Market of Resources: Opportunities Domain

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INTRODUCTION

In the actual context of fast change, uncertainty, and competition, one of the most important factors of competitiveness is the organizations' capability of fast adaptability to the market, which implies the ability of flexible access to the optimal resources (products, operations, services) for each of the functions that the organization undertakes in order to produce a product that meets the market requirements. This factor, together with the capability to manage all business and manufacturing functions, independently of distance, is achieved through the emerging agile/virtual enterprise (A/VE) organizational model, a particular case of the virtual enterprise organizational model. Partners (resources providers) search, negotiation, selection of optimal solutions, establishment of contracts and integration of the A/VE, enforcement of contracts, and so forth are complex and risky activities required by this model (see the articles "Market of Resources for Virtual Enterprise Integration" and "Market of Resources: Cost and Effort Model" in this publication).

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, 2003; Dai & Kauffman, 2001; Dogac, 1998; Hands, Bessonov, Blinov, Patel, & Smith, 2000; O'Sullivan, 1998; Wang, 2001).

Internet and World Wide Web technologies are raising hopes of helping from procurement processes until the search of partners for a partnership, including negotiation, contractualisation, in terms of quality, flexibility, speed, and cost efficiency (Cunha, Putnik, Carvalho, & Ávila, 2002). These technologies and applications can be used in the search of resources to integrate an A/VE and will be designated as the "e-based traditional way." The e-based traditional way includes Internet search engines, Internet directories, Internet-based catalogues, and Internet-based marketplaces.

As these technologies do not cope with the A/VE requirements (Cunha & Putnik, 2006c), the authors have proposed a market of resources as an institution, providing an alternative environment for A/VE integration.

The concept of market of resources consists of an electronic and virtual market, mediating offer and demand of resources to dynamically integrate in an A/VE and is deeply discussed in Cunha and Putnik (2005, 2006a, 2006c) and Cunha, Putnik, Gunasekaran, and Ávila (2005).

Search, negotiation, and selection processes can be performed under two approaches: *independent selection* (analyzing the *n* eligible resources providers one by one) and *dependent selection* (considering all possible combinations of the *k* required resources being provided by all the combinations of the *n* eligible resources providers).

The authors have proposed a cost and effort model both for the e-based traditional way and for the market of resources, considering dependent and independent selection models, which was introduced in this publication under the title "Market of Resources: Cost and Effort Model," representing a kind of a part one of the performance comparison between the market of resources and the e-based traditional technologies in supporting A/VE integration.

The cost and effort models have been instantiated into a concrete situation to define constants to be used within its application.

Concerning the e-based traditional way, the authors have triggered the process of searching a domain (using WWW search) for two resources of a given project, try-

ing to identify the time to select between the solutions obtained from a search engine or a WWW directory, time to visit these and evaluating their eligibility for negotiation. Using the market of resources, the authors have performed a demonstrator for the most (human) effort consuming activities and also to identify time constants.

The cost models were tested within a set of situations in function of the domain of resources for search, project complexity, and defining different dimensions for the solution space dimension. The analysis of the results led to the identification of the situations where the market of resources presents more attractive conditions (in terms of search and selection time) in function of project complexity and search domains dimension.

VIRTUAL ENTERPRISE INTEGRATION ACTIVITIES

The main activities underlying A/VE integration are presented in Table 1. Only search costs and contracting costs are included, as we consider that monitoring and enforcement can be done independently of using the market of resources or the e-based traditional way.

COST AND EFFORT MODELS APPLICATION: ANALYSIS OF RESULTS

In this section, we present the simulation results for the search and selection time and cost, using independent and dependent selection methods for different dimensions of search domains and different values of *K*.

Some previous considerations:

- The user of the traditional way can decide the dimension of the set of resources for visiting (visit domain); we considered this set to be 20% of the search domain (SD), but according to SD quality, the user can reduce or increase this percentage.
- We are assuming that the search domain dimension in the market (focused domain) is 20% of the WWW directory search results (search domain).

Table 1. A/VE integration activities

Activity	E-Traditional Method	Market of Resources
	Activity Description	***Activity Description***
A/V E Request	Systematization of the A/VE project and preparation for search and selection	
- *Request Negotiation*		- Registration, specification of the request and contractualization with the market
- *A/VE Design*	- Selection of the directory category/subcategories that best traduce the required resource (search domain identification)	- Computer-aided A/VE design, with specification of the resource requirements and of negotiation parameters - Design validation
Resources Search and Selection	Identification of eligible resources for each required resource of the VE project, negotiation within these sets, and selection of the best combination of resources providers	
- *Eligible Resources Identification*	- Analysis and sorting of the results of searching on the selected subcategories search domain and identification of which of them can contain the solution (Visit Domain) - Visit to this set and identification of its eligibility - Eligible resources result from the visited resources	- Selection of the Focused Market(s), vertical or horizontal, where it is intended to perform the search search domain. - Focused market filtering—automaticaly, from the requirements of the A/VE design to identify eligible resources
- *Negotiation*	- Negotiation with the eligible resources, to identify the candidate resources for integration; the traditional method forces to a manual request for bids (RFB) or direct negotiation.	- Computer-aided negotiation with the eligible resources to identify the candidate resources for integration
- *Selection*	- Sorting of the negotiation results and identification of the best combination of resources providers, and confirmation with the selected providers	- Computer-aided decision making for final selection of resources to integrate; sorting of negotiation results and identification of the best combination of resources providers
A/VE Integration	Contractualization with the selected resources for integration	
- *Contractualization*	- By e-mail, using the digital signature facilities - Elaboration of specific contracts for every situation - Negotiation of contracts terms with suppliers	- Automatically, when a selected resources provider confirms its participation - Selection of the adequate contract from a standardized collection - The market also offers integration procedures, which are not considered here