Chapter XIV
Towards the Use of Networked Ontologies for Dealing with Knowledge-Intensive Domains: A Pharmaceutical Case Study

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ABSTRACT

Knowledge intensive sectors, such as the pharmaceutical, have typically to face the problem of dealing with heterogeneous and vast amounts of information. In these scenarios integration, discovery and an easy access to knowledge are the most important factors. The use of semantics to classify meaningfully the information and to bridge the gap between the different representations that different stakeholders have is widely accepted. The problem arises when the ontologies used to model the domain become too large and unmanageable. The current status of the technology does not allow to easily working with this type of ontologies. In this chapter we propose the use of networked ontologies to solve these problems for the particular case scenario of the nomenclature of products in the pharmaceutical sector in Spain. Instead of using a single ontology, the idea is to break the model in several meaningful pieces and bind them together using a networked ontology model for representing and managing relations between multiple ontologies. The semantic nomenclature is a case study that is currently under development in the EC funded FP6 project NeOn¹. Among the main objectives of the case study, are helping in the systematization of the creation, maintenance and keeping up-to-date drug-related information, and to allow an easy integration of new drug resources. In order to do that, the case study tackles the engineering of a drug Reference Ontology, the provision of easy mechanisms for discovery, model and mapping of drug resources in a collaborative way, and the ability to reason on the context of user and ontologies to ease the mapping and retrieving processes.
CURRENT SITUATION

One of the most important issues in the pharmaceutical sector regarding the description of medicines is that of having a common and unified nomenclature. Steps in that direction have been taken by different international bodies and organizations. A number of classifying systems, thesauri, taxonomical classifications and even ontologies have arisen in the last years. However, the current scenario is that there is no unified way of naming and work with drug-related information. In the next paragraphs a quick overview of the most used international classification schemas and nomenclatures are depicted.

The Anatomical Therapeutic Chemical Classification System (2007) (ATC classification) is one of the most widely used classifications of drugs. It is controlled by the WHO Collaborating Centre for Drug Statistics Methodology, and was first published in 1976. Medicinal products are classified according to the main therapeutic use of the main active ingredient, on the basic principle of only one ATC code for each pharmaceutical formulation (i.e. similar ingredients, strength and pharmaceutical form).

SNOMED (Systematized Nomenclature of Medicine) is a systematically organised computer processable collection of medical terminology covering most areas of clinical information such as diseases, findings, procedures, microorganisms and pharmaceuticals. The design of this Nomenclature is based on Description Logics. SNOMED CT is one of a suite of designated data standards for use in U.S. Federal Government systems for the electronic exchange of clinical health information (College of American Pathologists, 2007).

Medical Subject Headings (MeSH) is a huge controlled vocabulary (or metadata system) for the purpose of indexing journal articles and books in the life sciences including drugs and pharmaceutical preparations. Created and updated by the United States National Library of Medicine (NLM), it is used by the MEDLINE article database and by NLM’s catalogue of book holdings. MeSH contains around 23,000 subject headings which are arranged in a hierarchy and could be viewed as a thesaurus (National Library of Medicine, 2007a).

Also, the globalisation in the marketing of drugs and sharing information among pharmaceutical professionals, the competent authorities and laboratories has contributed to the creation of terminologies as MedDRA. This terminology is used mainly in pharmacovigilance, due to MedDRA has a high number of terms for coding diseases, symptoms, diagnosis...

There are more thesauruses, taxonomical classifications, or medical languages as the Unified Medical Language System (UMLS) (National Library of Medicine, 2007b). UMLS is a controlled compendium of many vocabularies, not only about pharmaceutical products, such as LOINC, RxNORM, HL7, NCI and other, which also provides a mapping structure between them.

Some medical ontologies such as Galen, OpenCyC or the NCI thesaurus define the concept of pharmaceutical product and attempt to classify different categories of drug-related information. But the current status is that there is a limited set of ontologies focused specifically on drugs, particularly in the description of pharmaceutical products.

Meanwhile, the Spanish governmental organizations are working in improving their Nomenclature providing their information about drugs in the Spanish market following mostly the ATC classification. Figure 1 shows the main actors of the pharmaceutical sector in Spain, depicting the main life-cycle relationships. The main actors represented in the figure are:

- The Ministry of Health edits and provides two official databases (Digitalis, Integra) with information about pharmaceutical products in Spain every month. Digitalis is the nomenclature officially used in the invoicing of prescriptions and contains
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