Scheduling ontology development projects

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ABSTRACT

In the ontology engineering field, key aspects of real-world business contexts are not normally taken into account. One of these crucial aspects is that of planning and scheduling. Software engineering practitioners use different approaches and tools for planning and scheduling software development projects, whereas their counterparts in ontology engineering encounter many problems to create project plans and schedules. To bridge the gap we have created a method and a tool (the latter called gOntt) for systematizing the scheduling of ontology development projects in the context of the NeOn Methodology. In this paper we try to explain the methodological pillars in which method and tool are grounded.

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1. Introduction

Ontologies are used for making knowledge explicit and allowing this knowledge to be shared by different applications in a great variety of domains. Several methodological approaches have been proposed to provide guidance during the ontology development (e.g., METHONTOLOGY [1], On-To-Knowledge [2], and DILIGENT [3]) that have transformed the art of constructing single ontologies[1] into an engineering activity. Recently, the NeOn Methodology Framework ([4–6]), a scenario-based methodology, has been created. This methodology provides prescriptive guidance for the development and maintenance of ontology networks,[2] paying special attention to the reuse and reengineering of available knowledge resources.

However, the ontology development methodologies proposed before the NeOn Methodology did not provide guidelines on key aspects of engineering processes, which are fundamental in real-world business contexts [8]. Issues such as costs estimation, planning and scheduling, or quality assurance procedures are normally disregarded in the ontology engineering field.

One of the crucial aspects within engineering processes is that of planning and scheduling development projects. These two independent activities are sometimes viewed as a single activity. Although, planning[3] is the act of drawing up plans, that is, a series of steps has to be carried out to achieve an objective; and scheduling,[4] on the other hand, is defined as the activity to set an order and time for planned events. Scheduling should be performed after planning, and the two activities are crucial in any engineering project. In software engineering, every development project includes a life cycle [9], which is produced by

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[1] A single ontology is an ontology that does not have any type of relationship (domain dependent or independent) with other ontologies.
[2] An ontology network is defined as a collection of ontologies (called networked ontologies) related together through a variety of different meta-relationships such as mapping, modularization, version, and dependency relationships (based on [7]).
[3] http://www.wordnet-online.com/planning.shtml.
[4] http://www.wordnet-online.com/scheduling.shtml.

instantiating a particular life cycle model. To properly manage software development projects, it is essential (a) to know the entire software development life cycle [10], and (b) to schedule the project. To do the latter, different approaches can be used, for example, that of developing a work breakdown structure (WBS) [11], which is a set of tasks with development costs, duration, and precedence relationships that can be represented as Gantt charts [12], as PERT (Program Evaluation and Review Technique) models [13], or by means of Monte Carlo simulations [14]. In addition, different tools can be employed for planning and scheduling; the most popular one for creating a project schedule is Microsoft Project, according to [10]. On the other hand, in ontology engineering, one activity, called scheduling [4], covers both the creation of plans (planning) and the establishment of order, time, and resources in the plans created.

Unfortunately, ontology engineering currently offers little help to professional ontologists in showing how to create schedules for their ontology development projects. Although a cost estimation model called ONTOCOM [15] is available to predict the costs of ontology development projects, the model does not support the scheduling activity. To bridge the gap, we have created a method and a tool (gOntt), for systematizing the activity of scheduling ontology development projects, within the context of the NeOn Methodology.

The rest of the paper is organized as follows: Section 2 presents the three methodological pillars for scheduling ontology development projects; Section 3 describes the three-way combination of the methodological pillars of our cornerstone for scheduling; Section 4 presents the guidelines for scheduling; Section 5 shows the scheduling templates from the cornerstone; Section 6 describes the technological support called gOntt; Section 7 shows the feasibility analysis of the method and gOntt; and finally, Section 8 provides some conclusions and future work.

2. Three methodological pillars for scheduling

By scheduling ontology development projects [4] we refer to the identification of the different activities to be performed during the ontology development, as well as their arrangement, and the time and resources needed for their completion. The outcome of this activity is the schedule that guides the ontology network development, including activities, their order and time, as well as human resources restrictions.

To establish the particular schedule for the ontology network development, four important questions have to be answered:

Q1. Which ontology life cycle model is the most appropriate for the ontology network development?
Q2. Which particular activities should be carried out in the ontology network development?
Q3. What order and dependencies exist among activities?
Q4. How many resources (human and time) are needed for developing the ontology network?

The first two questions are related to what in software engineering is called planning, whereas the other two refer to what is called scheduling in the same field. In addition, it is important to mention that the first three questions are related to the establishment of the ontology network life cycle, that is, the specific and ordered sequence of activities that ontology developers carry out during the life of the ontology network. The responses to the first three questions would result in a general plan for the ontology network development, which can be graphically represented as a Gantt chart. The fourth question is related to the inclusion of time and human resources restrictions for each of the activities included in the plan, and its response would yield the particular schedule for the ontology network development.

The proposed method and gOntt aim at helping ontology developers to answer the first three questions thoroughly. The fourth question is partially answered by gOntt, since this tool currently provides default times for each activity planned.

Both method and gOntt are grounded on three methodological pillars, which are key components of the NeOn Methodology Framework ([4–6]).

1. The first pillar is constituted by a set of nine scenarios for building ontology networks; this set provides information about the different pathways that can be used in the ontology development (Section 3.1.1).
2. The second pillar is a set of two ontology network life cycle models, which provide information on how to organize the activities into phases[5] for developing ontologies (Section 3.1.2).
   It should be noted that the *ontology network life cycle model* describes how to organize an ontology network development project into phases. The two ontology network life cycle models proposed in the NeOn Methodology are
   (a) The *waterfall model family* (Section 3.1.2.1), for those cases in which (a) requirements are closed (e.g., to implement an ontology based on an ISO standard or on resources with previous consensus on knowledge) or (b) when ontologies have to cover a small and well-understood domain.
   (b) The *iterative-incremental model* (Section 3.1.2.2), for those cases in which requirements are not totally known or can change during the ontology development.
3. The third pillar is a set of possible activities to be performed during any ontology development. This set of activities is shown in Fig. 1.

As can be observed along the paper, the results of the scheduling techniques described here are dependent on the life cycle model used to develop the ontology network.

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[5] A distinct period or stage in a process of change or development (http://www.wordreference.com/definition/phase).