

## Merging Capabilities of the Social Web and the Semantic Web to Support Knowledge Management in Small and Medium-Sized Enterprises

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**Abstract**—The research focuses on finding an interlinking solution for integration of the Social Web and the Semantic Web for knowledge management needs of small and medium-sized enterprises in respect to preserving their knowledge assets. The solution proposed includes a conceptual level framework for describing metadata of knowledge assets and a process for its usage. The framework can be used for introduction of a semi-structured knowledge repository which role is to act as a middleware between Social Web and Semantic Web tools used by small and medium-sized enterprises. Moreover, analysis of data acquired through online questionnaire and revealing trends in usage of Social Web environments and knowledge management activities within small and medium-sized enterprises is presented in the paper.

**Keywords**—*Semantic Web; Social Web; knowledge management; DBpedia; small and medium-sized enterprise*

### I. INTRODUCTION

Small and medium-sized enterprises (SMEs) are a significant subject in the European agenda, because they play a decisive role in the competitiveness and dynamic of the European economy [1]. Their central role is recognized by the Small Business Act for Europe [2] adopted in June of 2008. It puts into place a comprehensive SME policy framework for the EU and the Member States [3]. At the same time, since adoption of the Lisbon Strategy [4] the Europe is moving towards development of a knowledge-based economy that even more emphasizes significance of SMEs as providers of employment opportunities and key players for the well-being of local and regional communities [2]. It is logical that with the transition to a knowledge-based economy knowledge has become an important competitive factor and the most substantial value in all aspects of social and professional life. Therefore, today, staying competitive means relying upon knowledge of human resources and performing effective knowledge management with aim do not lose business-vital knowledge assets because usually know-how of enterprises is closely associated to tacit knowledge of their employees. In the paper, a knowledge asset is understood as any kind of knowledge like enterprise's know-how, employees' experience and competence, etc. used or held by a SME. In [5], two approaches to knowledge management are

distinguished: 1) a product-oriented approach focusing on creating, storing, and re-using documents and 2) a process-oriented approach in which knowledge is tied to the person and is shared with other employees through communication. The paper focuses on the last approach.

Rapidly growing information and communication technology (ICT) provides a lot of solutions for effective knowledge management, but in the process-oriented approach the purpose of ICT is to help employees to communicate knowledge. However, typically SMEs use different environments, platforms, and collaborative tools (very often with different formats and structures of information stored), usually freely available in the Web, for support of knowledge management. This restricts collaborative use and sharing of knowledge assets in order to provide employees with knowledge needed in a particular time span. There is no mechanism in place which allows retrieving and transforming of knowledge assets from and between different environments without losing contextual meaning of these assets. One of the solutions for solving this issue could be introduction of technological capabilities offered by Web 3.0 (the Semantic Web). Web 3.0 allows describing and structuring of different knowledge assets using ontology which adds meaningful metadata to knowledge assets. Regardless that Web 3.0 technology suffers from drawbacks related to high-cost development and maintenance, as well as technological capabilities, it can be successfully used together with the already widely popular Social Web. Both technologies – the Semantic Web and the Social Web – are able to supplement each other in order to achieve knowledge integrity and ubiquity.

The current research was initially motivated by personal experience of one of the authors who is a CEO of a SME. Therefore, it seeks to answer the main research question: how both mentioned technologies can be integrated in an applicable way to support knowledge management activities within SMEs? The paper offers a conceptual level solution that can be adopted by SMEs on the top of their existing ICT infrastructure. It includes a framework for describing metadata of knowledge assets and a process for its usage. The framework can be used to introduce a semi-structured knowledge repository the role of which is to act as a middleware between Social Web and Semantic Web tools used by SMEs.

The paper is structured as follows. Section II considers related work in the field of usage the Semantic Web for needs of SMEs. General information on the Social Web and the Semantic Web is provided in Section III. Section IV presents the research methodology. Results of the analysis of data acquired through the online survey and revealing trends in usage of Social Web environments and knowledge management activities within SMEs are given in Section V. Then the solution for merging capabilities of the Social Web and the Semantic Web is described together with its testing results. Conclusions and directions of future work are given at the end of the paper.

## II. RELATED WORK

Breslin et al. [6] point out that the Semantic Web has become very popular last years and many large companies have started to experiment with it in order to understand the value of this technology for their business. The authors consider theoretical fundamentals of the Semantic Web and its usage in different application areas, inter alia the paper includes a quite comprehensive section on the Semantic Web and knowledge management. Rezgui et al. [7] concentrate on construction industry where SMEs are dominating and develop ontology for integration of disparate web-enabled applications and management of interactions between individuals and teams. The system which is based on the Semantic Web and supports knowledge workers in learning at workplace is presented in [8]. The authors report a case of deployment of the mentioned system in a network of SMEs and discuss issues which a company has to face, when it wants to deploy a modern learning environment relying on the Semantic Web technology. Goy and Magro [9] consider the problem of integration of the capabilities of knowledge based systems using ontologies (the Semantic Web) and possibilities of the Social Web and provide a design of a social web-based repository of software solutions offered by ICT companies for SMEs. It is necessary to note that regardless that there is a huge amount of publications and books on the Semantic Web itself, there are a few researches on potential of this technology for SMEs. The main reason could be related to drawbacks of this technology, especially high development and maintenance costs which could not be acceptable for SMEs usually operating within tight financial limits. At the same time, integration of the Semantic Web with the already widely distributed Social Web could provide significant advantages for SMEs without necessity to spend additional financial resources.

## III. THE SOCIAL WEB AND THE SEMANTIC WEB

The Social Web, also referred as Web 2.0, assumes that content is created and managed by users populating a single environment (usually a social network). Users in this environment are related by the set of social relations which allow communication and content sharing. According to Rohani and Hock [10], social networking services offer users a space where they can maintain their relationships, chat with each other, share information, and build new relationships through existing ones. Kim et al. [11] define social websites as those websites that give people possibility

to form online communities and share user-created contents. Therefore, the more users share their knowledge in a social network, the bigger knowledge base is created within this environment.

The Semantic Web, also referred as Web 3.0, introduces intelligence in the Web through representation of information in machine readable and understandable way leading to more adaptable and personalized environments. According to Bonilla-Morales, Medianero-Pasco, and Vargas-Lombardo [12], the Semantic Web is composed of a set of Web and knowledge representation technologies constituting what is known as a web of data where some human intelligence is integrated into the Web, making the search easier and more productive.

The architecture of the Semantic Web consists of the following layers [12][13]:

- Uniform Resource Identifier (URI) [14] used for location and identification of resources in the Web through giving them unique names;
- XML together with XML Schema [15] allowing transfer of different data between different environments;
- Resource Description Framework (RDF) together with RDF Schema [16] used to describe semantics of information; SPARQL query language allows expressing of queries for data that are stored in RDF format;
- Web Ontology Language (OWL) [17] allowing definition of a common vocabulary or, in other words, a common library of meanings which can be used between different environments.

The Semantic Web provides a number of benefits like possibility to describe all information in a semantic way, more consistent search queries, ability to transfer information between environments without losing its meaning, shifting tasks from humans to artificial intelligence, and improved decision making processes. However, regardless that the concept of the Semantic Web is very promising, it faces many issues such as high development costs due to necessity to rebuild ICT structure to get value from introduction of semantics, time consuming ontology building for a particular domain of interest, high maintenance costs due to changes, ageing, and appearance of knowledge in a dynamic way, etc.

At the current point of technological development and of users' overall ICT skill level, it is hard to maintain a computable Semantic Web-based environment alone, without introduction of any other already existing (or new) technologies. The research presented by Jovanović, Gašević, Torniai, Batemand, and Hatala [18] suggests combining the already popular and well adopted Social Web with the technological capabilities offered by the Semantic Web. In this case, it is possible to avoid drawbacks of the Semantic Web and also to improve the current Web infrastructure, which lacks interoperability from the perspective of knowledge transfer. Combination of these technologies does not mean "blind" merging of the capabilities as such, but taking the best independent components and/or concepts to bind them together. The same research also mentions that

the Semantic Web cannot work alone in an available Web environment as it requires collaborative applications based on the Social Web that allow operating with shared knowledge. On the other side, the Social Web can benefit from structured and easily transferable knowledge because it can be used by multiple applications without special adoptions.

#### IV. RESEARCH METHODOLOGY

The research presented in the paper followed the following main steps:

- 1) Identification of trends in usage of the Social Web within SMEs and issues related to preserving knowledge assets within an enterprise;
- 2) Examination of capabilities of the Social Web and the Semantic Web in relation to the results of Step 1;
- 3) Finding an integration solution.

Step 1 was based on a questionnaire which development proceeded in two stages:

- 1) First of all, an initial questionnaire was developed and then used in the interview process with several management representatives of SMEs;
- 2) After the interview process, the initial questionnaire was modified to acquire a meaningful set of questions and then an online questionnaire was developed using services of the website [19].

The final questionnaire included 16 questions distributed between the following categories: 2 questions – information about the enterprise; 3 questions – usage of Social Web environments and tools within the enterprise; 3 questions – knowledge management tools used by the enterprise; 3 questions – enterprise's opinion about usage of the Social Web for knowledge management; 5 questions – trends in having employees with a unique knowledge set and existence of a scenario for preserving knowledge assets.

The final questionnaire was distributed to 90 managers of different SMEs in Latvia using personal contacts of the authors.

#### V. USAGE OF THE SOCIAL WEB AND KNOWLEDGE MANAGEMENT ACTIVITIES WITHIN SMALL AND MEDIUM-SIZED ENTERPRISES

The survey was organized with the following hypothesis in mind: despite active use of Social Web tools in SMEs, enterprises do not have a scenario in place for managing and preserving their knowledge assets.

During March of 2012, 50 respondents (from 90 to whom the questionnaire was sent) from different business areas took part in the survey. They included managers and CEOs of SMEs in the Republic of Latvia. The majority of the data were collected from enterprises in ICT field - 22,22% (11), followed by Production - 18,18% (9) and companies which provide B2C services 12,12% (6). The whole set of enterprises participated in the survey was distributed as follows: ICT – 22%; Other – 22%; Production – 18%; Services – 12%; Finance – 8%; Construction/Real estate – 6%; Wholesale – 4%; Retail – 4%; Media – 2%; Transport/Logistics – 2%.

The usage of Social Web environments and tools within an enterprise is very closely related to behaviour of employees and their willing to use such tools not only in their primary duties at work, but also in everyday life. Figure 1 presents data about usage of Social Web environments and tools among employees from the perspective of management. It is possible to note that 50% (25) of all enterprises assume that at least 60% of their employees use Social Web environments in their everyday life to perform different activities, such as communication, knowledge sharing, and learning. However, it is important to take into account that this data can be biased, because of the fact that they are provided by the management, not by employees themselves and can differ from the real situation, as some employees may hide their behaviour of using the Social Web.

Further analysis of the data shows that 74% (37) of all respondents use the Social Web in their enterprises, nevertheless only 58% (29) answered that they know what is knowledge management and its associated activities. Moreover, 50% (25) of respondents were able to choose specific Social Web tools they find beneficial for knowledge management within their enterprises. The managers chose the following tools: Messenger – 20%; File transfer – 18%; Multimedia – 12%; Chat – 11%; Forums – 8%; Wiki – 8%; Blogs – 7%; Bookmarks – 7%; Feedback forms – 6%; Other – 3%.

The data show that the most popular are Messenger with included electronic mail, File transfer, Multimedia, and Chat. The least popular are tools that require much more efforts in relation to content creation and its management. They are Forums, Wiki, Feedback forms, Bookmarks, and Blogs. Among other tools beneficial for knowledge management, the managers mentioned Twitter which has got enormous growth in recent years due to easy and simple interaction and user interface.

The whole spectrum of the tools chosen by the management allows making a conclusion that two main aspects of knowledge management are equally important for enterprises: a) communication and b) knowledge sharing. The managers who participated in the survey explained that they consider these tools as a mechanism which supports knowledge sharing in a more efficient manner and allows faster interexchanging (communication) of different knowledge assets between employees.

Analysis of the data concerning knowledge holders within enterprises reveals that 80% (39) of enterprises have key employees who own a unique knowledge set from the perspective of a particular enterprise. This is a common situation for small companies and startups in their early development stage, when there is a group of key employees who perform several crucial tasks and monitor main business processes. Regardless that having such employees is a big risk for any enterprise, the answers showed that the managers pay no effort in solving such a situation, as 74% (37) answered that they do not have a scenario developed for preserving knowledge in case if an employee leaves the enterprise. The reason for such a behaviour can be explained in two ways. The first one is that usually SMEs delegate

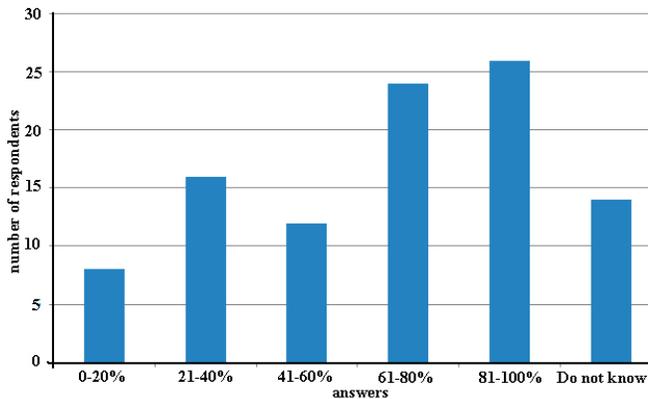


Figure 1. Usage of Social Web environments among employees from the perspective of enterprises' management.

several fields of competence to the same employee to save financial resources. This is a pure management problem which does not have relationship with technological issues. However, still effective business process optimization with the help of ICT can improve the situation. The second reason is that the most of the management are not aware or do not have a mechanism available to capture key knowledge and preserve them. Regardless that tools built on the concept of the Social Web allow collecting of knowledge, there is still a problem of developing efficient exchange of this knowledge across different applications in necessary context and provision of them to employees in the same manner as a unite knowledge asset. Variety of tools and data formats preferred and used by enterprises hinders efficient knowledge sharing across the enterprise, resulting in a huge risk for organizations to suffer from loss of key knowledge assets.

## VI. INTEGRATION OF THE SEMANTIC WEB AND THE SOCIAL WEB FOR PURPOSES OF KNOWLEDGE MANAGEMENT

The analysis of the questionnaire presented in Section V revealed that the most part of SMEs use Social Web tools to ensure communication and sharing of knowledge assets. Therefore, to support both of the mentioned aspects in efficient way, it is necessary to integrate metadata of the Semantic Web into a Social Web environment to provide semantic meaning for knowledge assets of the enterprise.

### A. The Proposed Solution

Taking into account that different types of tools and environments use different methods for representation of knowledge, it is necessary to find common patterns in order to introduce a standardized knowledge representation structure. For this purpose examination of Social Web tools for communication, knowledge sharing and management was made paying attention to their data sets. The results allowed assuming that it is possible to use a common metadata description framework which relies on the following attributes:

- title of a knowledge asset;
- abstract of the knowledge asset;
- description of the knowledge asset;

- data about the author;
- link to a knowledge source.

The title of a knowledge asset is a common and mandatory description for any type of knowledge provided and used within a SME. The abstract of the knowledge asset provides a short introduction into knowledge contained in the asset. The description of the knowledge asset includes content of the knowledge asset from a communication tool and it should not be mandatory because file transfer and multimedia solutions in most cases do not provide this kind of information. To ensure reliability of knowledge and to increase responsibility of employees within SMEs, it is necessary to store information about the author of the provided knowledge asset. Such information could also be useful in case of necessity to add additional knowledge to the asset. In case of using a knowledge sharing and management tool for storing or transforming non-textual knowledge assets, links to the original knowledge source show the exact location of the knowledge asset. This attribute should not be mandatory, as textual information does not require a link to a knowledge source because of its integration into the description area of the knowledge asset. Taking into account different formats of knowledge assets used within SMEs, it is recommended to use links to original knowledge sources. A knowledge asset itself is still kept within the storage repository of the Social Web environment. Following such a guideline allows bypassing implementation process of a complex and costless mechanism for managing different knowledge assets within ICT environment of SMEs.

The next step is to discover common patterns within the Semantic Web to create a linkage between Web 2.0 and Web 3.0 technologies. In order to define the research scope, it was decided to focus on technological capabilities and structure of the Semantic Web portal DBpedia [20], which is the biggest publicly available free semantic knowledge repository, containing more than 3.6 million descriptions of knowledge assets and over 1 billion of RDF triples. DBpedia structures and describes knowledge assets in a semantic way from Wikipedia which is a typical Social Web environment. DBpedia's centrality and cross-domain nature makes it one of the most important and most referred knowledge bases on the Web of Data, generally used as a reference for data interlinking [21]. Its knowledge assets contain information about persons, places, music, films, games, organisations, species, diseases, and many other subjects of interest that can be used to support knowledge management in SMEs by enriching their knowledge repositories with additional knowledge interlinked using an ontological description.

In order to access the knowledge repository of DBpedia, it is possible to use SPARQL endpoint offered by DBpedia for direct implementation of complex queries to retrieve description of a specific entity displayed within infobox. Depending on the type of an entity, DBpedia uses different infoboxes to display its content to the user; nevertheless there are still common properties for all knowledge assets. Examination of different types of content revealed the following set of properties:

- title of a knowledge asset;
- rdf:type – a type defined in DBpedia and assigned to each knowledge asset with aim to group knowledge assets and make their hierarchy;
- dbpedia-owl:abstract – abstract of each knowledge asset of DBpedia;
- dbpedia-owl:wikiPageExternalLink – a link to a description of a knowledge asset in Wikipedia;
- is dbpedia-owl:wikiPageRedirects – a link to synonyms of a knowledge asset.

Structure of the properties described above can be considered as similar to some degree with the metadata description proposed by the authors of the paper. Such similarity allows introduction of interlinking between unstructured knowledge assets of Social Web tools and the knowledge repository of DBpedia in order to add additional meaning to unstructured knowledge assets. Knowledge assets retrieved from the Social Web can benefit from such interlinking by acquiring additional knowledge and imposing structure through different assets of DBpedia. By introduction of the structuring mechanism for knowledge assets of the Social Web, it is possible to get semi-structured knowledge, which can be used to support knowledge management within SMEs, and to increase reliability and accessibility of particular knowledge. Moreover, it allows an enterprise to use additional knowledge available in DBpedia.

In order to introduce interlinking between knowledge assets of the Social Web and DBpedia, it is necessary to develop a middleware that will serve as a metadata description repository of knowledge assets within an environment. The purpose of the middleware is to tie knowledge assets from different Social Web tools with knowledge instances from the knowledge repository of DBpedia. Figure 2 illustrates interlinking of Social Web environments and DBpedia.

Taking into consideration the structure of properties in DBpedia and the one within the Social Web, it is possible to define a list of properties that should be introduced within the middleware for description of knowledge assets:

- rdf:title – title of a knowledge asset;
- rdf:category – a category of the knowledge asset allowing to group knowledge assets; categories can be freely defined by an enterprise;

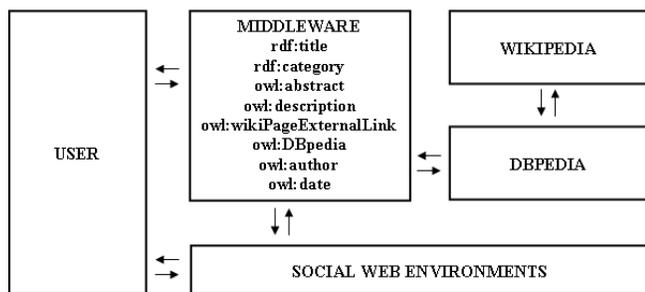


Figure 2. User interaction with the middleware and Social Web environments.

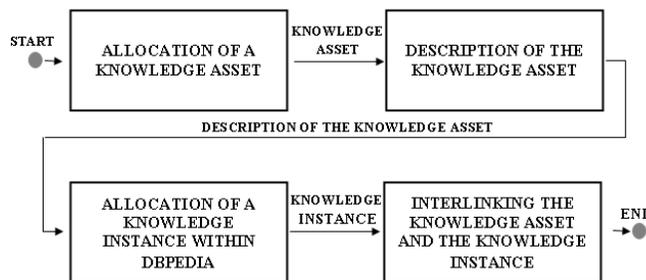


Figure 3. The process for interlinking a knowledge asset and its instance.

- owl:abstract – abstract of the knowledge asset;
- owl:description – description of the knowledge asset;
- owl:wikiPageExternalLink – a link to a Social Web tool, where the knowledge asset is located;
- owl:DBpedia – a link to a description of the knowledge asset in DBpedia;
- owl:author – data about the author (employee);
- owl:date – date when the knowledge asset was added; introduced with aim to fix when the last modifications were made and how actual is the knowledge asset.

In order to achieve better linking between the middleware and DBpedia, it is necessary to describe all properties and values using the RDF descriptive language. Such an approach is able to provide additional benefits in future by moving an enterprise’s knowledge repository even closer to semantic structure. In order to perform interlinking of a Social Web environment and DBpedia, the middleware should be able to support a process proposed by the authors of the paper and illustrated in Figure 3. First of all, it is necessary to allocate a knowledge asset within a particular Social Web environment. This task is not mandatory for the middleware as it can be performed manually by an employee of the enterprise. This allows to lower development costs of the middleware. After the allocation process, it is necessary to describe the knowledge asset using the RDF descriptive language according to the property structure described previously. In order to interlink the knowledge asset with DBpedia, the employee must perform search procedure to allocate a corresponding knowledge instance within DBpedia. After retrieving information about the knowledge instance, the employee must add value to owl:DBpedia property to establish a link between the asset and the instance. After implementation of the described process, employees of the enterprise will be able to access the interlinked knowledge asset for performing learning or decision-making processes.

Following the process described above, it is possible to define any type of knowledge assets from the Social Web and interlink them with knowledge instances of DBpedia in order to provide additional meaning to a particular knowledge set and to introduce a semi-structured knowledge repository within SMEs without rebuilding their ICT infrastructure. The interlinking solution (see Figure 3) allows still relying on capabilities offered by the Social Web; nevertheless it allows using of concepts of Web 3.0

within an enterprise to improve knowledge management activities.

*B. Testing the Solution*

In order to prove feasibility of the solution developed and presented in this paper, it was decided to perform an experiment within a SME by linking its existing knowledge assets from a Social Web environment with external knowledge assets from the Semantic Web Portal DBpedia. The SME is using Wiki platform for knowledge management purposes by describing key knowledge used in its business processes. Regardless that Wiki allows grouping of knowledge assets using criteria developed by an organization, it lacks semantic structure which makes it difficult to structure knowledge in a meaningful way. The Wiki of the SME contains knowledge assets related to user interface and web design. Taking into account two mentioned groups of knowledge assets, it was decided to group knowledge assets presented in Wiki by linking them to two different instances of DBpedia about web design and user interface issues. Table I illustrates a description schema for interlinking knowledge assets of the SME with knowledge instances from DBpedia taking into account category of a particular knowledge asset.

After that, the following experiment was performed. A knowledge asset was chosen from the Social Web portal Behance Network (<http://www.behance.net/>) which serves as a creative community for communication between designers and storing of different data formats for building creative portfolio. Portfolio assets within Behance Network in most cases consist of graphic and textual materials presented using a common template for all sets of data. The chosen knowledge asset contains portfolio information about design of user interface for Latvian fashion designer Davids' Internet resource and can be located through the following [22]. Table 2 lists properties and values of the description of the knowledge asset.

In order to test the description of the knowledge asset and integration results of DBpedia, it was decided to share the knowledge asset with two employees of the enterprise. One of the employees received the knowledge asset with the attached description. The second partner received just the knowledge asset without the description. After that to test results, the meeting with all three parties (the manager and 2 employees) was arranged to discuss the project from the perspective of web design. Results of the meeting revealed that both employees were informed about the project and had no problems with involvement into discussion about the particular subject. Nevertheless when the topic of the meeting was changed in a favour of web design area itself, the employee who had received the knowledge asset with the additional description showed better understanding about the problem area and was taking more active part in the discussion process. Moreover, he had also acquired knowledge about graphic design as it was linked with the web design instance of DBpedia.

The experiment showed that usage of the interlinking solution within SME allows, first of all, introduction of a semi-structured knowledge repository by adding additional

TABLE I. PROPERTIES AND VALUES FOR THE DESCRIPTION OF THE KNOWLEDGE ASSETS

Properties	Interlinking with 'Web Design'	Interlinking with 'User Interface'
rdf:title	[Knowledge asset title]	[Knowledge asset title]
rdf:category	Web design	User interface
owl:abstract	[Abstract]	[Abstract]
owl:description	[Description]	[Description]
owl:wikiPageExternalLink	[link to original knowledge source within Wiki]	[link to original knowledge source within Wiki]
owl:DBpedia	<a href="http://dbpedia.org/page/Web_design">http://dbpedia.org/page/Web_design</a>	<a href="http://dbpedia.org/page/User_interface">http://dbpedia.org/page/User_interface</a>
owl:author	[Data about author]	[Data about author]
owl:date	[DD-MM-YYYY HH:MM]	[DD-MM-YYYY HH:MM]

TABLE II. DESCRIPTION OF THE KNOWLEDGE ASSET USED IN THE EXPERIMENT

Properties	Values
rdf:title	David's user interface
rdf:category	User interface
owl:abstract	User interface design for Latvian fashion designer David's Internet resource
owl:description	User interface layouts for Latvian fashion designer David's Internet resource. User interface set includes layouts for introduction, homepage, and inner pages of web design project
owl:wikiPageExternalLink	<a href="http://www.behance.net/gallery/D-Fashion/149987">http://www.behance.net/gallery/D-Fashion/149987</a>
owl:DBpedia	<a href="http://dbpedia.org/page/Web_design">http://dbpedia.org/page/Web_design</a>
owl:author	Raitis Sevelis
owl:date	16-05-2012 13:38

knowledge grouping criteria based on the Semantic Web Portal DBpedia. Moreover, the proposed solution enlarges the knowledge repository of the SME by adding free available knowledge from DBpedia by linking it with the already existing and used knowledge assets and can be considered as a first step towards the Social Semantic Web.

VII. CONCLUSION AND FUTURE WORK

The research presented in the paper included analysis of data acquired through the survey aimed to uncover trends regarding usage of Web 2.0 environments and knowledge management tools within SMEs. As a result, the main conclusion made was related to the fact that SMEs actively use Social Web environments for knowledge communication and sharing. At the same time, the most of enterprises do not have a scenario for preserving their knowledge assets. Taking into account the findings mentioned above, the solution for interlinking the knowledge repository of the Semantic Web portal DBpedia with Social Web

environments was proposed and tested. Integration of DBpedia, as a resource of Web 3.0, can help SMEs to structure their unstructured knowledge assets from different Social Web environments by introducing the semi-structured knowledge repository through adding contextual meaning to existing knowledge assets. The proposed solution allows interlinking of different Social Web based knowledge communication and sharing tools and does not restrict enterprises in adding metadata descriptions to existing knowledge assets. Nevertheless, it requires introduction of the middleware between DBpedia and a Social Web environment, which serves as a bridge between the Social Web and the Semantic Web. Future work is related to practical implementation of the proposed solution. It is planned to introduce the mentioned repository in several SMEs in Latvia and to perform pilot testing with further identification of its usability, advantages, and drawbacks through a questionnaire offered to staff and managers of the SMEs.

#### REFERENCES

- [1] European Commission, EU SME policy, European Small Business Portal, [http://ec.europa.eu/small-business/policy-statistics/policy/index\\_en.htm](http://ec.europa.eu/small-business/policy-statistics/policy/index_en.htm) 19.12.2012.
- [2] "Think small first: a "Small Business Act" for Europe", Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, COM(2008) 394, Brussels, 25.06.2008.
- [3] European Commission, "Small and medium-sized enterprises (SMEs): Small Business Act for Europe, Enterprise and Industry", <http://ec.europa.eu/enterprise/policies/sme/small-business-act/> 19.12.2012.
- [4] Presidency Conclusions, Lisbon European Council, March 23-24 2000, [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/00100-r1.en0.htm](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/00100-r1.en0.htm) 19.12.2012.
- [5] D. Apostolou, G. Mentzas, R. Young, A. Abecker, "Consolidating the product versus process approaches in knowledge management: the know-net approach," <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.21.5816> 19.12.2012.
- [6] J. G. Breslin, D. O'Sullivan, A. Passant, and L. Vasiliu, "Semantic Web computing in industry," *Computers in Industry*, no. 61, 2010, pp. 729–741.
- [7] Y. Rezgui, S. Boddyb, M. Wetherill, and G. Cooper, "Past, present and future of information and knowledge sharing in the construction industry: towards semantic service-based e-construction?," *Computer-Aided Design*, no. 43, 2011, pp. 502–515.
- [8] C. Christl, C. Ghidini, J. Guss, S. Lindstaedt, V. Pammer, P. Scheir, and L. Serafini, "Deploying semantic web technologies for work integrated learning in industry. A comparison: SME vs. large sized company," *Proc. 7th International Semantic Web Conference (ISWC 2008)*, Springer, Oct. 2008, pp. 709-722.
- [9] A. Goy and D. Magro, "Exploiting folksonomies and ontologies in an e-business application," <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.154.9487> 19.12.2012.
- [10] V. Rohani and O. S. Hock, "On Social network Web sites: definition, features, architectures and analysis tools," *Journal of Advances in Computer Research*, no. 2, 2010, pp. 41–53.
- [11] W. Kim, O.-R. Jeong, and S.-W. Lee, "On social Web sites," *Information Systems*, no. 35, 2010, pp. 215–236.
- [12] B. Bonilla-Morales, X. Medianero-Pasco, M. Vargas-Lombardo, "Survey: grid computing and Semantic Web," *International Journal of Computer Science Issues*, vol. 7, 2010, pp. 1-6.
- [13] M. M. Taye, "Understanding Semantic Web and Ontologies: Theory and Applications," *Journal of Computing*, vol. 2, iss. 6, 2010, pp. 182-193.
- [14] Semanticweb.org, "Uniform Resource Identifier", [http://semanticweb.org/wiki/Uniform\\_Resource\\_Identifier](http://semanticweb.org/wiki/Uniform_Resource_Identifier) 19.12.2012.
- [15] W3C, "XML Schema", <http://www.w3.org/XML/Schema> 19.12.2012.
- [16] W3C, "RDF Vocabulary Description Language 1.0: RDF Schema", <http://www.w3.org/TR/rdf-schema/> 19.12.2012.
- [17] W3C, "OWL 2 Web Ontology Language", <http://www.w3.org/TR/owl2-overview/> 19.12.2012.
- [18] J. Jovanović, D. Gašević, C. Torniai, S. Batemand, and M. Hatala, "The Social Semantic Web in intelligent learning environments: state of the art and future challenges," *Interactive Learning Environments*, vol. 17, iss. 4, 2009, pp. 273-309.
- [19] Webanketa, "Free creation of questionnaires, surveys, tests and polls!", <http://webanketa.com/> 03.02.2012.
- [20] DBpedia.org, "About DBpedia", <http://wiki.dbpedia.org/About> 13.04.2012.
- [21] F. Orlandi and A. Passant, "Modelling provenance of DBpedia resources using Wikipedia contributions," *Web Semantics: Science, Services and Agents on the World Wide Web*, vol. 9, iss. 2, 2011, pp. 149-164.
- [22] Behance, Inc., "D-Fashion", <http://www.behance.net/gallery/D-Fashion/149987> 16.04.2012.