Business Ontologies Modelling for Communities of Handicraft Women

Valérie Monfort[1,2], Ikmel Haamdi[1], Rahma Dhaouadi[1] and Achraf Benmiled[1]

[1]SOIE LI3, ISG Tunis, 41, Rue de la Liberté, Cité Bouchoucha 2000 Le Bardo, Tunis, Tunisia
[2]Université de Paris 1, Panthéon Sorbonne, Paris, France

Abstract. Social networks are websites or platforms which bring together users in various online communities. Social networking on the Internet capitalizes on the Web's latent structure as a meta-network of social connections to boost computer-supported collaboration in conjunction with the use of Semantic Web metadata. The Semantic Web effort is in an ideal position to make Social Web sites interoperable. Applying Semantic Web frameworks including SIOC (Semantically Interlinked Online Communities) and FOAF (Friend-of-a-Friend) to the Social Web can lead to a Social Semantic Web, creating a network of interlinked and semantically rich knowledge. Moreover, communities can be professionals who want to share knowledge, to sell their production, to communicate and to collaborate. We are involved in a research project which aims to study the ability of handicraft women to use new technologies. In this paper, we show the manner we elicit and we model knowledge with several business ontologies.

1 Introduction

A Social Network is usually formed by a group of individuals who have a set of common interests and objectives. There are usually a set of network formulators followed by a broadcast to achieve the network membership. After the minimum numbers are met, the network starts its basic operations and goes out to achieve its goal. Success of a Social Network mainly depends on contribution, interest and motivation of its members along with technology backbone or platform support that makes the life easier to communicate and exchange information to fulfil a particular communication need. Moreover, the social-semantic web (s2w) [1] aims to complement the formal Semantic Web vision by adding a pragmatic approach relying on description languages for semantic browsing using heuristic classification and semiotic ontologies. A socio-semantic system has a continuous process of eliciting crucial knowledge of a domain through semi-formal ontologies, taxonomies or folksonomies. S2w emphasize the importance of humanly created loose semantics as means to fulfil the vision of the semantic web. Instead of relying entirely on automated semantics with formal ontology processing and inferring, humans are collaboratively building semantics aided by socio-semantic information systems. While the semantic web enables integration of business processing with precise automatic logic inference computing across domains, the socio-semantic web opens up for a more social interface to the

Monfort V., Hamdi I., Dhaouadi R. and Ben Miled A..
Business Ontologies Modelling for Communities of Handicraft Women.
DOI: 10.5220/0004608500520062
In *Proceedings of the 2nd International Workshop on Web Intelligence* (WEBI-2013), pages 52-62
ISBN: 978-989-8565-63-1

semantics of businesses, allowing interoperability between business objects, actions and their users. Much of the Semantic Web functionality envisioned by Tim Berners-Lee [2] relies on ontologies [5] [10]. Creating ontologies is difficult, time-consuming, and expensive, reminding of the labor of knowledge engineering in expert system design, in particular if ontologies are designed to support automated inference envisioned by advanced Semantic Web applications.

Our research work is based on a research project studying the manner handicraft women use new technologies such as social networks to develop their activity. In a first time, we aim to elicit knowledge and to model ontologies with Protégé Tool. The aim of this paper is to present an extract of this first step and how we organized to succeed.

The remainder of this paper is organized as follows. Section 2 introduced the context of the project. A brief state of the art on ontologies is given in section 3. Section 4 describes approaches to define ontologies. In section 5 we propose an extract of the Handicraft ontologies. Conclusion is given in section 6.

2 Context

2.1 Landscape

The users want to keep in touch with friend regardless of the Host location. They are able to share their interest by joining groups and forums too. Some social media might help people find jobs and may even help establish business contacts. Social networks offer special features such as the choice to design their profiles that reflects their personality or emotion. Music and video sections are also popular additional features. Social networks are examined through the profiles they provide, the safety it provides to the people, networking features their people may use, search option, support and help choice for any queries through the people, plus much more. Myspace is among the best internet sites for locating people. Although Facebook profiles can't be personalized, their platform is extremely clever and clean. Facebook is centered on interactions. Specifying extracted knowledge from interviews under ontology formalism is a primordial step. But the structure of the generated ontology still static without any enhancement procedures. However exploring social networks data and structure can leads us to deduce relevant scenarios to ensure the dynamicity of the already designed ontology. On top of all, with our pragmatic experience and drawback, we noticed three main lacks addressed below:

- The major challenges come from the fact that social networks in the present age do not concentrate on a particular service. Every social network tries to provide maximum features to its users. Social networks are slowly losing out on the user population who are finding it very difficult to concentrate on a particular social network for a length of time. The increasing competition is also removing the most important feature of these networks. We propose a social network should be concentrating upon one of the niche services while keeping the other common features as an additive or supporting cast to the main service.

- Semantics emerged from social networks. We think also that specific ontologies for social networks such as FOAF[1], RELATIONSHIP[2], SIOC[3], MOAT[4], and SKOS[5] are a possible issue to model profile, etc. But these ontologies do not allow us to model business knowledge (data, process, etc). Moreover, these ontologies are limited for instance, profile express the semantics of a user profile not a social Web user involved in a professional activity, sharing a part of his/her knowledge to some members, collaborating to propose a specific product, learning technics from other members, etc. We propose to align different kind of ontologies to face to the different point of views.
- The resources allocation shows a genuine lack of flexibility, we aim to address this lack at run time as communities are endlessly creating and re configuring. We propose to use specific graphs theory issues.

2.2 Project Description

We are involved in a research project financed by both the Tunisian and Algerian governments. The aim of this project is to study the manner handicraft women use new technologies to support their activity. The main characteristics of these communities are as followed:

- Women come from different Tunisian and Algerian regions. The priority of the governments was to favour touristic and along the coast big cities, to the detriment of inland regions. So inland infrastructures are archaic, and unemployment is increasing.
- Inland Handicraft women are mostly coming from poor social background and they have the duty to stop studying early to financially help their family. Most of them are analphabetic housewives with several children and with unemployed husband. This provides the social, traditional, religious and cultural backgrounds with the perfect ground upon which to impose their supremacy. Simply using a mobile phone might be seen as an emancipation act, so, very often, husband uses phone instead of his wife.
- It is difficult to contact raw material providers who rarely sell little quantities. It is also difficult to sell their production, because they are isolated and they need means of transport. Organized associations mostly are lucrative and make a consequent profit to the detriment of Handicraft women.

Firstly, we aim to study the manner handicraft women use technologies (Fig.1). We plan to propose them specific training with specific semi assisted organization to help them. Then, we shall study their learning skills. Some will not accept and will propose their children to be trained. These results will help us to define a genuine social profile of these women and to challenge current communication technologies. We aim to answer to the following question: Are current communication technologies suitable to all the users?

[1] http://www.foaf-project.org/
[2] http://vocab.org/relationship/
[3] http://sioc-project.org/
[4] http://moat-project.org/ns#
[5] http://www.w3.org/TR/skos-reference/

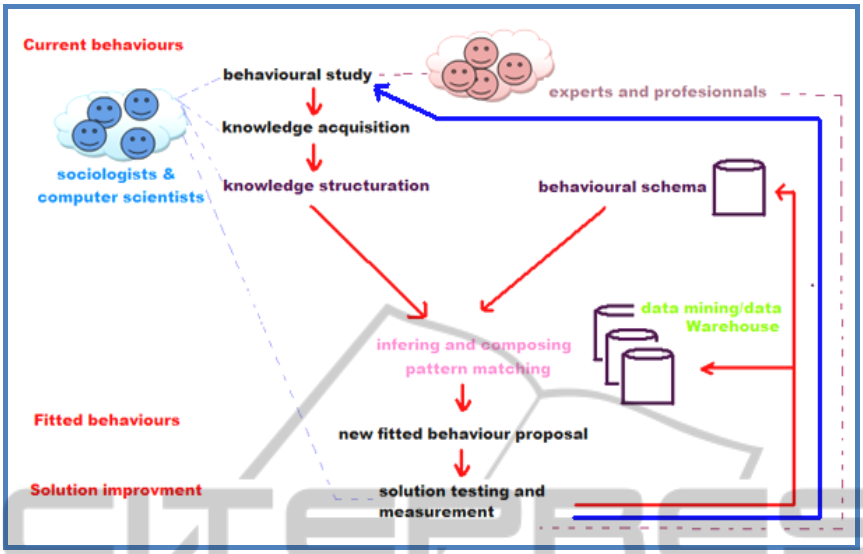

Fig. 1. Proposed process.

Secondly, we aim to develop handicraft women activities allowing them gaining their independence and increasing their purchasing power. To meet such a goal we propose to create communities sharing together the knowledge, the experience and the creativity regarding handicraft activities. This will be very helpful when dealing with collaborative work promotion or training other women to handicraft jobs which results in reducing unemployment rate.

Our team includes socio economists and computer scientists. Socio economist members defined an interview grid. We found facilitators to meet women. We started driving interviews to design knowledge which are formalized via ontologies to express: business data (clay, clay color, quantity of clay, paintbrush, natural pigment, wool, etc), business processes (providers selection, production, clay cooking, selling, etc), and business rules ("when ambient temperature is over 18°C drying time of clay is 2 days"). According to ambient context, women's skills and profile can change and/or be adapted according to profiles or geographical location.

3 Knowledge and Ontologies

Knowledge acquisition is the ability to locate, gather, and formalize knowledge. This process is often named knowledge management and is dealing with two distinguished knowledge nature explicit knowledge and tacit one [12]. There are previous steps to overcome before focusing on the identification of relevant knowledge belonging to a contextualized domain which are collecting data and then structuring and organizing this obtained data so to be already information. Several approaches are proposed such as positivist and constructivist. Positivist approach assumes that knowledge is completely independent on a user or on a group of users while the knowledge extraction phase is done partially. However constructivist approach is considering that

knowledge is built step by step in a collective way and is the resulting from the study and validation of information by the domain expert community. Knowledge mapping is composed of three phases: 1) Context analysis through the domain experts interviewing. 2) Collective appropriation of relevant information carried out by experts. 3) Information validation and information recognition by experts and potential users. We are especially interested in the acquisition of business knowledge regarding techniques, practices and skills required to design and realize a specific handicraft product. In the following, we are mentioning five approaches for business knowledge management:

- The Social and cooperative approach consists in the study of the interactions between group members thus to offer tools and methods to structure and enhance exchanged knowledge and facilitate the reuse.
- The Bottom-up approach consists in identifying and extracting concepts and the reasoning of the domain taking into account sources like deliverable, reports, emails, etc.
- The Top-down approach consists in a first of all in mapping the domain knowledge and then the system or the cogniticians interact with experts in order to extract the necessary information.
- The Decisional approach consists in the knowledge capitalization and reuse in order to support the decision making.
- The Organisational approach takes into account the social dimension in order to structure knowledge and especially to facilitate the share of formalized knowledge among. New technologies can support this fact.

This knowledge is structured into ontologies. According to [13], we can classify ontologies as followed: 1) The generic or upper ontology is specifying common abstract concepts subsuming the terms belonging to a wide range of domain ontologies. It can be applicable in various contexts; 2). The domain ontology is only specifying knowledge related to a specific one particular domain such as medicine, agronomy, policy, GIS etc. Another relevant definition is given in [9], where authors assert that domain ontology models the information known about a particular subject and therefore should closely match the level of information found in a textbook on that subject; 3) Business ontology: It is focused in the formalization of the knowledge regarding a specific business. It is dealing with actors, resources, processes defining this business. 4) Task ontology or process ontology: it describes the vocabulary specific to a task or an activity integrated in the completion of a determined final target. Besides, this ontology specifies a reasoning process towards a specific goal. 5) Application ontology: It is dedicated to a specific application and it includes enough knowledge to structure a particular domain. An additional dimension when applied to ontology is enabling the transfer from static ontology structure to a dynamic one ensuring its evolution online. This dimension is always called context, situation or simply environment and is very useful mainly to support decision making respectively to contextual changes.

Abstract, business and task ontologies with instances are used in the handicraft women's project. We aim to define different abstraction levels such as: 1) a generic level which is the same for all handicraft business, 2) a business level for one specific handicraft business such as ceramic, 3) an instance level to create detailed typologies such as the categories of ovens (electric, with wood, etc). Several operations such as

alignment or merging can be applied to the ontology: 1) Alignment principle is consisting in the identification of semantic matches between the elements (concepts, their relationships, their instances) belonging to different ontologies [6]. The alignment process is based in the mapping process and is stopped with setting the necessary association between entities belonging to the different ontologies. 2) However, ontology merging procedure [11] consists in the fusion of the set of handled ontologies in a united one. This generated ontology includes: concepts, relationships and instances of original ontologies.

According to [2], two main groups of approach to build ontologies can be identified. On the one hand, there are experience-based methodologies, such as the methodology proposed by [3] based on TOVE Project or the other exposed by [4] from Enterprise Model. Both were issued in 1995 and belong to the enterprise modeler domain. On the other hand, some methodologies propose flexible prototypes models, such as METHONTOLOGY [7] that proposes a set of activities to develop ontologies based on its life cycle and the prototype refinement; and 101 Method [8] that proposes an iterative approach to ontology development. On the one hand, there is not just one correct way or methodology for developing ontologies. Usually, the first ones are applied when the requirements are clearly known at the beginning; the second ones when the objectives are not clear from the beginning. Moreover, it is common to merge different methodologies since each of them provides design ideas that distinguish it from the others. This merging depends on the ontology users and ontology goals. On the other hand, like any other conceptual modeling activity, ontology construction must be supported by software engineering techniques. Thus, we used methods and tools from software engineering to support ontology engineering activities. Ontology development can also be divided into two main phases: specification and conceptualization. The goal of the specification phase is to acquire informal knowledge about the domain. The goal of the conceptualization phase is to organize and structure this knowledge using external representations that are independent of the implementation languages and environments.

Manual approaches for modeling ontologies are costly and time consuming. Moreover, semi automatic or automatic methods are mostly used. They are always handling unstructured data like textual documents. Multiple methods are based on techniques of natural language treatment combined with machine learning tools. However, according to social profile of women we used manual approaches. Some women are analphabet, shy, and they are very impressed by researchers which interest on their activity. So we used, questions, pictures, documents, films, etc, to define and model knowledge.

4 Proposed Ontologies

4.1 A Business Generic Ontology

Figure 2 is an implementation with *Protégé 4.2* [6] and presents an ontology to describe the semantic relation between women, the whole environment and context. Protégé OWL plugin is used to define an OWL ontology representing the resource relationships combined with SWRL[7] (Semantic Web Rule Language) and representing the

dependencies between those relationships. There modeled three kinds of resources: 1) Human resources include: women, clients, providers and partners which help to product. 2) Business Process describes women activity and what they use for. 3) Process is very important for the production, selling and purchasing cycle. Following ontology (Fig 2.) is supposed to be the same for all the handicraft business.

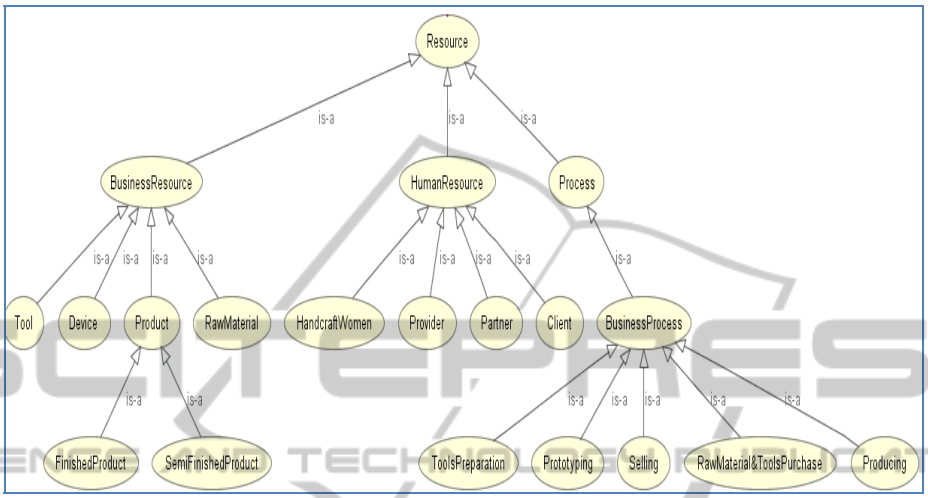

Fig 2. A Business Generic ontology.

4.2 A Business Specific Ontology

Figure 3 shows one kind of women's work, it's composed of tools and raw material. During the production step women need tools and raw material. This ontology describes a ceramic product: women uses a pottery wheel (manual, electric), oven (electric, woody) and paint brush. The raw materials are: engober, dried cow dung, painting (chemical and natural), glazing and clay.

4.3 A Business Instance

Figure 4 shows an instance from the clay entity. Depending on the production women choose a particular kind of Clay such as: chamotte, white clay or red clay.

There are several kinds of clay such as: WhiteMoistClay, Chamote, RedClay, etc. They are all instances of clay. A SWRL rule contains body and a header. Both the body and head include positive conjunctions of atoms:

$$atom \ \hat{} \ atom \ .... \ - > atom \ \hat{} \ atom \qquad (1)$$

An atom is an expression where p is a predicate symbol and arg1, arg2... argn are the terms or arguments of the expression:

$$p \ (arg1, \ arg2, \ ... \ argn) \qquad (2)$$

[6] http://protege.stanford.edu/
[7] http://www.w3.org/Submission/SWRL/

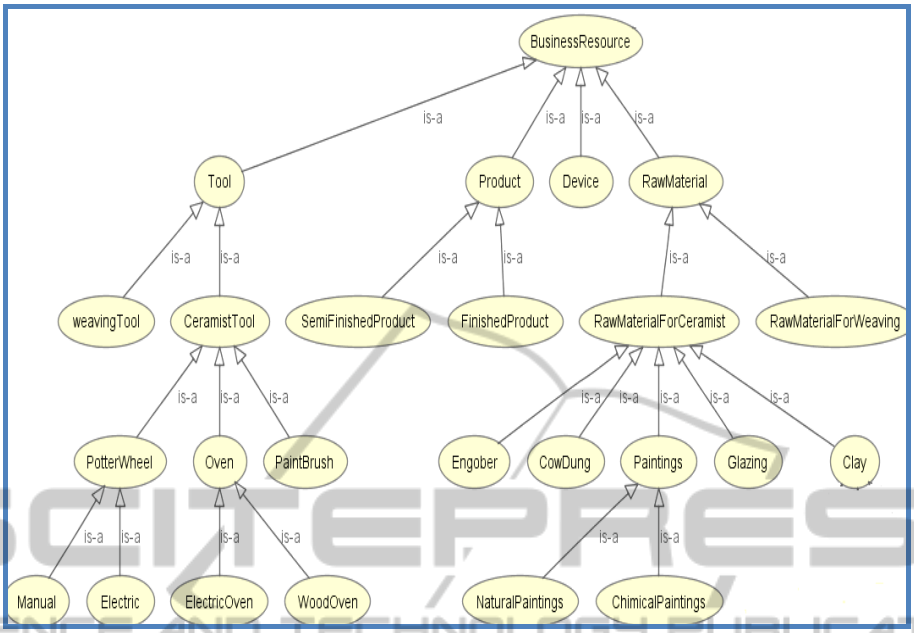

Fig 3. A Business Specific ontology.

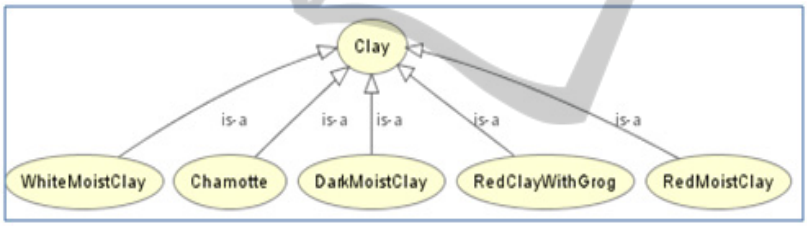

Fig 4. Instances.

Code1 presents some rules created with SWRL.

Code 1. Hierarchy of Business entities.

```
1) HumanResource (?)-> Resource(?s)
2) HandcraftWomen(?w) -> HumanResource(?h)
3) Client(?c) -> HumanResource(?w)
4) Provider(?p) -> HumanResource(?w)
5) Partner(?r) -> HumanResource(?w)
```

According to the first rule (line 1) of code1, human resource is a sub class of Resource. Women, clients, providers and partners are sub class of HumanResource. Code 1 shows an example rule using class atoms to declare types of women, clients, partner and provider are part of the class HumanRessource.

A second rule (Code 2) shows women use their devices to contact suppliers, partners and clients: The rule contains three atoms, which is expressed by the relation

between women, partner, provider and client. Here, `HandcraftWomen` and `Partner` are OWL named classes, (?w) is a variable representing an OWL individual. `UseDevice` and `Contact` are OWL object properties. Women can contact Partners, providers or clients.

Code 2. Rule To use device to contact different actors.

```
1) HandcraftWomen(?w), Partner(?r), UseDevice(?w, ?d)
   -> Contact(?w, ?r)
2) HandcraftWomen(?w), Provider(?p), UseDevice(?w, ?d)
   -> Contact(?w, ?p)
3) HandcraftWomen(?w), Client(?c), UseDevice(?w, ?d) -
   > Contact(?w, ?c)
```

This rule illustrates women use devices during the selling and purchasing process: Here, `HandcraftWomen` and `RawMaterial&ToolsPurchase` are OWL named classes. `UseDevice` and `Purchase` are OWL object properties. According to this rule, women can access to User Interface via their devices to purchase (`Purchase`) raw material and tools (line 1). They also can sell (`SellProduct`) their Product (`FinishedProduct`) using their devices (line 2).

Code 3. Rule To use device to contact different actors.

```
1) HandcraftWomen(?w), RawMaterial&ToolsPurchase(?m),
   UseDevice(?w, ?d) -> Purchase(?w, ?m)
2) HandcraftWomen(?w), FinishedProduct(?p),
   UseDevice(?w, ?d) -> SellProduct(?w, ?p)
```

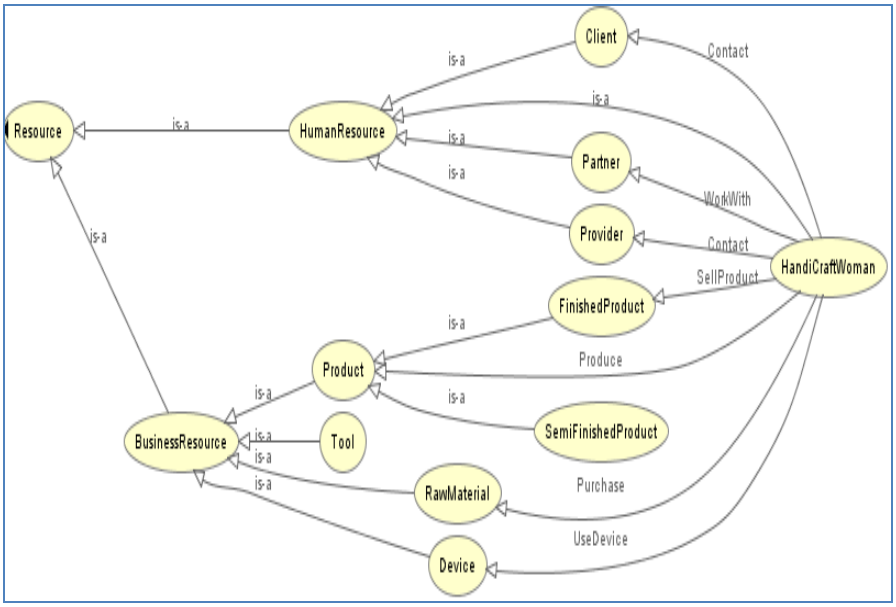

Fig 5. Graph presenting ontologies and relations.

Production process can be shared by two handicraft women (code 4). Here, `HandcraftWomen` and `Partner` are OWL named classes. `WorkWith` is an OWL object properties. Another rule allow choosing to work with a partner (`WorkWith`).

Code 4. Rule To access to women partners.

```
1) HandcraftWomen(?w), Partner(?p) -> WorkWith(?w, ?p)
```

The graph of the fig.5 is an extract and it presents elements and relationships between concepts.

6 Conclusions

Our work is based on a research project studying the manner handicraft women use new technologies such as social networks to develop their activity. In a first time, we aimed to elicit knowledge and to model ontologies with Protégé Tool. We met difficulties to access to inland women who are living in little villages where roads are more trails made of stones. But all the women accept interviews and to be trained (or delegate their daughters). We go on interviewing and we plan to use social Web Mining to analyze results. With trainings and next analysis, we hope having answer to the suitability of new technologies to any kind of user. With this answer we could define either a new technology either we shall adapt current technologies. We are faced to the limitations mentioned in section 2.1 and we have to find solutions in future works as the processes modeling and the execution of these ontologies.

References

1. Cahier J. P., L'Hédi Z., Zacklad M. : Information seeking in a "socio-semantic web" application. Proceedings of the 2nd International Conference on Pragmatic Web, ICPW, Simon Buckingham Shum, Mikael Lind, Hans Weigand (Eds.):, ACM International Conference Proceeding Series 280 ACM 2007, ISBN 978-1-59593-859-6, Tilburg, The Netherlands, October 22-23 (2007)
2. Berners-Lee T., Fischetti M., Weaving the Web : The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor, New York, HarperBusiness, 2000, 256 p. (ISBN 0-06-251587-X)
3. Wache H., Vögele T., Visser U., Stuckenschmidt H., Schuster G., Neumann H., Hübner S. (2001) Ontology-Based Integration of Information –A Survey of Existing Approaches. Proc. IJCAI-01 Workshop: Ontologies and Information Sharing, Seattle, WA, 108-117.
4. Gruninger M. and Fox M. S. (1995) Methodology for the Design and Evaluation of Ontologies, IJCAI Workshop on Basic Ontological in Knowledge Sharing, Montreal, Canada.
5. Gruber, Thomas R: A translation Approach to portable ontology specifications, knowledge Acquisition: 199-220 (June 1993)
6. Jérôme Euzenat, Pavel Shvaiko: Ontology matching, Springer-Verlag, 978-3-540-49611-3, (2007)
7. Gómez-Pérez A., Fernández López M. and Corcho O. (2004) Ontological Engineering with examples from the areas of knowledge management, e-commerce and the semantic web. London: Springer.

8. Fernández M., Gómez-Pérez A., Juristo N., «METHONTOLOGY: From ontological art towards ontological engineering», Proceedings AAAI-97 Spring Symposium Series, Workshop on ontological engineering, Stanford (California), 1997, p. 33-40
9. Sinéad Boyce, Claus Pahl: Developing Domain Ontologies for Course Content. In Educational Technology & Society 10 (3): 275-288 (2007)
10. Corby O., Dieng-Kuntz R., Faron-Zucker C., "Querying the Semantic Web with Corese Search Engine", the 16th European Conference on Artificial Intelligence (ECAI'2004), Prestigious Applications of Intelligent Systems, pages 705–709, Valencia, Spain, August 22-27, 2004.
11. Konstantinos Kotis, George A. Vouros, Konstantinos Stergiou: Towards automatic merging of domain ontologies: The HCONE-merge approach. Web Semantics: Science, Services and Agents on the World Wide Web, Volume 4, Issue 1, January 2006, Pages 60-79
12. Nonaka I. and Takeuchi, H. (1995): "The Knowledge-Creating Company", Oxford University Press, Oxford, 1995.
13. Guarino N. "Some Ontological Principles for designing upper level lexical resources" in Proceedings of the first international conference on lexical resources and evaluation, 1998.