Market of Resources: Supporting Technologies

Maria Manuela Cunha
Polytechnic Institute of Cávado and Ave Higher School of Technology, Portugal

Goran D. Putnik
University of Minho, Portugal

Jaoquim P. Silva
Polytechnic Institute of Cávado and Ave Higher School of Technology, Portugal

INTRODUCTION

The implementation of an organizational model characterized by very high interorganizational dynamics, such as the virtual enterprise (VE) model, presents several requirements in order to keep the VE partnership aligned with the market, that is, with business (Cunha & Putnik, 2005a, 2005c, 2006b). Such requirements include (1) the reduction of reconfiguration costs and effort and (2) the capability to preserve the firms' private knowledge on products or processes (Cunha & Putnik, 2006c). These must be assured by a specific environment, or, in other words, by organizational infrastructures such as a meta-organizational structure for VE design (or integration) and operation, such as the market of resources—an environment developed by the authors to cope with the highlighted requirements, assuring better performance than the traditional environments such as Internet search engines or electronic marketplaces (Cunha & Putnik, 2005c; Cunha, Putnik, Gunasekaran, & Ávila, 2005a). However, VE formation, integration, and operation rely on the existence of an adequate platform of information and communication technologies (Cunha & Putnik, 2003; Cunha, Putnik, & Silva, 2005b). The environment for creation, integration, operation, reconfiguration, and dissolution can be implemented under the format of a market of resources, an entity conceived to cover the whole VE life cycle (Cunha, Putnik, & Ávila, 2004). The market of resources, its characteristics, operation, and functionalities, is specifically addressed in a different article in this encyclopedia.

This article discusses some technologies that could support the market of resources, namely, XML/ebXML and *Web services*, and proposes an architecture to support the operation of the market of resources, representing a fusion of the peer-to-peer (P2P) architecture with the client-server architecture as a variant of P2P architecture.

REQUIREMENTS FOR VIRTUAL ENTERPRISE DYNAMIC INTEGRATION OR RECONFIGURATION

Dynamic reconfigurability, that is, the ability for fast change of the VE organization (structure) faces the unpredictable changes in the environment (market), is a requirement of the VE to keep the partnership aligned with business requirements, and is a consequence of product life cycle dynamics, that is, business and market dynamics. This requirement implies the ability of:

1. Flexible and almost instantaneous access to the optimal *resources* to integrate in the enterprise.
2. Design, negotiation, business management, and manufacturing management functions independently from the physical barrier of space.
3. Minimization of the reconfiguration or integration time.

Several supporting organizational infrastructures and supporting 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. The market of resources is the solution proposed by the authors

to fully support VE implementation, operation, and management, which is documented in depth (Cunha & Putnik, 2005b, 2005c, 2006a, 2006b; Cunha, Putnik, & Ávila, 2000; Cunha, Putnik, & Gunasekaran, 2003) as well in a specific article in this encyclopedia.

MARKET OF RESOURCES: AN ENVIRONMENT FOR VIRTUAL ENTERPRISE INTEGRATION

The operational aspect of the market of resources consists of an Internet-based intermediation service, mediating offers and demand of resources to dynamically integrate in a VE, assuring low transaction costs and the partners' knowledge preservation.

The services provided by the market of resources are supported by (Cunha & Putnik, 2005c; Cunha et al., 2003, 2005a):

- A knowledge base of resources providers and results of their participation in previous VE (historic information).
- A normalized representation of information.
- Computer-aided tools and algorithms.
- A brokerage service.
- Regulation, or management, of negotiation and integration processes as well as contract enforcement mechanisms.

The market of resources is able to offer (Cunha & Putnik, 2005c; Cunha et al., 2003):

- Knowledge for VE selection of resources, negotiation, and its integration.
- Specific functions of VE operation management.
- Contracts and formalizing procedures to assure the accomplishment of commitments, responsibility, trust, and deontological aspects, envisaging that

Table 1. Technologies to support the main components and processes of the market of resources (Cunha & Putnik, 2006a; Cunha et al., in press)

Market of resources components and processes	Support technologies and tools
- Market contents: user/buyer profile, catalogues, historic, database of resources	- Database management systems - Distributed database management systems - E-business development platforms - E-portals
- Negotiation: request for quotes, auction/reverse auction, optimal selection	- Web services - Software agents - Electronic negotiation tools - Algorithms or protocols - Regulation of negotiation - Intelligent decision making systems - Workflow management
- Business transactions: payment, contractualization	- Web services - Electronic payment - Digital signature - Certification - Other security mechanisms
- Management: monitoring, performance evaluation, analysis of operation results, decision making, security	- Web services - Simulation tools - Workflow technology and collaboration techniques - Regulation - Data analysis and decision support systems - Security systems, digital certification, …
- Brokerage: expert advise, monitoring, and coordination	- Messaging and conferencing - Database management systems, data analysis, and decision support systems - Selection algorithms - Management procedures
- Resources providers integration: file translation, collaboration	- Web services - Standards for product/services description - Collaboration tools - Data translation standards and tools - Communication protocols
- Resources final selection (optimal combination)	- Algorithms, heuristics, and computer-aided tools - Intelligent decision-making systems - Artificial intelligence - Data analysis and decision support systems

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