

ELECTRONIC MARKETPLACE FOR BUSINESS COMPETENCIES EXCHANGE

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ABSTRACT

This paper introduces a new approach to draw up business competencies as well as to facilitate their exchange and diffusion through an e-marketplace. The business model and a view on a technical solution to implement « B-C Market » has been built in the context of an e-marketplace. Obviously, the main challenge to cope is to find a way to outline and retrieve the competencies. Business competency representation must be flexible enough to allow every company describe its own business, and explicit enough to reveal the relevant ones. Therefore the first effort was to develop a reference model of business competencies. Then, we aimed to adjust it to several domains.

1. INTRODUCTION

This paper presents a new approach to representing and exchanging business competencies. The « B-C Market » has been implemented as a prototype of an electronic platform. The essential idea is to introduce an engine that gives the best possible insight into business core competencies and, eventually, facilitate the process of competencies description, retrieval and business partners discovery.

The "B-C Market" model is justified by the fast evolution of Internet technologies and emerging e-business models. The "B-C Market " also brings together and makes use of successful experiences in the fields of competitive advantage, business collaboration theory and intelligent agents.

1.1. Trends and Changes in the New Economy

To face the reality of the modern economy, characterized by an open market and transparency, companies have to focus on what they do best, specializing in their core competencies and business. This specialization implies outsourcing everything else. In other words, there exists a strong need to co-operate and exchange information between companies.

Today, the technology enables information exchange in a secure and fast way. Companies are on the way to adapting the value chain to the e-challenge. Obviously, managers will tend to examine whether the business is a success by evaluating the business key factors and distinctive competencies level. Competitive advantage cannot be understood by looking at a firm as a whole (PORTER, 1985). It stems from the many

discrete activities a firm performs in designing, producing, marketing, delivering, and supporting its products. Each of these activities can contribute to a firm's relative cost position and create a basis for differentiation. A systematic way of examining all the activities a firm performs and how they interact is necessary for analyzing the sources of competitive advantage. So, "B-C Market " aims to provide the means to formulate a demand as well as to evaluate the business partner competitive advantage level.

1.2. Partnering and Alliances in the Context of the New Economy

However, up until recently, businesses have measured efficiencies based on what they could perform and control internally. This has motivated companies first to focus on ERP (Enterprise Resource Planning). Then, the global competition, greater customer choice and mobility have forced companies to rewrite the rules and modify the way they do business (MILES et al, 2000).

Alliances and strategic partnerships enable partner companies to focus on core aspects of their businesses. So, that they may perform together with efficiencies and competitiveness greater than that of a single company, offering comprehensive solutions to customers. Business community of this kind is known as "**extended enterprise**" or "**virtual enterprise**" (SUTER et al, 1998, SUTER et al, 1999).

A common example of alliance is a vertical alliance. Vertical alliances are based on a long lasting agreement, and include organizations in different industries: collaboration can be co-ordinated to offer complete solutions to clients. With little chance of competition between alliance members, firms can combine their skills to compete with much larger and more diversified organizations.

At the same time, a teaming agreement is usually a project-oriented effort where the firms work together at different points in a project, but have no further commitment to each other. These arrangements are common, and made for convenience. Sometimes project agreement is contract driven. The process of setting up the agreement may be less comprehensive than that of a long-term relationship. And it may be confined to the scope of work in the contract.

1.3. Main Steps for Forming Alliances

While building a "B-C Market" system architecture, we considered the following commonly accepted process for forming alliances (PARTNERING and ALLIANCE, 2000). This process can be broken down into four basic steps.

1. Plan

The objectives of this step are to determine processes that have to be done, which resources are indispensable, which resources the firm already has available and which resources need to be brought in from elsewhere.

2 Selecting a partner

At this stage, the firm look for information on potential partners.

3. Negotiating the Agreement

Next, the firm tries to set up areas of responsibility for each partner during the course of the proposed initiative. The alliance structure should be discussed and agreed. Finally, a decision has to be made to accept or reject the deal.

4. Managing the Relationship

Lastly, comes the task of establishing the working relationships and keeping the initiative on track. Performance evaluation of the alliance should be conducted regularly.

1.4. Electronic Marketplaces

The idea of electronic marketplaces is rather well developed (WENGER et al, 1999). One can find many examples on the Internet: presently, e-marketplaces enable the exchange of products, services and data easily. However, the existing models of the e-marketplaces are not elaborate enough to face the rising challenge of business competencies representation and exchange.

We argue that the concept of competencies goes beyond the limit of turnover assessment, ratings of the workforce's skills, or basic description of products and services. Business competencies also represent organizational knowledge and the level of efficiency of business processes in terms of performance and quality.

So in order to achieve this goal, we have worked out a reference model of business competencies. Based on this model, one can build an electronic platform that enables building of business alliances.

The role of our model is to facilitate the interpretation into a common language of the information submitted by companies. In this way the model can be used by a third party, to evaluate the real competencies of the firms. Depending on the complexity of the request, this third party can be a knowledge worker, or an electronic knowledge worker.

2. ELECTRONIC MARKET PLACES OF COMPETENCIES: A NEW PERSPECTIVE

2.1. The Problem of Competencies Representation, Retrieval and Exchange. Necessity of a Reference Model

The growing number of electronic commercial services, storefronts and e-marketplaces doesn't solve the difficulties of building a virtual business partnership. The main concern is to handle a multitude of different styles, and find out how to create a relevant profile of business competencies. For the time being, no general agreement has been achieved on business standards:

- each enterprise tends to present its business and competencies in its own way (enterprise level).
- when looking at several different industry or sector models (domain specific level), we usually can recognize common groups of instances of these knowledge components.
- it is obviously impossible to describe competencies of enterprises, in the perspective of comparing them, without the support of a conceptual meta-model that is accepted by both parties. In other words, a meta-model identifies key competencies.

To embody the conceptual meta-model, we have chosen to use Unified Modeling Language (UML) enlarged with the "UML Business Extension" as defined by Eriksson and Penker (ERIKSSON and PENKER, 2000). Moreover, this language is now evolving towards a global standard for building systems as diverse as e-commerce, medical electronics and robotics (BOOCH, 1999). Another advantage of UML is that it is object-oriented and not information-oriented as is often the case. Furthermore, the fact that UML is generally accepted contributes to the diffusion of the meta-model.

2.2. Meta-Reference Model

Our model was inspired by the research in enterprise strategies. In this field, the concept of competencies is a core concept. An organization is seen as an open system that has some strategic goals and fulfils objectives and executes projects through processes, using different kinds of resources [HEENE & SANCHEZ 1997].

This model design underlines the importance of necessary competencies and adequate combinations of resources in order to realize projects with an effective level of competence. The model not only helps to specify the firm competencies, but also assists in key competencies retrieval.

Figure 1 represents the different entities needed to describe business competencies. These entities are placed on different levels.

The first level represents the general mission and the culture of the enterprise, which can be expressed by the vision of the CEO. This level defines the goals and objectives, the strategy of the enterprise.

The next level characterizes a project executed by the firm for a customer. We assume that the project is done within certain conditions, limits and boundaries, represented on the third level.

The result will be an output, evaluated according to different criteria and parameters.

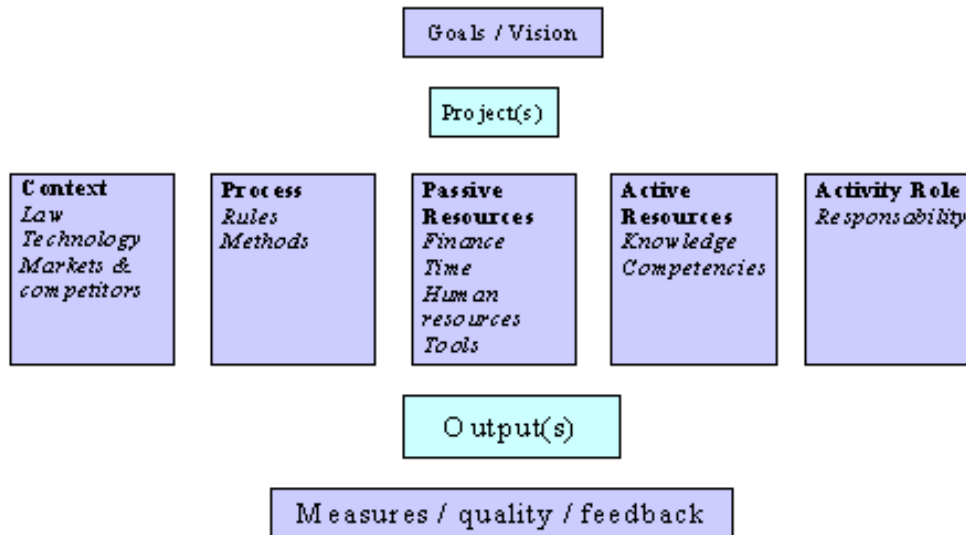


Figure 1: main components of the meta-model

Once we have defined the entities, it is important to identify the relations between them (figure 2). Our model of business competencies is built around the concept of a *PROJECT*. This concept is fundamental, because it is through a project that the competencies of the organization have been synthesized.

The *CONTEXT* and the *GOALS* of the organization influence the *PROJECT*. For instance, a firm active in copiers maintenance may, as a result of major changes in the market, modify its strategy, by diversifying its services.

PASSIVE RESOURCES are essential for the implementation of a project. These resources include financial, material and human resources. Also, *ACTIVE RESOURCES* are a part of a project, that guarantee that the project will be carried out in an optimal way and will be successfully completed. *ACTIVE RESOURCES* refer to knowledge and competencies developed by the organization. These resources are particular in the sense that they are augmented along the realization of the projects. These *Active Resources* are the crystallization of the knowledge and competencies acquired during the project.

A project is realized according to *PROCESSES*, and defines the *ROLE* or *ACTIVITY* of the organization, which means different levels of responsibility: in a project of construction, a firm can be project manager, or be responsible for a part or an aspect of the project.

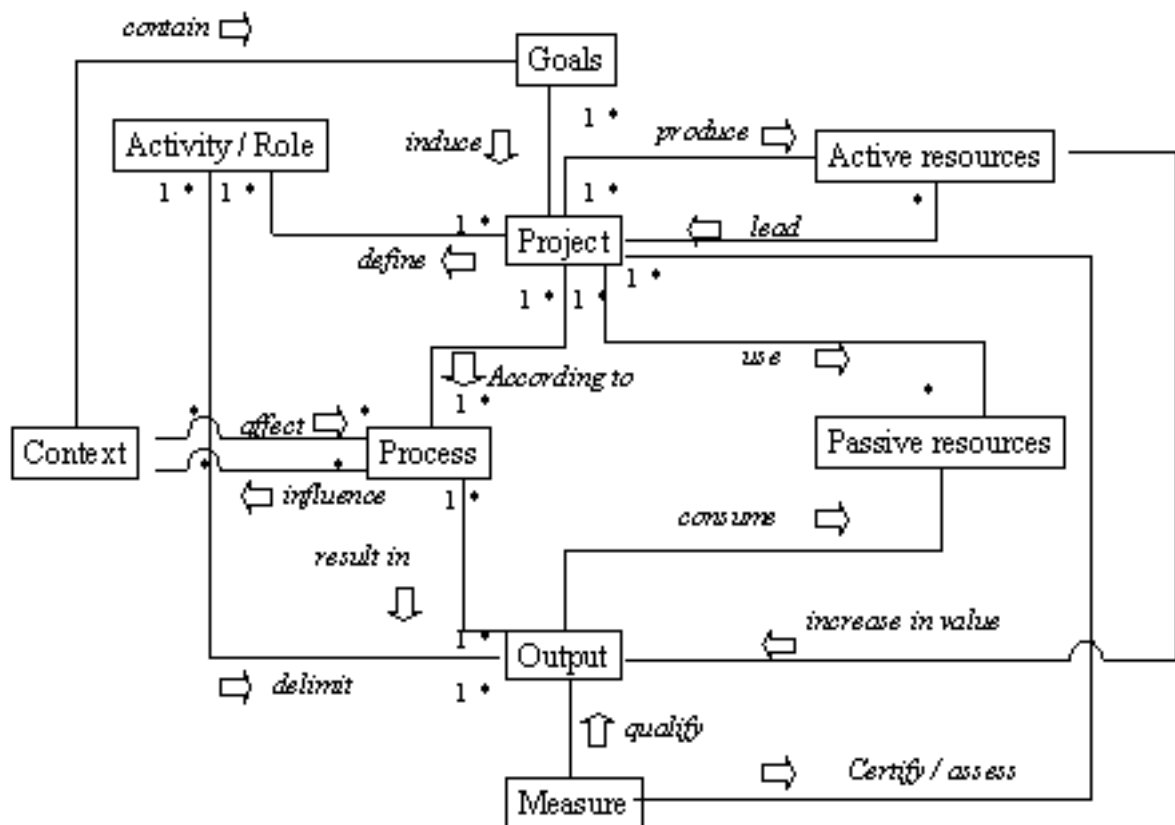


Figure 2: the business competencies meta-model

The conjunction of *ACTIVE* and *PASSIVE RESOURCES*, guided by *PROCESSES*, confined by the *ROLE*, leads to an *OUTPUT*, the materialization of the project, which is to be evaluated (*MEASURE*).

This approach takes into consideration not only achieved projects, but future projects as well. In this way, it is a realistic description of the competencies.

2.3. Domain Specific Model and Business Case

This general framework shows our business activities' vision. The advantage is that this meta-model is general enough to embrace most domains or sectors. By adapting the content of the entities, and keeping the relations between them, we have applied the "BC Market" model to concrete examples.

Let us describe an example of a company, which is specialized in catering to different types of events: concerts, sport events, festivals. These events all have a large number of visitors. According to our model, the *GOAL* for the enterprise can be defined: to reach a position of leader on a regional scale.

The firm has been contacted to take part in the organization of a popular athletics competition. In this *CONTEXT*, its *ROLE* will be to assure the drink and food supply of the whole manifestation. This situation implies constraints such as sanitary regulations and customer preferences. To capture the market, the firm has to consider possible competitors' offers.

Obviously, the firm has to establish business *PROCESSES* to realize this contract: workflow management, logistics, marketing, sales and human resources management.

This project will consume *PASSIVE RESOURCES*, like workforce attribution and immobilization, and the use of specific material.

The *ACTIVE RESOURCES* are similarly realized projects, past successes and failures, and lessons learned from competitors' experience.

The *OUTPUT* will have an impact on supplying the required service, and the *MEASURE* can be seen as a users' satisfaction, turnover: a sort of table of evaluations and ratios.

3. SYSTEM ARCHITECTURE

3.1. System Design Overview: E-Market Place of Enterprise Competencies

The notion of an e-market for competencies embraces a range of value-added services carried out on an e-market place. We propose a system that aims to provide intelligent and customized guidelines in an e-market of competencies. "B-C Market" helps express implicit concepts about competencies in demand. It overcomes the problems that arise when trying to formulate a competency description as well as presenting acquired experience.

The solution can be found either by introducing a common standard or ontology, or by performing translation. We have used both approaches. At the core of the system is the ontology that is used to represent a meta-model, at the interface level users can express their needs and competencies in a flexible way. An interface agent adjusts and translates a request to the framework of a domain model.

With information entered by customers and additional data extracted from a knowledge base, a retrieval agent performs searches on profiles of service providers.

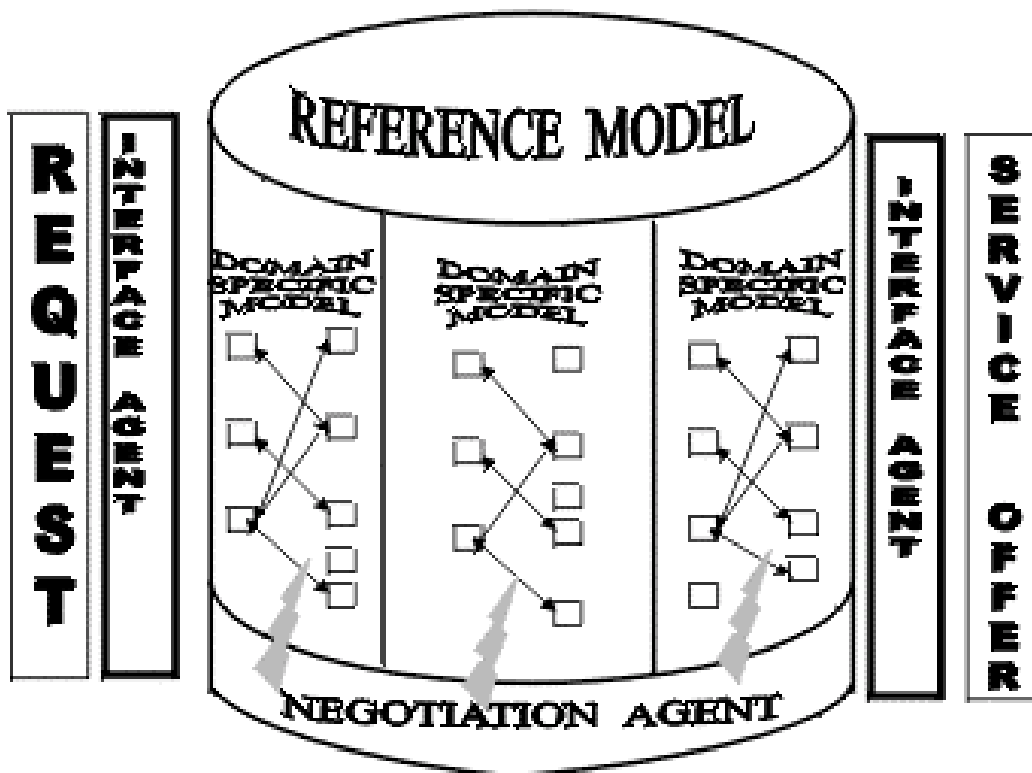


Figure 3: System architecture

3.2. Intelligent Agents Add Functionality

We have chosen to implement the "B-C Market" as a multi-agent system. Multi-agents systems offer a great flexibility (WENGER, PROBST, 1998). Our agents operate autonomously in exploiting domain knowledge. The interface agent translates a user request into the underlying model concept, and interacts with a retrieval agent via an agent-communication language, based on XML in our case. Practice has shown and proved that explicit form of XML-style data representation permits to interoperate with considerable ease. The system has reactive capabilities, it perceives an environment via the agents, and responds in a timely fashion to changes that occur in it.

3.3. Case Retrieval Net

We use a Case Retrieval Net (CRN) to build a Retrieval agent. Among the advantages of such an approach figures flexibility of representation, context dependent similarity measures and efficiency.

CBR is a problem-solving paradigm that, in many respects, is fundamentally different from other major AI approaches. Instead of relying solely on general knowledge of a problem domain, or making associations along generalized relationships between problem descriptors and conclusions, CBR is able to utilize the specific knowledge of previously experienced, concrete problem situations (cases). A new problem is solved by finding a similar past case, and reusing it in the new problem situation. A second important feature is that CBR lets a new experience be retained in a case base. So each time a problem is solved, it becomes a new case which is immediately available for resolving future problems (LENZ et al, 1998).

In Case-Based Reasoning applied for business competencies retrieval , four major containers can be identified:

- ❑ the vocabulary used to describe cases: the common language to describe business profiles, projects description, third parties references and business context
- ❑ the similarity measure used to compare cases: a number of methods to evaluate enterprise, projects and processes performances and quality
- ❑ the case base, or case memory, containing all the stored cases, which are enterprise profiles, project descriptions, evaluation metrics
- ❑ the adaptation knowledge required for transferring solutions in order to adjust a stored case to a new environment

Recently, a number of techniques have been developed that can be used to implement the retrieval task, i.e. the search for cases similar to queries, including kd-trees and CRN (LENZ et al, 1998). We have chosen CRN because this memory model has been specially developed for being employed in the area of decision support. CRN is best suited for domains with simple case representations but can efficiently deal with a huge case base, which is essential in E-Commerce applications.

Applied to the context of event (athletic, music festival, etc), the prototype, which we have built, makes it possible to find the most appropriate business partners to support and promote the event and generates a list of services companies that offer accommodation, catering, transport, etc.

Two types of entity exist in a Case Retrieval Net (CRN): cases and information entities (IE). In our example, a case is a description of a specific event (cultural or athletic). An information entity is a basic knowledge item such as the details of an event (name, type, place, duration, budget, date). Each case is joined to a number of IEs, which describe its features. Similarity links exist between IEs, which have the same attribute name. Relevance links between a case and an IEs indicate the importance of that feature in the case. A spreading activation process is used in order to retrieve cases. So, first, IEs, which are the characteristics of a new event, are activated. Then the relevance of each active IE to a case is estimated. Finally, the case with the highest weight of activation is retrieved and considered as a probable solution.

4. CONCLUSION AND PERSPECTIVES

With this project we had two objectives: first we wanted to elaborate a system that will permit a precise and complete description of business competencies. The proposed meta-model gives comprehensive business competencies representation. This model is decomposed into domain-specific sub-models. We have designed an agent based system architecture that exploits the concept of Case Retrieval Net. Our second objective was to implement an effective way to retrieve enterprises competencies in a flexible (based on different search criteria) manner and provide precise as well as pertinent answers.

This approach was validated with our test prototype on a test example set. Further validation will be done. We are in the phase of establishing a partnership with firms that are interested in the topic: namely to identify their key competencies, evaluate them, exploit them optimally and anticipate their needs.

REFERENCE

- Booch, G. (1999). UML in Action. *Communications of the ACM*, October
- Eriksson, H. and Penker, M. (2000) *Business Modeling with UML, Business Patterns at Work*; Wiley Computer Publishing, New-York
- Glushko, R., Tenenbaum, J. and Meltzer, B. (1999). An XML framework for Agent-based e-commerce. *Communication of the ACM*, 42(3).
- Heene, A., Sanchez, R. (1997). *Competence-based strategic management*, John Wiley, 1997
- Lenz, M, Bartsch-Sporl B., Burkhard, H., Wess, S. (1998). *Case Based Reasoning Technology. From foundation to applications*. Springer, Berlin
- Miles, R. E., Snow, C.C., Miles, G. (2000). TheFuture.org. *Long range Planning*, 33, 300-321.
- "Partnering and Alliances", review, <http://strategis.ic.gc.ca>, 1999.
- Porter, M. (1985). *Competitive Advantage*, First free press edition, New-York
- Suter, B., Kaufmann, G., Probst, A.-R., (1999). Towards an intelligent marketplace for Virtual Enterprises. In *Proceedings of the HCI International conference on human computer interaction* (Bullinger, H.-J. Ed) p. 1157-1161, Munich, Germany
- Suter, B., Kaempfen, K., Probst, A.-R., (1998). Towards a cooperating support system for Virtual Enterprise. In *Proceedings of the European Conference on Information Systems ECIS'98*, France, Aix-en-Provence.
- Wenger, D., Kampshoff, E., Probst, A.-R., Soliva, A. (1999). E-SERVE: The Proactive_Electronic Service Center for Marketing Sales & Support. In *Proceedings on the first international conference on the practical application of Java*. P. 41-60, Great-Britain, London
- Wenger, D., Probst, A.-R. (1998) Adding Value with Intelligent Agents in Financial Services. In *Agent Technology: Foundations, Applications and Markets* (Jennings, N.R., Wooldridge, M. J. Ed.), Springer, Berlin.
- Wooldridge, M. and Jennings, N. R. (1995). Intelligent Agents: Theory and Practice. *Knowledge Engineering Review*