

# On ontology of research, development and innovation in Republic of Moldova

Andrei Rusu

## Abstract

Building information systems supposes an unambiguous understanding of key terms and relations between them in the domain of interest. We consider the process of evaluating the research, development and innovation project proposals in Republic of Moldova and build an initial ontology of it with the goal to be useful to make available the use of software agents in the process of evaluation of proposals and their results.

**Keywords:** research, development, innovation, ontology.

## 1 Introduction

An ontology is a formal specification of the concepts and the relationships that can exist between concepts. According to Guarino's definition, "*an ontology is a logical theory accounting for the intended meaning of a formal vocabulary, i.e. its ontological commitment to a particular conceptualization of the world*" [1].

## 2 Method of ontology construction

The methodology used for ontology construction is based on existing methodologies, like ontology development 101 [2] and other ones. The proposed method translates the knowledge semantics described semi-formally in the already developed information system *EXPERT Online* <https://expert.idsi.md/> developed at IDSI, <http://idsi.asm.md/>. The

method consists in the following steps: i) define the classes and their hierarchy, ii) define relations between classes; iii) describe the business rules in ontological manner; iv) make other adjustments; v) verify the ontology. We have to mention also here the use of Protégé ontology editor [3] and the web ontology language OWL DL [4].

### 3 Ontology construction

Today there are some top-level ontologies which describe general concepts like space, time, object, event which are independent concepts from a particular domain or a concrete problem. Among these we use DOLCE ontology, Temporal Relations and other ones. Other top-level ontologies might be used.

#### 3.1 Identifying classes and creating taxonomy

To identify OWL classes used in our ontology we start with the glossary of terms developed by InfoScientific group at Information Society Development Institute [5] since OWL classes represent individuals that form an extension of the concept mapped by the class. Many attributes of the classes have been transformed in corresponding qualities of time and other abstract characteristics of the DOLCE ontology and other top-level ones.

The classes are organized in a taxonomy created on the basis of the subsumption relation. Classes  $A$  and  $B$  are linked by subsumption relation if and only if every instance (individual) of  $A$  is also an instance of  $B$  and in this case we say that  $B$  subsumes  $A$  or  $A$  is a subclass of  $B$ . For example, the taxonomy of **Activitate** is shown in the Fig. 3.1.

#### 3.2 Defining relations and business rules

Most of the relations found in our ontology map to relations found in DOLCE ontology and its submodules. Business rules were identified during analysis of the proposed methodology for evaluating research, innovation and development project in Republic of Moldova proposed

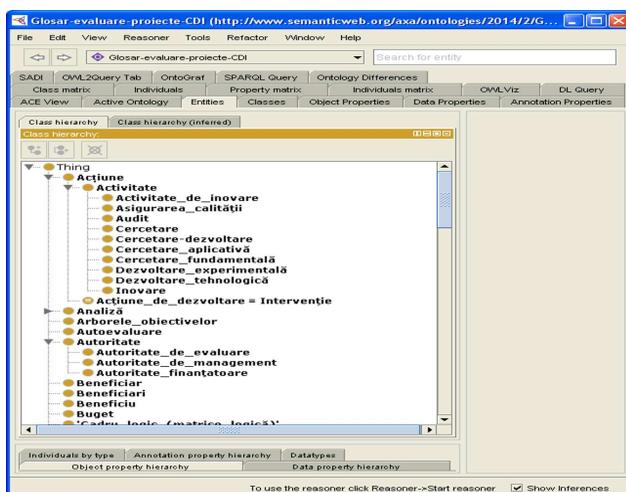


Figure 1. Initial ontology based on [5]

in [6] and taking in consideration the information system *EXPERT Online*.

### 3.3 Ontology verification

The ontology consistency is checked with the help of the Protégé tool [3] and the Pellet reasoner system [7].

## 4 Conclusion

The proposed ontology can be used for information exchange between humans and software agents as well as it can be extended to better support the controlled natural language support in information systems developed to support research, development and innovation in Republic of Moldova.

**Acknowledgments.** This research was supported by *Information Society Development Institute*, <http://idsi.asm.md/>, in the project

”Development of informational support for scientometric studies in Republic of Moldova (2013-2014)” no. 13.817.18.05A, <http://idsi.md/infoscientic>. This work was conducted using the Protégé resource [3], which is supported by grant GM10331601 from the National Institute of General Medical Sciences of the United States National Institutes of Health.

## References

- [1] N. Guarino. *Formal Ontology and Information Systems*, in Proceedings of FOIS'98, Trento, Italy, IOS Press, 1998, pp. 3–15
- [2] Natalya F. Noy, Deborah L. McGuinness. *Ontology Development 101: A Guide to Creating Your First Ontology*, 2001, <http://ksl.stanford.edu/people/dlm/papers/ontology-tutorial-noy-mcguinness.pdf>
- [3] Stanford Center for Biomedical Research, <http://protege.stanford.edu/>.
- [4] World Wide Web Consortium. OWL Web Ontology Language Reference. W3C Recommendation, 2004, <http://www.w3.org/TR/owl-ref/>.
- [5] Information Society Development Institute, *Glosar de termeni aferenți procesului de evaluare a proiectelor de CDI*, <http://idsi.md/node/1275>.
- [6] Information Society Development Institute, *Cadrul metodologic pentru evaluarea proiectelor și programelor de cercetare-dezvoltare în Republica Moldova*, [http://idsi.md/files/file/Cadrul\\_metodologic\\_Glosar\\_final.pdf](http://idsi.md/files/file/Cadrul_metodologic_Glosar_final.pdf), 54 p.
- [7] Pellet Reasoner. <http://clarkparsia.com/pellet>

Andrei Rusu<sup>1,2</sup>

<sup>1</sup>Information Society Development Institute, Academy of Sciences of Moldova  
Email: [andrei.rusu@idsi.md](mailto:andrei.rusu@idsi.md)

<sup>2</sup>Dep. Math. and Informatics, Ovidius University of Constanța  
Email: [agrusu@univ-ovidius.ro](mailto:agrusu@univ-ovidius.ro)