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A Knowledge Sharing Model for Peer Collaboration in the Non-Life Insurance Domain

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In this report we describe KennisNet, a community support system developed at Achmea where developers of non-life insurance products collaboratively construct and share a repository of knowledge items. The aims of KennisNet are to structure, initiate and organise the sharing of knowledge within the group. The KennisNet framework assures the continuous availability of consistent and up to date information and knowledge. The components of the system are face-to-face workshops and a knowledge sharing server. The model draws on different technologies and methods such as knowledge modelling and representation, user-centred design, intelligent agents and visualisation.

1.   Introduction

Achmea is a insurance and financial services company, resulting of 10 years of merges and acquisitions. This leads to the fact that management, processes and development within different business units and brands happens in different and seemingly unrelated ways. However, in order to realise and profit of the potential of Achmea as a whole, co-operation, co-ordination and sharing across business units and practice groups must be encouraged and nurtured. This was the main lead to the start up of a Knowledge Management strategy at Achmea.

Achmea aims at the achievement of sustainable Management of Knowledge within the organisation that supports the development strategy of the organisation through the development of core competencies and a group identity. Furthermore, KM the internationalisation efforts of Achmea, through Eureko are supported and in specific cases and business units, increased results through quicker reactions to environment change and cost reduction can be expected. Several activities relating to the systematic and pragmatic development of an integral Knowledge Management strategy are already taking place both at the holding as at local level. This document reports on one of those initiatives: the Knowledge Network of Non-Life Insurance professionals.

The evaluation of several KM projects shows that a critical success factor in the implementation of knowledge management is the creation of a cultural environment that encourages the sharing of information [9]. Knowledge communities are an answer to the forming of such environments. Knowledge communities are boundary-less virtual communities not hindered by organisational or physical barriers. In this

report we describe a community support system developed at Achmea where developers of non-life insurance products at Achmea collaboratively construct and share a repository of knowledge items. In this scenario a number of knowledge management challenges arise:

1. How to stimulate and organise the publishing process in a user friendly and high quality manner.
2. How to provide individualised knowledge retrieval and navigation facilities in an effective and sustainable way.
3. How to achieve collaboration between people by matching supply and demand of knowledge.

At the Achmea's Knowledge Centre for Non-Life Insurance (Kenniscentrum Schade) a framework for knowledge sharing, KennisNet, was developed to address the challenges above. This model draws on different technologies and methods such as knowledge modelling and representation, user-centred design, intelligent agents and visualisation software. The development of the framework was inspired by several leading work in Knowledge Management models and systems (for example [5, 6, 8]) and draws from the consultancy and modelling experience of the members of the development group [2].

2.   KennisNet Model

Within the Knowledge Centre for Non-Life Insurance, there is a need for efficient and goal directed sharing of information and knowledge. Members of the network have lots of knowledge, which is greatly valuable and useful to each other. Of course, knowledge transfer is a natural part of daily organisational life. However, often people will discuss their business problems with a direct colleague just because they happen to be conveniently close and not because he/she is the best person to consult with [1]. Experience shows that any technological support for knowledge exchange greatly improves if users feel they know and can trust each other. The aims of the KennisNet project are to structure, initiate and organise the sharing of knowledge within the group. Moreover, KennisNet aims at setting up a framework that assures the continuous availability of consistent and up to date information and knowledge. Components of the system are face-to-face workshops and a knowledge sharing server. The KM methodology briefly described in section 1.2.1 was followed for the development of a system that supports these objectives. In this section, we briefly describe the activities undertaken and results achieved during the different development phases of the KennisNet project.

The objectives and the format of the project were analysed, discussed and decided upon during several meetings in which all members of the group participated. It was chosen for a dual approach incorporating direct contacts between members of the group and intranet support. Direct contacts between participants are formalised as quarterly workshops with the participation of all members. The aim of the workshops is twofold. In one hand workshops assure the creation, maintenance and uniformity of domain knowledge (for example, by inviting external authorities in a relevant field and by facilitating structured discussions around a theme). On the other hand, because participants get to know and appreciate other colleagues, a feeling of community is developed.

In parallel, the virtual meeting place and knowledge repository that has been developed facilitates members of the group can find each other and share their knowledge, expertise and provide up to date information on actual themes. The aim is to design an exchange environment restricted to selected participants with the global goal of supporting collaboration and synergy, and in this way meet the organisation requirements. This resulted in the conceptual model for the knowledge sharing server, which stores knowledge generated and verified in the daily practice of members of the group and provides the means for collaboration and communication between users. The knowledge sharing server focuses on issues of storage and sharing of knowledge, and specifically on computer-mediated management of explicit descriptions of knowledge.

2.1. Stakeholders and requirements

From the preparation meetings for the project, the requirements for the system were evaluated. Participants are aware of and collaborative with this requirement but also have their own objectives and constraints. Participants wish to be free to determine their own exchange rules and to be assured that there is control over who are the other participants in the environment.

Both knowledge seekers as knowledge owners want to be able to decide on trade partners and conditions. Sharing is not centrally controlled but greatly encouraged by the management. The best-suited partner, according to each participant's own conditions and judgement, will get the 'job'. However, factors such as privacy, secrecy and competitiveness between brands and departments may influence the channels and possibilities of sharing and must thus be considered. Furthermore, the number and behaviour of participants cannot be fixed a priori and the system can be expected to expand and change during operation, both in number of participants as in amount and kind of knowledge shared.

The following list was gives an overview of the most significant informal requirements expressed by the project stakeholders:

- The *organisation* requires the preservation and organisation-wide availability of existing knowledge.
- *Knowledge owners* are willing to share their knowledge within a group that they feel they can trust. They wish to be able to decide on sharing decisions and conditions; furthermore, added-value of the sharing effort and fair exchange is a must (that is, the feeling that one is rewarded for share).
- *Knowledge seekers* are not aware of existing knowledge and knowledge owners; they also wish to be able to decide on acquisition conditions and partners and furthermore an accreditation and certification mechanism is desired, that enables them to check the level of trust and knowledge of partners.
- Users want to determine who, when and how their knowledge is shared/ distributed
- Users want to communicate directly with others, 1 to 1 or many to many
- Users want to be able to trust knowledge sources received

Furthermore the project must accommodate the following technical requirements:

- The system must make use of existing intranet facilities at Achmea (Lotus Notes)
- The system must follow the infrastructure developments at Achmea and evolve into a web based infrastructure

2.2. Development of KennisNet

The development of the knowledge sharing server takes place in three phases. The reasons for the phased development are twofold. In one hand we believe that a gradual change is more favourable to the acceptance of the system as users get gradually exposed to different processes and have the possibilities to get used to new functionality and ways of work. On the other hand, this phased approach allows the project to follow the technical developments of the current intranet infrastructure at Achmea.
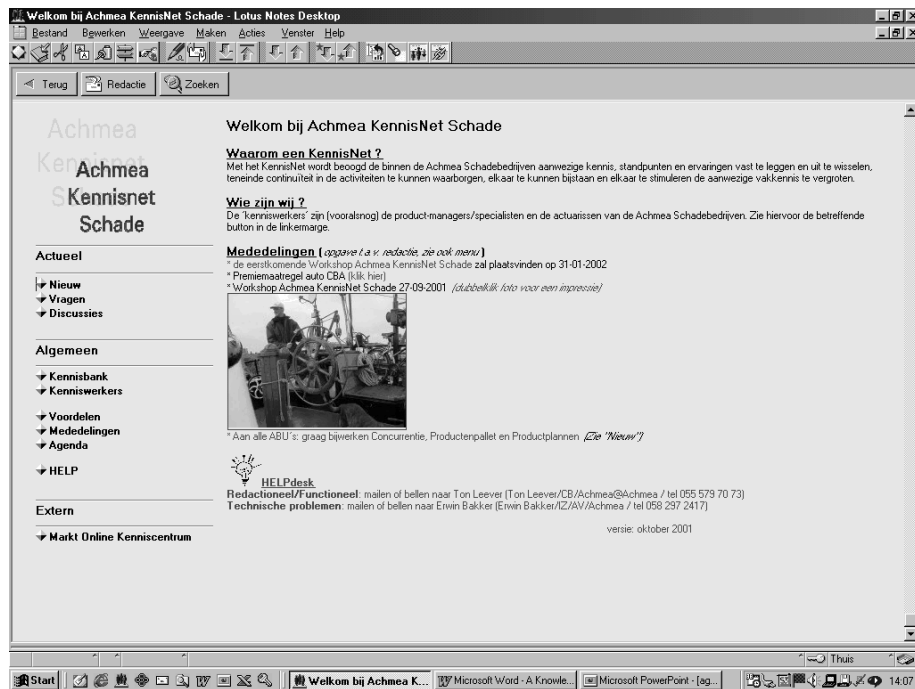

Fig. 1. Portal to the KennisNet

During the **first phase**, the workshop concept was put in place and the knowledge repository was implemented. The existing technical infrastructure, the Lotus Notes network available at Achmea is used for the implementation of the repository. In this phase, we made use of available functionality supported by Lotus Notes that allows for direct access activities of publishing and browsing of knowledge items. The infrastructure also allows for the implementation of facilities for discussion and broadcast of questions and requests. The portal to the KennisNet developed in phase 1 using Lotus Notes technology is depicted in figure 1. The first step in the development of the knowledge sharing server, was the specification of the infrastructure for knowledge organisation (classification and description) and the procedures for publishing and to determine the relevance of proposed knowledge items. Simultaneously, participants must be encouraged to contribute to the system and kept informed of the functionality. A procedure for gradual change of habits and

for the participation of users in the development is realised among other things, by the setting up of face to face workshops. Furthermore, a reward schema is being developed that will contribute to provide incentives knowledge workers to contribute knowledge items.

The **second phase** concentrates on the support of the different types of users, namely search support and publishing support. The requirements identify a need for need dedicated support of search activities. Users are not aware of the contents and structure of the repository. Furthermore, the formulation of the exact query that will lead to the needed information is not a trivial task. In this stage, tools that provide the means to define keyword maps and visualise associations between concepts will be used to provide seeker-oriented support. Furthermore, in order to keep the repository in step with the developments and changes in the environment, publishing support will provide support for the classification of knowledge items, eventually by automatic textual analyse of the texts published. Furthermore, from the analysis of seeker requests, trends and gaps in the repository can be found and publishers are directly requested by the system to provide information about specific areas. The system identifies experts by analysing profiles and the publishing history of users.

The community of users supported by the KennisNet operates independent of holding organisational structure across business unit boundaries. Sharing knowledge therefore implies that knowledge seeker and knowledge owner must be able to find each other and agree on the terms of the exchange. Such exchange conditions are dependent on the level of trust and dependency community members feel for each other. That is, instead of making their knowledge explicit and available through the knowledge repository, knowledge owners can choose to share it in a controllable, trusted group under conditions negotiated for the specific situation and partners. However, in knowledge repositories, such as the one developed in phases 1 and 2, knowledge is decoupled from the knowledge owner. Publisher participation must therefore be encouraged with the introduction of reward or sanction schemas that provide an external valuation for knowledge. However, people rather keep decision about sharing knowledge on their own hands, and that the value of sharing can change depending on many factors. Furthermore, knowledge and information requests are often not a mere exchange of a finished 'product' but imply a work process during which the knowledge owner will develop the answer sought by the requester. Direct links between knowledge and knowledge owners provide direct reward for the owners both through recognition as well as because owner can decide himself on exchange conditions and price.

Therefore the **third phase** of development of KennisNet concentrates on the collaboration aspects of the system and provides mechanisms for knowledge exchange and collaboration that keep ownership links between knowledge and people and that support the search and negotiation process. This phase results in the development of an agent-mediated knowledge sharing market that adds the following functionality to KennisNet:

- Possibility to share knowledge that is not (yet) described in the knowledge repository
- Support for coalition formation (in order to develop new solutions when knowledge is not available)

- Support for direct exchange between parties where the negotiation of exchange conditions happens in a case to case basis

The next section describes the overall architecture of KennisNet. The agent-mediated knowledge sharing market will be described in section 4. The all system and the methodological background for its development are described in more detail in [4].

3. KennisNet Architecture

The overall architecture of the Knowledge Sharing Server (KennisNet) is depicted in figure 2 that also shows the processes associated with different categories of users. As describe before, we identify three categories of users, associated with the functionality required by the stakeholders:

Seekers: are those who search for and read knowledge items in KennisNet.

Owners: are those who submit knowledge items to KennisNet

Editors: are those responsible for maintaining the structure and content of KennisNet.
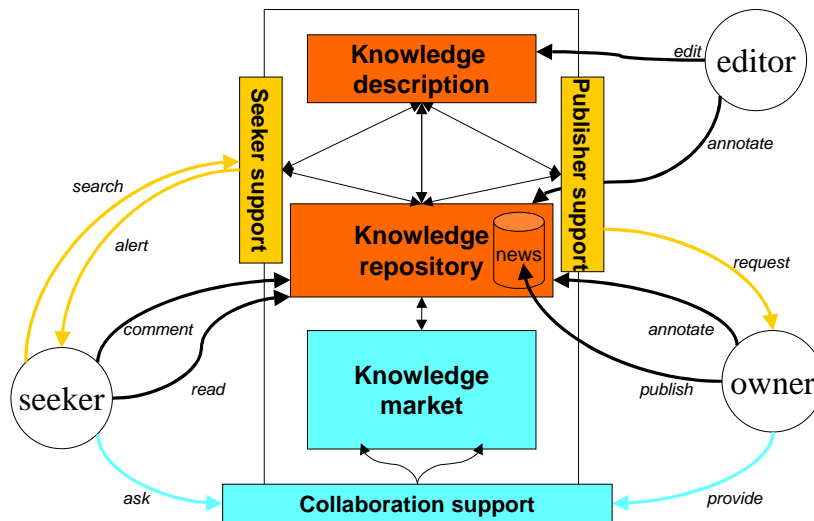

Fig. 2. Architecture of the Knowledge Sharing Server

Any user can play one or more of this roles. However, the possibilities and activities of a user are dependent on the role taken. The central component of the system is a **repository** which content is supplied by the users (knowledge owners). This repository can be browsed by the knowledge seekers and is maintained by the editors. The knowledge repository is built using the ontology-driven **knowledge description** component. Items in the repository are descriptions of knowledge sources, information about employees, discussions and questions. **User support** functionality is directed to the needs of users as knowledge seekers and knowledge publishers. Finally, the **knowledge market** component used the knowledge repository to support and extend direct collaboration between users and will be described in the next section.

The system allows for self-service by the users but additionally provides support for use. That is, users can choose to navigate the Knowledge repository by themselves or to use the different support functions offered. The levels of access are as follows:

- **Direct access to knowledge repository** is the most basic level of access. This level was developed in the first phase of the Implementation stage. Seekers can read knowledge items, join discussions and comment on the items accessed. Owners can publish knowledge items. Both the owners and the editors can associate knowledge items to the classification structure. This phase relies on the knowledge seeker to be well informed about the content and organisation of the repository and have a clear aim or query in order to find the knowledge sought. Knowledge owners can publish knowledge items using a description template. In order to support direct access by users the portal to the KennisNet allows direct access to news, information on knowledge workers, agenda, discussions, and to the knowledge repository.

- **Supported access to knowledge repository** is tailored to the needs of users in the different roles. This functionality is developed in the second phase of the implementation stage. Support for knowledge seekers facilitates search activities and informs knowledge seekers of newly available content if desired. By analysing the requests of seekers, the system can detect 'gaps' in the content of the repository and request knowledgeable users to publish in those subjects.

- **Supported collaboration** (through the knowledge market) allows for direct collaboration between users. This functionality will be developed in the third phase of the implementation stage. In opposition to a knowledge repository where content is published only after being created, used and judged relevant by the publisher, the collaboration component allows for knowledge seekers to request for knowledge that is not (yet) in the repository. By analysing what content a user as published previously, the system can decide which are the most likely partners for a knowledge request. The system then supports the partners to negotiate about the conditions and rewards for the collaboration. The fact that knowledge owners are requested to provide knowledge creates direct reward (as a feeling of expertise and recognition) and will possibly motivate users to publish.

The following activities are supported by the systems:

- *Publish*. Knowledge owners submit a knowledge item to repository, using the knowledge description template. Submitted items are stored in the News-base of the repository. (implementation phase 1)

- *Read*. Knowledge seekers browse through the repository to find interesting items. (implementation phase 1)

- *Annotate*. Both the knowledge owner submitting an item as the repository editor can perform ontology-driven classification of submitted items. That is, items in the News-base are evaluated for preservation in the repository and classified according to the ontology. (implementation phase 1)

- *Comment and discuss*. Knowledge seekers can comment on items they retrieve. A comment is treated as an associated knowledge item. Also discussions can be generated in this way. (implementation phase 1)

- *Edit*. Editor can develop, modify and maintain the ontology and description templates as well as the portal of the repository. (implementation phase 1)

- *Search*. A user interface for knowledge seekers integrates traditional direct browsing with ontology-driven search and retrieval to support associative search

across the whole KennisNet structure. The interface also supports query construction using ontological relationships to determine closest concepts. (implementation phase 2)

- *Alert*. User profiles (which are entered in the system as knowledge items describing the users themselves) are used to determine interests and needs of the users and used to alert the users by email about relevant new items. (implementation phase 2)
- *Request*. Periodic analyse of seeker requests is used to request new items from experts. Experts are determined based on user profiles. (implementation phase 2)
- *Ask*. Knowledge seekers can place requests for collaboration aiming at finding interested experts willing to provide dedicated knowledge. A personal agent will join the knowledge market with its user's request and negotiate appropriate collaboration partners. (implementation phase 3)
- *Provide*. Experts can indicate their interest in collaborate by sending a personal agent with their offers to the knowledge market. Alternatively, the market authority can request possible experts to offer their knowledge in the market by consulting the user profiles stored in the repository. (implementation phase 3)

4. The Knowledge Sharing Market

We followed the design model for architecture agent societies described in [3] for the development of the Knowledge Market. The user interface of the Knowledge Market allows KennisNet users seeking collaboration (both as knowledge seeker and as knowledge owner) to initiate a personal agent that will act as their avatar in the market. This agent will use the preferences and conditions specified by the user to find appropriate partners and negotiate exchange terms. The architecture of the Knowledge Market portrays the different types of users possible in the KennisNet model. Furthermore, in order to support the social activity of agents a facilitation level is needed that incorporates agents roles necessary for the co-ordination of the market. Interaction is determined by norms specified by the society and regulated by mechanisms of social control. Agents at facilitation level are responsible for the social organisation of the environment, including acceptance and socialisation of new members, matchmaking, support of negotiation, enforcing of social rules and resolution of conflicts.

The 'goods' to be exchanged are knowledge descriptions similar to the items in the knowledge repository. It is not the aim of the market to create a commercial exchange where money change hands in order for knowledge to be exchanged. However, a mechanism for fair exchange is needed through which knowledge owner feel rewarded for their efforts. A possible way to realise is by using a point system. That is, knowledge seekers will pay an agreed number of points to the knowledge user(s). Points earned can be used to buy knowledge from other owners but also enable users to follow courses or visit conferences.
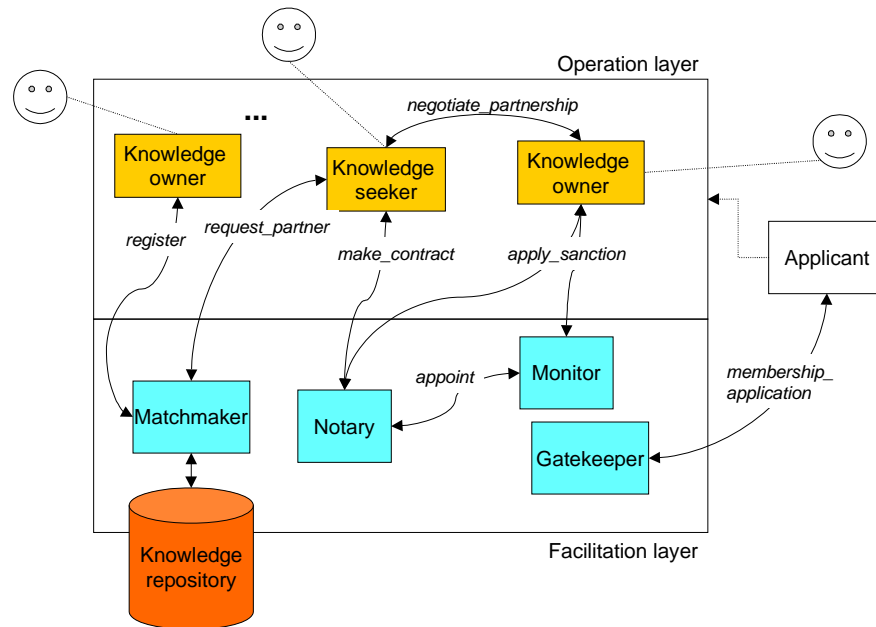
Fig. 3. Basic architecture of Knowledge Market

The following scenario illustrates the functionality of the knowledge market: Anne is working in the development of a new product for liability insurance. She requires an analysis of the products offered by competitors that is not available in the KennisNet repository. Via the user interface, Anne communicates her needs and conditions to her personal assistant. The conditions set by Anne refer for example to the deadline (when is it needed), type of source preferred (does she prefer to talk to someone, to read a document), and what is she willing to 'pay' for the result. Anne's assistant will seek to join the knowledge market (an application procedure is necessary to assure that only authorised members can access the system[1]). Once in the system Anne's assistant will assume the role of *knowledge seeker$_{Anne}$* and contact the *matchmaker* in order to find out potential partners. Using its own internal information about knowledge owners in the system, or possibly, referring to the knowledge repository to find out possible knowledge sources matching the request, the *matchmaker* will provide a list of *knowledge owners* to the *knowledge seeker$_{Anne}$*. Following its own strategy, the knowledge seeker will then contact knowledge owners and try to get the best deal for Anne's request. Matching strategies may differ for each agent and can be indicate by the user. For example, an agent may want to negotiate with all possible choices in the list received from the matchmaker and another will just the take the first one. In this example, *knowledge seeker$_{Anne}$* will make a commitment with *knowledge owner$_{Paul}$* that Paul will provide Anne with the

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[1] There may be other agents 'around' in the organisation that do not belong to the KennisNet users. Such application procedure will assure the confidentiality and integrity of the market. Also, it is conceivable to think that within KennisNet, specialised knowledge markets will be formed where only some types of users can participate.

information she requested. Commitments are registered with the *notary* agent. However, depending on the exact request and conditions, Anne and Paul will possibly need contact each other directly in order for the requested knowledge to be exchanged. If nothing more is reported back, the personal assistants will assume that the commitment was fulfilled and the contract archived. The system assumes that it is in the interest of users to report wrong match or unfulfilled commitments, since such feedback will assure the improvement of future interactions.

5.   Conclusions

The KennisNet provides an example of a model for integration of collaboration and knowledge repository functionality. Implementation phase 1 is now completed and is undergoing user testing and evaluation. A preliminary prototype for the knowledge market to be deployed in phase 3 is currently under development, with the main aims to test the potentiality of available agent platforms (we have evaluated Zeus [10] and Jade [7]). Open research issues concern the development of models for knowledge retrieval and visualisation.

   Finally, we feel that the major challenge for the success of this approach is the participation of users. Empirical results from analysing user participation in phase 1, show that a critical volume of items in the repository (and thus a substantial amount of answer to user requests) is necessary for users to perceive the added value of the systems. Such critical volume can however only be achieved by active participation of users. The situation can result in a vicious circle. Methods and incentives for change in working habits of users are therefore critical aspects for the development of KennisNet.

6.   References

1. Davenport, T. and Pruzak L.: Working Knowledge: How organisations manage what they know, Harvard Business School Press, (1998).
2. Dignum, V. and Heimannsfeld, K.: Knowledge Management for Requirements Engineering. In: Proceedings of the Knowledge Acquisition Workshops - KAW99, Banff, Canada, (1999), http://sern.ucalgary.ca/KSI/KAW/KAW99/papers.html.
3. Dignum, V., Weigand, H., Xu L.: Agent Societies: Towards framework-based design. In: Wooldridge, M., Ciancarini P., Weiss, G. (Eds.): Proceedings of the 2nd Workshop on Agent-Oriented Software Engineering, Autonomous Agents, Montreal, (2001) 25-31.
4. Dignum, V.: KennisNet: an Integrated Framework for Management and Sharing of Knowledge, in preparation, (2001).
5. Domingue, J. B. and Motta, E.: A Knowledge-Based News Server Supporting Ontology-Driven Story Enrichment and Knowledge Retrieval. In: 11th European Workshop on Knowledge Acquistion, Modelling, and Management (EKAW '99), (1999), http://kmi.open.ac.uk/people/motta/papers/planet_onto.pdf.

6. Gandon, F., Dieng, R., Corby, O. & Giboin, A.: A Multi-Agent System to Support Exploiting an XML-based Corporate Memory. In: Proceedings PAKM'00, Basel, Switzerland, October 30-31, (2000).
7. Jade, http://sharon.cselt.it/projects/jade
8. Mentzas, G., Apostolou, D., Young, R. & Abecker, A.: Knowledge networking: a holistic solution for leveraging corporate knowledge. In: Journal of Knowledge Management, Vol 5 Issue1, MCB, (2001).
9. Reimus, B.: Knowledge Sharing within management consulting firms: Reports on How U.S.-Based Management Consultancies Deploy Technology, Use Groupware and Facilitate Collaboration. Consultant News, Kennedy Information, Fitzwilliam, New Hampshire, (1997), http://www.kennedyinfo.com/mc/gware.html.
10. Zeus, http://www.labs.bt.com/projects/agents/zeus/index.htm