

# Improving Competency Evaluation of Web-Ontologies Supported by Natural Language Interface to an Ontology Editor

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**Abstract** – *An ontology is a key element for the Semantic web that facilitates a common understanding of the structure of knowledge in a domain, backing applications as semantic annotation, consistency checking, search and retrieval. The increasing use of the Semantic web has escalated the demand for competent ontologies. One way to check on the competency of an ontology is by use of competency questions to ascertain whether the ontological commitments are adequate to support its purpose of design. Thus, it is useful to have a competency evaluation-supporting tool to assist an ontology engineer to perform this analytic task. At present, such support is noticeably weak. This led us to develop a competency question checking natural language interface to the popular Protégé ontology editor. The interface is currently equipped with simple functions, but has demonstrated its potential as a dependable support for performing the competency evaluation on web ontologies more effectively, in less time and with reduced effort.*

**Keywords:** Semantic web, Web ontologies, Ontology engineering, Competency evaluation, Natural language interface

## 1 Introduction

An ontology is a formal specification of conceptualisation of a representation vocabulary specialised in a knowledge domain [1, 2]. The role of the model is to make the underlying assumptions about the domain concepts and the relationships among them explicit. The idea is to help to elucidate the meaning of expressions in the shared knowledge resources. Consequently, ontology has emerged as a key element of the Semantic web that is founded on *meaning*, and is used to support applications as semantic annotation, consistency checking, searching and retrieval of the shared knowledge resources distributed on the web.

The concepts in a web ontology are defined as classes of domain entities whose attributes are captured as

properties and relations. The *subtype* and *cross* relations are seen as a way of structuring the concepts defined in the ontology.

Web ontologies are typically represented using Descriptive logic [3], which only allows binary relationships to express the logical association between concepts that are represented using frames. The ontologies are usually developed with the aid of editors such as Protégé [4], OntoEdit [5] and WebODE [6], and are typically encoded in ontology languages like OWL [7], DAML [8] and RDF [9]. OWL has become the defacto web ontology language and Protégé is a freely available, popular web ontology editor.

Formative evaluation is a necessary part of the ontology development process. Traditionally, the evaluation is based on a list of desirable qualities that has evolved from the best practices in conceptual modelling such as consistency, completeness, conciseness, and extensibility, which often emphasise on the aspects of generality to enable ontology reuse [2, 10, 11]. On the other hand, it has been said that when developing a new ontology or when adapting an existing one, an ontology engineer cannot disregard the ontology's ultimate purpose of use [12], and so, competency is a consequential quality of a usable ontology that must be present [13]. A competent ontology is a specification of conceptualisation that espouses adequate ontological commitments to provide for the ontology's purposive mechanisms.

We propose to check on the competency of an ontology by using a premeditated set of competency questions. The notion of competency question was originally conceived in the context of knowledge base systems development [14]. The questions are used to corroborate the reliability of the knowledge base that is constructed based on an ontology.

Interestingly, ontology editors like Protégé, OntoEdit and WebODE provide limited query support over the