Visualizing Information Science Knowledge by Modelling Domain Ontology (OIS)

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ABSTRACT

Information Science (IS) is one of the areas that need a unified ontology model to facilitate information in order to access the heterogeneous data resources, and share a common understanding of the domain knowledge. The aim of the study is to develop a generic model of ontology that serves as a foundation of knowledge modelling for applications and aggregation with other ontologies. This study adopts the Methontology methodology to develop an Ontology of Information Science (OIS). To support ontology development, the virtual community of practice of Information science (Ontocop) was employed. The Ontology was coded using Protégé and the OWL web ontology language. The main achievement of the study is that a new model of Information Science Ontology (OIS) has been constructed, which is a generic model that contains only the key objects and associated attributes with their relationships. The model defines the 706 concept, which will be widely used in Information Science applications. The research reveals that OIS ontology is a model that meets the ontology quality criteria for the subject area. It is concluded that OIS ontology unifies information science knowledge, which is composed of Library, Computer, and Archival science, by creating a theoretical base that is useful for further practical systems. The OIS ontology can be reused as the basis for any domain development.

Keywords: Information Science, Knowledge Representation, Ontology, Virtual Communities of Practice, Visualisation, Web Ontology Language

1. INTRODUCTION

In recent years ontology has gained attention in both academic and industrial fields. The word ontology has been defined in different ways, originally taken from philosophy, where it means the basic characteristics of existence in the world. Ontology is applied in various domains such as medicine, movies, cooking, and management, to provide a formal model that structures knowledge (Bhatt et al., 2009; Amira et al., 2007). Many technologies offer a good solution for data sharing at syntax level, for instance XML, but they cannot solve the problem effectively at a semantic level. Ontology offers a good solution for data use and

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sharing at semantic level. It is a moulding tool that provides a formal description of concepts and their relations as a foundation for semantic integration and interoperability.

The lack of domain ontologies in computer based applications has led to loss of knowledge in specific domains. In this sense, the problem is vital for scholars and researchers, who need to access information in efficient ways to meet their interests. The problem has been defined as requiring an artifact for a solution. Ontologies can lead to solutions to this problem, due to the fact that they give some sort of notion of meaning about terms. They have the potential to overcome the problem and make the conceptualization of specific domains explicit and understandable.

The IS domain appears as an interesting research area. It is a multidisciplinary science that has its roots in different branches such as library science, documentation and archival science. The IS has a long history but at the same time is still seeking its identity. This nature of science led to inconsistency in its structure, which thus led to the lack of a unified model to represent the domain knowledge. The domain knowledge needs to be integrated to overcome the problems related to the nature of the science itself. This lack makes data at syntax and semantic level difficult to use and share. The main effort in creating an OIS ontology model is to address the problem of relationships between concepts that indicate the same things but have different terminological descriptions.

This problem is common for IS domains, especially between researchers and beneficiaries, even among specialists across country boundaries. They use different names to refer to the same concepts or use different meanings to refer to the same concepts. For example, when two librarians or information specialists talk about “information” as a concept they have more knowledge about it in their minds, so they can think about its interpretation. Alternatively, when others from different areas talk about “web” concept each one will think about it according to their background and mental minds, in this case they will think about different meanings related to it. The former one may be considering its meaning as ”spider’s web” and the later thinks it is the world wide web.

Another problem is that the IS domain is a multidisciplinary science, overlapping with other sciences such as Economic science, Philosophical science, Management, Social science and Marketing. Moreover, the domain itself consists of many branches such as Library science, archival science and computer science. Inconsistency in the structure of the IS domain led to the lack of a unified model of domain knowledge that provides a standard terminology and shared representation of domain concepts, and identifies its relations with other sciences. This lack makes data at syntax and semantic level difficult to use and share. However, Information Science IS as an interdisciplinary science needs to be defined. Ontology has the potential to overcome the problem of tacit knowledge by making the conceptualization of the IS domain explicit. Ontology gives assumptions to make the term clearer, and to decide in which context the term can be used (Daconta, Obrst & Smith, 2003). In this paper our consideration is to identify the information science by representing its knowledge in order to be accessible by machines, especially with its complex nature, which became necessary to develop to represent the domain knowledge. The creation of the OIS ontology is discussed in this paper.

The goal of the paper is to study the terminology of IS to create a domain ontology. Many ontologies have been created and published. However, the OIS ontology is missing. OIS ontology is a new research direction in the IS field. This study is devoted to clarifying the basic concepts and framework of IS, in order to develop a taxonomy of the IS domain. It presents a formal semantic explanation for IS meta-data.

This study followed the life cycle of the ontology building process using Methontology, based on the IEEE standard for development software life cycle process, which mainly consists of: specification, conceptualization, formalization, implementation, maintenance and evaluation. The first stage involved identifying
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