

**PhD Thesis Review:**  
**The Usage of Ontologies for the Discovery and Coupling of**  
**Learning Active Components**  
by Bogdan IANCU

The “*The Usage of Ontologies for the Discovery and Coupling of Learning Active Components*” PhD thesis addresses one of the most current and debated themes from the European and international research. The premise from which this research work starts is the idea that a content based search can be more useful in the case of assisted learning and a semantic one can be superior from many points of view.

Starting from the results obtained in the past years in the domain of semantic web and by the usage of the emerging technologies based on e-learning ontologies, this PhD thesis has as main objective the creation of an e-learning software platform, that is built according to the latest assisted learning standards and that has major facilities for structuring learning resources, with the help of ontologies. When one chooses his learning domain, the platform automatically identifies the semantic domain to which it belongs to, it automatically selects the key learning concepts and supports the user in creating the learning path.

In order to achieve this objective, it was projected and implemented a platform component that is in charge with the continuous information discovery from internet resources, with the scopes of permanently updating the learning materials and building new domains based on conceptual evolution.

Internet available educational resources can be automatically found, semantic indexed and combined in such a way in which new knowledge can be produced. All this process can take place unsupervised or with small user interventions, user who doesn't have to have necessary domain knowledge; this is possible because of the latest semantic technologies, standardized by the W3C consortium which include automatic coupling abilities.

The author presents an original approach with the scope of defining a learning architecture that combines the simultaneous analysis of representation techniques, classifying methods and already existing ontologies. The survey created with the scope of evaluating the system, confirms the hypothesis regarding the efficiency of combining ontology based search techniques with coupling techniques assisted by the human capacity for defining the learning needs.

The thesis starts with a short *Introduction*, where are presented the economic and social aspects together with some technical considerations that can help him to achieve the proposed objectives. After some key concept definitions and a motivation for choosing the current theme are presented, the author enumerates the main ideas from the eight component chapters.

The first chapter called *The Role of Learning in Mankind's History* presents in its debut the main modern theories related to learning and, after that, continues with the presentation of the type of learning that the thesis is based on, e-learning. After identifying the key classes of e-learning software, the chapter ends with the presentation of a new concept from this domain, gamification. There are illustrated the characteristics of this concept alongside some conclusive examples.

The second chapter, *Objectives and Research Hypotheses* exposes the proposed objectives together with the hypotheses from where the author starts his research. He wants to resolve the problem of discovering intelligent software entities called active components. The main scope is to couple these components in order to produce new knowledge. The final objective represents the creations of an e-learning architecture based on active components and ontologies.

The third chapter, *Semantic Web and Ontologies*, illustrates the current state of research. It debuts with a short history of the internet and continues with the analysis of the semantic

web. There are presented the standardized technologies from this domain, in a layer based analysis, together with some software classes dedicated to ontology building.

The fourth chapter called *Semantic and Multimedia Resources* explains the way in which we can obtain knowledge starting from data. There are presented different definitions of the ontology concept alongside an analysis of the main existing ontologies. After classifying those, based on their openness to a linked data world, it is presented a special category of resources, that don't have a satisfying semantic indexing – multimedia resources. The chapter ends with the premises for realizing a learning architecture that allows multimedia based semantic annotation.

Chapter number five, named *E-learning Specific Standards*, identifies the key standards from the assisted learning domain. There are presented successively standards like LOM, SCORM and Experience API. On the final part of the chapter there are enumerated the reasons why the last one was chosen as standard for the proposed system.

The sixth chapter, *The Architecture of The Active Components Based E-learning System*, presents the learning architecture itself, called *Teach.me*. After a short introduction the used technologies, the developing stages and the platform actual way of working are presented. At its core the platform does a semantic search for educational resources based on ontologies and multimedia semantic annotations deducted from videos' subtitles. The automatic extractions of subtitles is made through the YouTube API, being followed by information transformation and processing by the usage of services like DBpedia Spotlight. The results are displayed in a completely navigable tridimensional graph which can be zoomed in or out. Each active component is colored differently in order to highlight better the links within the ontology. In the final part of the chapter they are presented the results of a survey realized within the platform's users which highlights the innovation and the platform's utility.

The seventh chapter, *Dissemination of Results*, enumerates the author's main research papers, alongside the research projects and research stages that he was involved in. The work ends with the eight chapter, *Conclusions and Future Researches*, which summarize the obtained results and presents some future developments.

The originality of the proposed solution is given by the user oriented approach of the learning methods, taking in consideration its personal character. The adaptive characteristic of the entire application allows a strong generalization of the implementation, the algorithm being able to adapt to a new domain with a minimum use of resources.

The implemented system reveals the author's capacity to transpose in practice the already proposed theoretical contributions together with a high level of domain knowledge and programming techniques from the economic informatics domain.

**Prof. Ion SMEUREANU, PhD**