

Ontologies for Project Management Teaching

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Abstract: The paper presents one practical approach aimed at developing teaching ontologies. The methodology that will scaffold the process of knowledge structuring and ontology design is described. Moreover, special stress should be placed on visual design as a powerful learning mind tool. For more comprehensible understanding the process of developing a practical ontology from the domain of project management is described.

Keywords: ontology, visual knowledge engineering, knowledge acquisition, knowledge sharing and reuse

Introduction

The achievements in the field of Artificial Intelligence help to develop a range of ways of symbolic and graphical representing of knowledge. A well-chosen analogy or diagram can make all the difference when trying to communicate a difficult idea to someone, especially a non-expert in the field. The idea of using visual structuring of information to improve the quality of student learning and understanding is not new. Teachers are used to work with concept maps, mind maps, brain maps, semantic networks, frames (Conlon 2002), (Jonassen 1998), (Sowa 2000) and other conceptual structures. A teacher operates as a knowledge analyst by making the skeleton of the studied discipline visible and showing the domain's conceptual structure called an ontology.

This paper proposes a clear, explicit approach to practical ontology design. We will present our proposed algorithm for ontology design used in the course in project management.

1. Using ontological engineering for teaching purposes

Ontological engineering can provide a clear representation of a course structure, main terms, methods, and their inter-relationship. Ontology as a useful structuring tool may greatly enrich the teaching process, providing students an organizing axis to help them mentally mark their visions in the information hyper-space of the domain knowledge.

Ontology creating also faces the knowledge acquisition bottleneck problem. The ontology developer encounters the additional problem of not having any sufficiently tested and generalized methodologies, which would recommend what activities to perform and at what stage of the ontology development process. An example of this can be seen when each development team usually follows their own set of principles, design criteria, and steps in the ontology development process

We can propose different types of teaching ontologies that can aid effective learning:

- Main concepts ontology,
- Historical ontology (genealogy),

- Partonomy of the discipline,
- Taxonomy of the theories, methods and techniques, etc.

The concrete set of ontologies depends on personal vision, teaching subject and awareness level of the students. Generalizing our experience in developing different teaching ontologies for e-learning in the field of artificial intelligence and neurolinguistics (Gavrilova & Voinov 1996), (Gavrilova 2007), (Gavrilova 2010), we propose a five-step algorithm that may be helpful for visual ontology design. We put stress on visual representation as a powerful mind tool (Jonassen 1998) in structuring process. Visual form influences both analyzing and synthesizing procedures in ontology development process.

The project management course is based on the studying of PMI standard based on the knowledge evolved from the good practices of project management practitioners. The ontologies developed for such concepts as “project”, “risk” and similar ones help the students to better understand the structure and relations in the area under study. On the other hand the ontologies created by the students for the planning of their training projects allow to check the course understanding by the students as well.

2. Developing Practical Ontology

In this section we describe our attempt to develop ontology for project following the 5-step algorithm.

- *Step 1 - Glossary Development*

The first step in building ontology is collecting information in the domain and building a glossary of the terms of the domain. To build a glossary for teaching project management course, we collected the terms from PMBOK (Project Management Body of Knowledge, 2008) and several tutorials. The project is a base concept of this course. All terms were extracted manually.

- *Step 2 - Laddering: Building an Initial Mind Map Structure*

At the second step we built an initial visual structure of the glossary terms. The main goal of this step is the creation of a set of preliminary concepts and the categorization of those terms into concepts. A mind map can be a useful visual structure for this step.

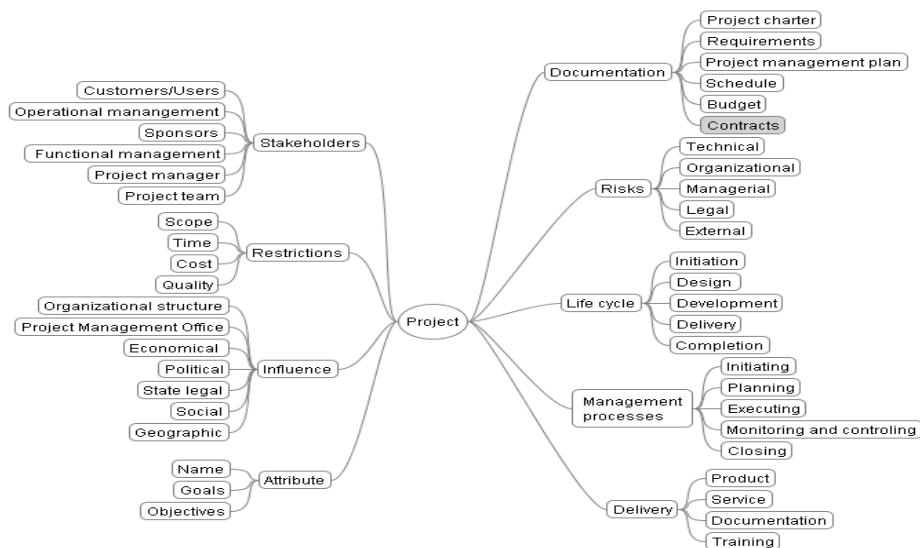


Fig.1 Mind-map for the concept “Project”

- *Steps 3 & 4 - Disintegration/Categorization: Building a Concept map with more Precise*

Hierarchy

At next step we composed more precise concepts and hierarchies by analyzing the glossary and previously built visual structure. Using the bottom-up strategy we tried to fit the terms and concepts into the meta-concept. Moreover, we created the relationships between the concepts. A concept map is the most useful visual structure for representation of the results of this stage, since it gives the ability of defining the relationship in addition to building the hierarchy. The output of this step is a large and detailed map, which covers the course in the hierarchical way. However, since this ontology is designed for teaching purposes it is important to offer the overall picture and a general hierarchy as well.

- *Step 5: Refinement*

The final step is devoted to making the ontology beautiful. The followings are some practical tips that we may be taken into consideration while designing the ontology:

- Use different font sizes for different strata.
- Use different colors to distinguish particular subsets or branches.
- Use a vertical layout of the tree structure/diagram.
- If needed, use different shapes for different types of nodes.

3. Discussion

This described approach can be applied to developing those tutoring systems where general understanding is more important than factual details. Furthermore, ontology design may be used as an assessment procedure for expressive as opposed to exploratory learning. For both formative and summarizing assessment purposes, students can clearly indicate the extent as well as the nature of their knowledge and understanding through creating ontology and explaining the involved processes.

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