

Market of Resources for Agile/Virtual Enterprise Integration

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INTRODUCTION

Enterprise Networking and Dynamics

Fast change, uncertainty, and strong competition are challenges of the actual worldwide economic context. Competitiveness is a main requirement of enterprises, whose satisfaction requires the definition of new organisational concepts, with extremely high performances that are strongly time-oriented while highly focused on cost and quality. Several factors appear as supreme factors of competitiveness: (1) the organisations' capability to achieve and explore competitive advantages in synergy, by using or integrating the optimal available resources for the functions that the organisation undertakes; (2) the capability of fast adaptability to the market; together with (3) the capability of managing all business processes independently of distance, to be achieved through the recent virtual enterprise (VE) organisational models (Cunha & Putnik, 2002; Cunha, Putnik, & Ávila, 2000).

The need to keep a close alignment with the market environment in permanent change implies the high dynamics of the organisations' structure reconfigurability, introducing a new concept of dynamically reconfigurable global networked structures, corresponding to the emerging agile/virtual enterprise (A/VE) model (Cunha & Putnik, 2004).

The Market of Resources is the environment proposed by the authors to enable A/VE dynamic integration and business alignment.

BACKGROUND

Critical Factors against Networking and Dynamics

Two critical factors against networking and enterprise dynamics are as follows:

1. The *transaction costs*, i.e., the firm reconfiguration cost, associated with partners search, selection, negotiation, and integration as well as permanent monitoring and evaluation of partnership performance. Resource allocation in the market is normally guided through prices, but within the firm, work/job is done through decisions and commands of management (Coase, 1937). Activities are collected in a firm when transaction costs incurred in using the price mechanism exceed the cost of organising those activities through direct managerial controls, i.e., the decision of keeping a function/activity in-house results from the comparison between expected economic loss that can result from an outsourcing contract (transaction costs and contractual risks), and the expected economic gains.
2. *Preservation of firm's knowledge* of organisational and management processes, as it is the firm's competitive factor. The firm incurs the risk of leakage of private information when opt by performing an activity by an independent market firm.

For the efficient implementation of A/VE, it is necessary to conceive tools to overcome the networking and dynamics disabling factors.

Tools for Managing, Controlling, and Enabling Networking and Dynamics According to BM_VEARM Approach

The main tools conceived by the BM_virtual enterprise reference model (BM_VEARM) (Putnik, 2000) for managing, controlling, and enabling networking and dynamics, overcoming the two critical factors, are:

- The Market of Resources is the environment for enabling and managing efficient configuration, and assuring virtuality, at low transaction costs and reduced risk of knowledge leakage.
- The broker or organisation configuration manager¹ is the main agent of agility and virtuality, acting

either between two operations of the A/VE (off-line reconfigurability, providing agility only) or online with the operation (online reconfigurability, providing virtuality and a higher level of agility).

- Virtuality makes possible the transition from one physical structure (instance) to another in a way so that the enterprise or process owner is not affected by the system reconfiguration and is not aware of the reconfiguration—the underlying service structure and reconfiguration process are hidden.

Additionally, A/VE must satisfy the highest level of integration and (geographic) distribution of the A/VE partners.

MARKET OF RESOURCES CHARACTERIZATION

Market of Resources Definition

Market of Resources is an institutionalised organisational framework and service assuring the accomplishment of the competitiveness requirements for A/VE dynamic integration and business alignment. The operational aspect of the Market of Resources consists of an Internet-based intermediation service, mediating offer and demand of resources to dynamically integrate in an A/VE, assuring low transaction costs (demonstrated in Cunha & Putnik, 2003a, 2003b) and the partners' knowledge preservation. Brokers act within the Market of Resources as intermediation agents for agility and virtuality.

In this “virtual” environment, *offer* corresponds to *resources providers* (individuals, enterprises) that make their *resources* (products, components, operations) available, as potential partners for A/VE integration.² *Demand* corresponds to *client*, the A/VE owner, the entity looking for resources to create/integrate/reconfigure an A/VE to satisfy the *Customer*. *Customer* is the entity giving rise to a business opportunity and is considered outside the Market of Resources.

The service provided by the Market of Resources is supported by the following:

1. A knowledge base of resources and history of previous performance results
2. A normalised representation of information
3. Computer-aided tools and algorithms
4. Brokers
5. A regulation, i.e., management of negotiation and integration processes, as well as contract enforcement mechanisms

It is able to offer knowledge for resources search and selection and its integration in an A/VE, specific functions of A/VE operation management, and contracts and formalising procedures to assure the accomplishment of commitments, responsibility, trust, and deontological aspects, envisaging the accomplishment of the A/VE objectives.

Information technology (Internet and WWW technologies, agent technology, e-marketplaces, etc.) supports or automates purchasing activities, helping from procurement processes up to the search for partners for a partnership, including electronic automated negotiation, electronic contracting, and market brokerage services. Although the basic IT infrastructures and tools are necessary as support, the added value comes from the higher-level functions, to support search, selection, and integration of resources under the format of an A/VE, coping with the high reconfigurability dynamics requirements (overcoming the disabling factors) intrinsic to the A/VE (Cunha, Putnik, Carvalho, & Ávila, 2002).

Market of Resources Functionality

The Market of Resources is designed to offer the following (Cunha, Putnik, & Ávila, 2003; Cunha, Putnik, & Carvalho, 2002):

- Reduction of negotiation time and of time-to-contract, as one instantaneous physical structure (one instance) of an A/VE may last (on a limit) for only a few days or even hours
- The permanent alignment of the A/VE with business requirements, trust of participants, and accomplishment of contracts, requiring a dynamic process of A/VE performance evaluation, monitoring the performance of participating resources, and identifying reconfiguration opportunities
- The ability to find the right potential partners and further efficient negotiation
- Enforcement and risk minimisation by a contractual agreement between the involved parties
- Provision of knowledge/advisory guidance in A/VE design, validation, and reconfiguration, through appropriate algorithms and expert brokerage functions

Market of Resources Organisation

The overall functioning of the Market of Resources (Figure 1) consists of the creation and management of the Market as the environment (Process A.1.) to support the design and integration of the A/VE (Process A.2.) and the A/VE operation (Process A.3.), offering technical and

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