bessonov, Blinov, Patel, & Smith, 2000; O'Sullivan, 1998; Wang, 2001).

Several authors (Carlsson, 2002; Martin, 1999) infer that the new VE paradigm claims for intelligent support for transactions, new effective methods for finding partners, intelligent support to virtual teams, knowledge management support systems, reliable decision support in VE/network design/configuring, effective tools for information filtering and knowledge acquisition, and support in the identification of the

best alternatives to keep the network aligned with the market, that is, competitive.

Several supporting infrastructures and applications must exist before we can take advantage of the VE organizational model, such as electronic markets of resources providers, legal platforms, brokerage services, efficient and reliable global and intelligent information systems, electronic contractualization and electronic negotiation systems, and decision support systems and tools.

This section introduces some examples of the recent generation of electronic marketplaces, the collaborative e-marketplaces, and introduces the recent concept of breeding environments, virtual clusters, electronic institutions, and the market of resources. We dedicate a separated section to the market of resources, a solution proposed by the authors, to fully support VE implementation, operation, and management, which is documented in depth in Cunha and Putnik (2006).

Electronic Marketplaces

To contribute to the reduction of search time in procurement and engineering, and to reduce transaction costs, manufacturers in several industries created electronic marketplaces (e-marketplaces) to pool their purchasing power and to develop technology platforms to exploit networked technologies. Electronic markets, like *Covisint* (<http://www.covisint.com>) in the auto industry, *Elemica* in the chemicals industry, (<http://www.elemica.com>), or *ManufacturingQuote* (<http://www.mfgquote.com>) in the engineering domain, in general, provide environments to help collaboration, networking, and, to a certain extent, VE dynamics.

Elemica was founded in August 2000 by 22 of the world's largest chemical firms. It was the premier global neutral information network built to facilitate order processing and supply chain management, offering an integrated suite of product solutions that enable buyers and sellers of chemicals to streamline their business processes and to collaborate to achieve savings (Elemica, 2005).

Its core business is an interoperable data exchange service capable of routing messages (such as purchase orders and shipping notices) between participants. In 2003, Elemica was able to connect up the chemical industry by offering integration of participants' ERP systems into a hub-and-spoke network (Metcalf, 2004). Elemica is an example of a collaboration e-

marketplace; that is, it emphasizes interaction services. Collaboration e-marketplaces are expected to benefit participants by reducing the costs and increasing the quality of multiparty information exchange (Christiaanse & Markus, 2003).

Covisint, officially announced in December 2000 as an independent company created by Ford, Chrysler, General Motors, Renault, Nissan, and a number of development partners, was projected to be a one-stop shop for the automotive supply chain, supporting buying, selling, and collaboration on a global platform: buyers can access all their suppliers on one site and, the same way, suppliers can have all their clients on one site, all sharing common procedures and processes.

Covisint consists of a virtual supplier network specifically created for the automotive industry. Its extension to other industries by strategic partnerships was planned since their creation; at present, Covisint is applying its *industry operating system* to the health care sector.

The Covisint (2001) project scope includes three major areas:

- **Procurement:** It hosts a global market place where industry participants can purchase and sell a wide range of items and services via the Internet.
- **Product development:** It provides customers the ability to develop products via real time collaboration and strengthen global integration among partners creating a secure environment.
- **Supply chain:** It allows individual organizations to see the current and future status of their supply chain inventory levels, material flows, and capacity constraints via Internet.

The service encompasses the complete interaction between suppliers or suppliers and their customers and includes procurement transactions, preproduction collaborative engineering, and exchange of information during production or for supply chain management.

The neutral e-marketplace, *Manufacturing Quote* (<http://www.mfgquote.com>), was founded in 1999 and facilitated its first online sourcing transactions in February 2000. It is an online *sourcing management system* with automated supplier discovery and a global network of independent participating suppliers.

MfgQuote uses its proprietary technology to intelligently connect buyers with suppliers of manufacturing services while facilitating the collaboration, quoting,

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