

## **Use of semantic technologies for integration and search of expert data in research and development organizations**

### **Abstract**

The human capital is of utmost importance for research and development organizations, because the vital business process, i.e. the process of innovation, depends on the effective management of scientific and technical knowledge of employees. This is the reason for focusing, in this doctoral thesis, on the design and implementation of a holistic knowledge management system for integration, storing, search and retrieval of expertise in innovative organizations. In particular, this doctoral thesis investigates the applicability of Semantic Web technologies for integrating expertise data from diverse sources in order to ensure meaningful search and retrieval of expertise for in-house users as well as the integration into the Semantic Web community space.

Because research and development organization's innovation charter demands a focus different from that of other types of organizations, specifically, to nurture open access to human resources' extensive knowledge and experience, both explicit and tacit, special attention in the doctoral thesis is paid to the knowledge elicitation process. In the PhD thesis framework, a new knowledge model in the Human Resources domain was defined using the OWL language which a formal language for representing ontologies in the Semantic Web and that precisely specifies the meaning and semantic relationships of concepts. The new knowledge model enables separation of the domain knowledge from the operational knowledge, assigning meaning to expertise data and making the expert data explicit and-interoperable with similar semantic applications. As the interoperability between different knowledge organization schemas is one of the major issues in the Semantic Web, the design of the semantic knowledge model was based on public vocabularies such as FOAF, SIOC, DOAC, BibTeX, and others. This enables defining open architecture model for expertise management system in knowledge-intensive establishment e.g. the "Mihajlo Pupin" Institute.

Further on in this research, the ontology population processes from structured sources and unstructured documents were studied and methods were developed for establishment of a modular expertise knowledge base. Methods were tested on the "Mihajlo Pupin" Institute's case study. Thus, this PhD thesis presents illustrative expertise search examples from the developed expertise management system that allow gaining a clear distinction between the operational business processes, automated with the commercial SAP® Enterprise Resource Planning system and the open-source Alfresco Enterprise Content Management, and strategic knowledge processes implemented with semantic technologies. Unlike the operational business processes that are aimed to carry out the daily activities such as tracking of employee's movements, managing personal data, time sheets and payroll, the ontological knowledge base establishes a knowledge repository and stores the complete profiles of experts. The competencies of experts are structured and expressed in a manner to ensure meaningful search and retrieval as well as the integration in European research space and beyond.