

# Business Community Creation Based on Competence Management

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**Abstract:** Business communities are networked organisations with members from different industries aiming at coordinating their activities for production of the final product/service. Forming a network of companies requires “understanding” of the different companies’ organisational competences. Competence management can help solving this task. This paper starts with presenting our earlier work in competence management projects aimed at supporting creation of business networks. Three cases are introduced: formation of business relationships with developing countries, competence supply in flexible supply networks, and collaborative product innovation. Based on experiences from these projects, competence management requirements for business community creation are identified and a conceptual framework for supporting the identified requirements is proposed. This framework considers competence management as an essential part of participation in business communities and conceptually integrates organisational and individual competence development. Enterprise models can be employed for supporting competence management and competence development in business community within the framework.

## 1. Introduction

In many industrial domains, the business environment currently is changing from traditional supply chains within one industry to a more network-centric approach spanning across different industries. This is illustrated by the creation of business communities including members from different industries. A business community can be characterised as an aggregation of resources of independent companies united on the principle of cooperation within the same information environment and capable of coordinating their activities for production of the final product/service. Business communities need to have a clear understanding what the different members can contribute, not only regarding services offered, resource capacity or production capability, but also in terms of organisational competences. Concepts and approaches from competence management can be applied to address this task.

Traditional competence management concepts for large organisations are aiming at the more long-term development and maintenance of organisational competences. For business communities, other approaches are needed, which support flexible short and mid-term competence supply in cooperating groups of smaller companies. Semantic technologies, like ontologies or semantic networks, are expected to support the task of efficient competence supply by providing concepts and solutions for modelling of organizational competence, and by implementing matching mechanisms between required competence and existing partners.

The next section presents our earlier work in competence management relevant for supporting creation of business networks. Three cases are introduced: formation of business relationships with developing countries, competence supply in flexible supply networks, and collaborative product innovation. Based on experiences from these projects, competence management requirements for business community creation are identified in section 3. A frame concept for business community creation is proposed in the last section.

## 2. Case Studies for Competence-Based Business Community Creation

### 2.1 Formation of Business Relationships with Developing Countries

Work presented in this section is based on a project for the Swedish International Development Agency aimed at supporting collaboration between enterprises in Sweden and Vietnam. The project considered situations like a company from one country looking for partners in another country in order to open new sales or find manufacturing capacity. Close collaboration of enterprises from different countries often requires overcoming diverse obstacles with regard to differences in products, processes, language, and culture. To facilitate this, companies can be supported by diaspora members having competence in the required industry sector and both cultures.

The applied approach is to model competences of companies and individuals and provide for means to search for needed competence. Figure 1 shows the competence modelling frame concept used in this project [1]. The first part is a meta-model that defines the language for representing competence models. Based on the meta-model, two competence models, for enterprises and individuals, were defined. These competence models were built with the help of an ontology language to represent relevant competences for a given task in a formalized notation. The individual competence model structures and formalizes skills and abilities of a person and includes three major parts: general competence, cultural competence, and occupational competence. The enterprise competence model consists of the industrial and occupational competence parts. The former is subdivided into economic activities, products/services, and specific domain competence.

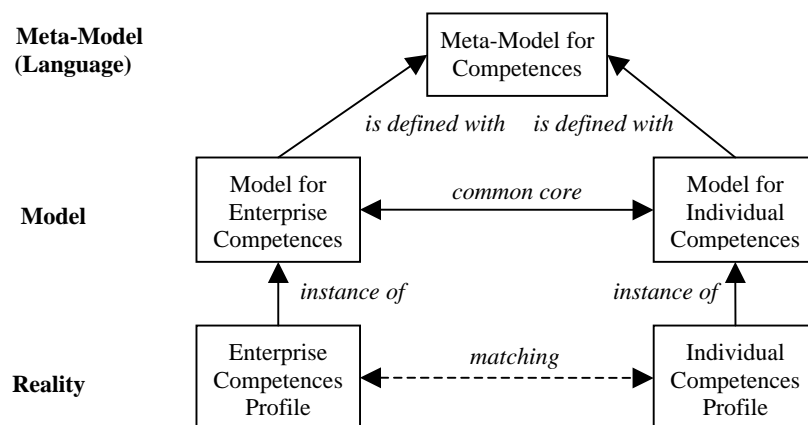


Figure 1: Competence Modelling Frame Concept

The last part of the competence modelling frame concept is competence profiles, which describe particular persons and companies. A competence profile is an instance of the enterprise or individual competence model. A matching mechanism is to be applied on the competence profiles, which are stored in a database, to find instances that match to a given request, like an individual with certain competences required by an enterprise. In this way, a company can find a partner with needed competence as well as get help from a diaspora member and learn more about the partner.

## 2.2 Competence Supply in Flexible Supply Networks

The FP6 project "Intelligent Logistics for Innovative Product Technologies" (ILIPT) is aimed at development of new methods and technologies to facilitate the implementation of "the 5-day car" manufacturing paradigm for the European automotive industry [2]. This is a new paradigm that will approach the building of 'cars to order' in a reduced time scale. ILIPT project will address the conceptual and practical aspects of delivering cars to customers within several days after placing the order [3]. Trying to identify and locate a member that has responsibility and/or competence in a particular part of the supply network can be a laborious, time-consuming process. Developing and maintaining a competence directory of all the relevant parties associated with troubleshooting and solving potential problems can significantly reduce the time. Further, linking this directory to key decision points and frequent problems can further enhance its effectiveness [4].

Depending on the way the competence management system is used, two types of clients can be identified: network members and individuals, who are employees of the network members. The employees are represented with individual competence models. It allows specifying and complementing individual requests with necessary information, and personalizing the knowledge and information flow from the system to the individual. The supply network members are represented with enterprise competence models, which makes it possible to faster and more precisely choose a network member to perform a required operation or to produce/supply required components.

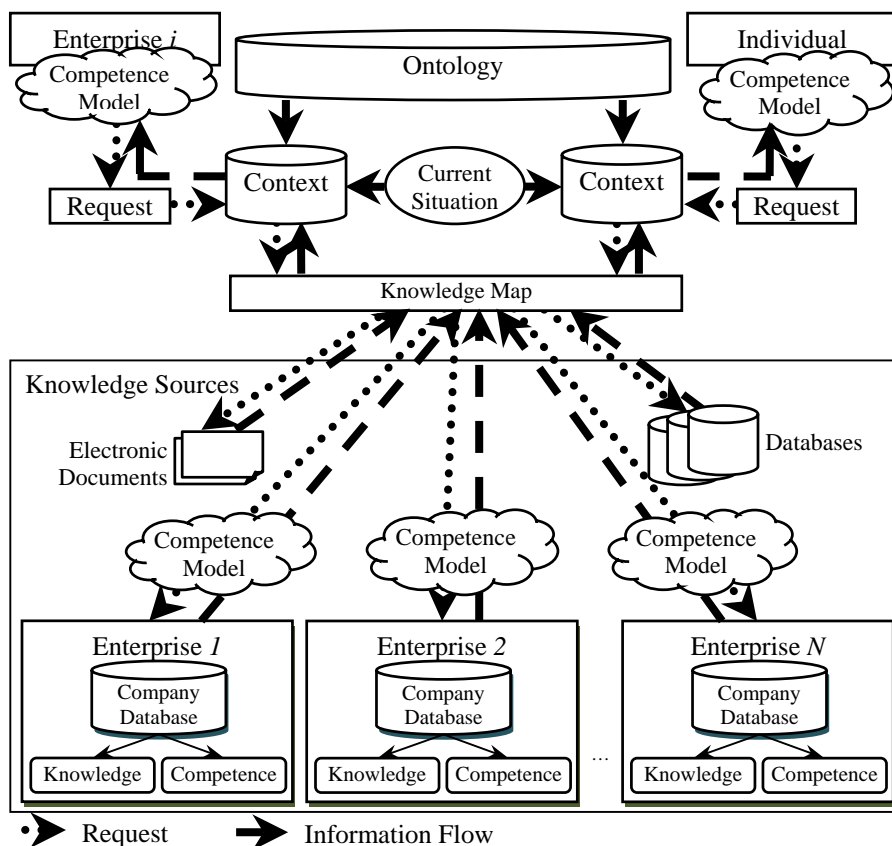


Figure 2: Conceptual Model of Context-Driven Competence Management System

The conceptual model of the context-driven competence management system in flexible supply network is presented in figure 2. Based on requests, ontology of the problem domain, and the current situation, the context is built, which is a description of the individual request and current situation in terms of the ontology. The knowledge map defines references between the ontology and knowledge sources.

### 2.3 Collaborative Product Innovation

Collaborative product innovation in dispersed groups of engineers creates various kinds of challenges to technology, organization and social environment. Selected examples are knowledge sharing, coordination support or formation of teams. The third case presented in this paper is based on experiences in the FP6 project “Model-Adapted Product and Process Engineering” (MAPPER) [5]. The challenge addressed is how to describe the competences needed for planned collaborative design projects in a way that those individuals best suited for the collaboration can be identified. The selected approach is to model competences of individuals including different competence areas like cultural, professional or occupational competences as part of enterprise models (see also section 4.2).

In order to develop a competence model for collaborative design, which represents all essential and desirable competences needed, we have to understand the nature of collaborative design. Collaborative design can be defined as design task performed in a dispersed group of workers with a joint collaboration objective. This leads to at least three areas, which should be taken into account: (i) the nature of engineering design work itself, (ii) the work of design teams as compared to individuals, and (iii) the effects of distributing design work as compared to co-located design.

We propose to utilize enterprise models to represent required competences. The first part of including enterprise competences is connected to roles. Each role needs certain competences, which can be represented with a specific competence construct being part of the enterprise modelling language. Furthermore, competence sub-items with relations to other competences should be included. As a starting point, the competence classification used in the enterprise under consideration should be applied. The second part of modelling design competences concerns the individuals working in the enterprise. The competence they possess, including a competence measurement has to be represented in the enterprise model as a relation between individual and competence category. The enterprise model developed in the project divided collaborative design competences into three major parts: general competence, competence in certain parts of the design process, and competence in systems and technologies. The main use of the enterprise models was capturing organisational best practices including the competence required for the roles involved.

## 3. Competence Management Requirements

Drawing on the experiences from the cases introduced in the previous section, this section identifies and illustrates the requirements for competence management based on the life cycle of business communities.

Business communities experience different phases and situations, which form the “life-cycle” of such a community. The most important phases are community building, formation, integration, operation, discontinuation, and community dissolution [6]. All the phases show specific requirements to competence development and require support mechanisms for competence management, which is shown in Table 1.

In order to illustrate the above requirements during the different life cycle phases, the case of formation of business relationships with developing countries was selected.

- Community building: during this phase companies need to create their competence profiles and enter them into a database accessible for other companies. Diaspora members should also create competence profiles and enter them into the database.
- Formation: a company, which is willing to find a partner, describes the required competence based on the enterprise competence model and searches the database for potential partners as well as persons who can help to form the business relations.
- Integration: the company selects a partner(s) after examining the competence profiles found in the database.

- Operation: members of the formed community (companies and diaspora members) update their competence profiles in the database to reflect accumulated experience.
- Discontinuation: the same update needed like in the operation phase.
- Community dissolution: no special requirements for competence management.

*Table 1: Characteristics of Business Community Lifecycle Phases and Competence Requirements*

<b>Life cycle phase</b>	<b>Description</b>	<b>Typical competence management requirements</b>
Community Building	<ul style="list-style-type: none"> <li>• Enterprises with joint objectives or interests gather in a community of loosely coupled members</li> <li>• Main purpose is information exchange and communication within the network</li> </ul>	<ul style="list-style-type: none"> <li>• Identification and structuring of competences of community members</li> <li>• Creation of competence models for the members</li> </ul>
Formation	<ul style="list-style-type: none"> <li>• Based on specific requirements for a collaboration, the formation of a project team is started based on the capabilities of the members</li> <li>• Potential partners with respect to the specific requirements have been identified</li> </ul>	<ul style="list-style-type: none"> <li>• Description of competence demand according to the requirements</li> <li>• Search for partner possessing the required competence</li> <li>• Selection of team member based on the search</li> </ul>
Integration	<ul style="list-style-type: none"> <li>• Potential team members have been selected and negotiate the legal and financial conditions for joint project work</li> <li>• A collaboration infrastructure is being implemented for all relevant levels of collaboration</li> <li>• The result is a project network</li> </ul>	<ul style="list-style-type: none"> <li>• Search for new partner possessing the required competence if the negotiation was unsuccessful</li> <li>• Selection of new team member based on the search</li> </ul>
Operation	<ul style="list-style-type: none"> <li>• The collaboration project is carried out within the project network</li> <li>• This is supported by the collaboration infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Update of competence models to reflect the relations between partners and changes in members' competences</li> </ul>
Discontinuation	<ul style="list-style-type: none"> <li>• The project network discontinues to exist</li> <li>• Dis-integration at all levels of the collaboration infrastructure and w. r. t. legal and financial issues is carried out</li> </ul>	<ul style="list-style-type: none"> <li>• Update of competence models to reflect the changes in members' competences resulting from the collaboration project</li> </ul>
Community dissolution	<ul style="list-style-type: none"> <li>• The joint objectives or interests within the community no longer exist</li> <li>• The network is dissolved</li> </ul>	

## **4. Frame Concept for Business Community Creation**

Requirements identified in the previous section and experiences from the industrial cases presented in section 2 form the basis for the conceptual framework for competence management support of business community creation, which will be presented in 4.1. Section 4.2 will illustrate how enterprise models can support implementation of the frame concept.

### *4.1 Frame Concept*

The requirements discussed in section 3 made clear that business community creation requires various organisational competences, some of them specialised for the purpose of the business community under creation, like collaborative design competences in case 2.3, some of them quite general competences, like the ability to quickly select suitable individuals within the organisation who are able to perform a specific business community task. Although organisational competences depend on individual competences, they also include best practices (i.e. competence for performing a process), organisation structures, and resources in the organisation (cf. [7]).

From a competence management viewpoint, there exists a tight interrelation between the business community life cycle, organizational competence development, and individual competence development, which is shown in Figure 3. The involvement in a business community creates different requirements to the competences of an organization (see section 3), which form an input for the organizational competence development life cycle. The needs with respect to organizational development surfacing in a business community can be classified into phase related and lifecycle related needs. Phase related needs concern the execution of tasks in a specific phase of the business community; life cycle related needs address organizational competences for management, monitoring and optimization of the business community. It should be observed that organizational competence development requires a certain lead time, i.e. both phase related and life cycle related development needs should be analyzed and qualification measures should be planned already in the business community creation phase.



Figure 3: Business Community Life Cycle and Organizational and Individual Competence Development

Business community requirements that cannot be adequately met by the organization show qualification needs on individual and organization level. Organizational and individual competence development cycles both include several stages caused by these qualification needs, like selection or development of qualification measures, education and training, evaluation and certification, resulting in changes organizational/individual competence profiles. Organizational qualification needs might also directly cause qualification needs on individual level, which is indicated by the connection between the two competence development cycles.

#### 4.2 Enterprise Models for Supporting Frame Concept Implementation

Integrating business community lifecycle and competence management results in a number of important elements needed for implementation of IT solutions supporting the framework for competence-based business community creation, including:

- A suitable approach for modelling and representing both organizational and individual competences
- Tools and approaches for populating the competence models
- An appropriate approach for expressing competence demand in the different phases

- Approaches and tools for matching the competence demand with the existing competence profiles for supporting formation phase and integration phase
- A methodology for integrating all above elements including the evolution of competence models.

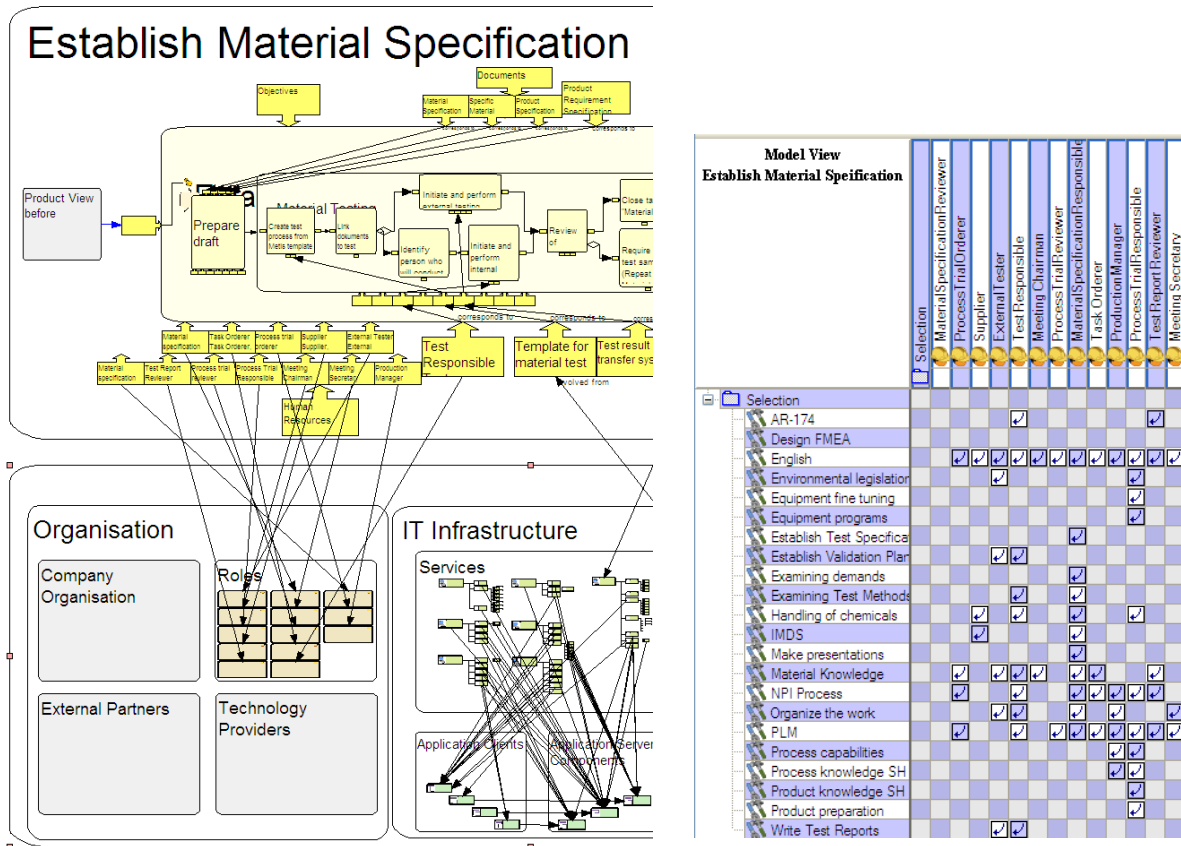


Figure 4a: Visual Enterprise Model

Figure 4b: Competence/Role Matrix

Based on the experiences from the MAPPER project, which was briefly introduced in section 2.3, we propose to use enterprise models<sup>1</sup> for supporting competence management and business community creation. Enterprise models usually capture different aspects of an enterprise including the work processes and activities performed, the organisation structure implemented including roles and actors, the resources used in the processes by roles/actors and the products or services offered by the enterprise. Enterprise models for supporting competence management also have to include the competence required for a specific role and the competences that different actors in the organisation possess.

Figure 4 shows a selected part of an example for such an enterprise model. Figure 4a shows the visual model including the process perspective (illustrated by showing the process for “establish material specification” in the upper half of the figure), the roles involved in the process (shown in the process perspective and in the organisation part, lower part of the picture), the staff available (grey boxes in the lower left part labelled “company organisation and “external partners”), and the IT infrastructure, which is part of the resources used with the processes. Figure 4b shows a matrix created based on the enterprise model listing the different competences as rows, the different roles as columns and the required competences as check marks.

Such an enterprise model describes substantial parts of organisational competences by capturing the processes implemented, the resources available, and the organisational structures in place. At the same time it also includes the individual competences required for the roles and possessed by the actual staff. We consider this kind of model as suitable

basis for supporting competence management and business community creation. [9] discusses the use of such models in configuration of flexible supply networks.

## 5. Conclusions

The main contributions of this paper are to identify competence management requirements for business community creation and to propose a conceptual model for supporting the identified requirements. The main idea in this context consists of (1) considering competence management as an essential part of participation in business communities, (2) conceptually integrating organisational and individual competence development and (3) using the enterprise models for supporting competence management and competence development in business community.

Future work will be of experimental and conceptual nature. From an experimental perspective, the proposed approach has to be implemented and evaluated in controlled environments or real-world cases. This will most likely lead to changes, refinements and improvements of the proposed approach. The conceptual work includes to further elaborate the aspects of expressing competence demands, populating competence models based on existing information sources, and matching approaches for competence demand and models. Approaches from ontology matching seem promising for the latter aspect, as they can be combined and integrated with enterprise models.

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<sup>i</sup> See [8] for an overview to enterprise modeling techniques.