Ontology

What is an ontology?

In modern computer science[1] and information science basic definitions consider an ontology to be:

- "*a data model that represents a set of concepts within a domain, and the relationships between those concepts*"[2]
- "*an explicit specification of a conceptualization.*"[3]
- "***an explicit formal specification of the terms in the domain and relations among them.***"[4]

In more details, an ontology usually includes:

- a formal explicit description of ***concepts*** or *classes* in a domain of discourse, with
- **properties of each concept** describing various features and attributes of the concept (*slots*, *roles* or *properties*), and
- **restrictions on concept** slots (*facets* or *role restrictions*), and
- **instances**, or concrete examples of classes included.[5]

An ontology has the following properties:[6]

- it is used to reason about the objects in a domain;
- specifies the classes of concepts and their relations at a higher level than relevant to the domain;
- captures the intrinsic conceptual structure of a domain;
- forms the hearth of the knowledge representation within a domain.

Why do we need an ontology?

An ontology can be used to:[7]

- *share common understanding of the structure of information among people or software agents*
- *enable reuse of domain knowledge*
- *make domain assumptions explicit*
- *separate domain knowledge from the operational knowledge*
- *analyze domain knowledge*

So how do you create an ontology?

You can follow this brief guide or a more detailed description with examples: Ontology Development 101: A Guide to Creating Your First Ontology.

Ontology and knowledge assessment

Ontologies contain domain knowledge in the form of definitions of terms, individuals belonging to these terms and relationships between these terms and individuals. The above constitute the asserted knowledge, that is, explicitly defined facts within the ontology. Ontologies also incorporate a reasoning mechanism in order to derive facts from explicitly defined knowledge (Baader et al. 2003). These facts, not explicitly defined in the initial ontology, constitute the inferred knowledge. In this approach, reasoning is applied before question generation and thus, generated questions are based on both asserted and inferred knowledge. As a result, a student performing a test is assessed on recalling factual knowledge, but also is expected to apply some 'lower level intellectual skills', in the sense of simple domain specific rules, in order to answer questions based on inferred knowledge. These skills are referred by Gagné et al. (1992) as concrete and defined concepts and are related to the ability to identify and classify specific individuals as members of particular concepts. Nevertheless, domain ontologies are not capable of specifying 'procedural knowledge' and thus they cannot be used alone for assessing higher order cognitive skills (Holohan et al. 2006).

[1)]

In philosophy, *ontology is the study of being or existence. It seeks to describe or posit the basic categories and relationships of being or existence to define entities and types of entities*. - Rana, Noman. Small Business - The Art of the Start. Self-Help Publishers, 2009.

[2)] , [6)]

Rana, Noman. Small Business - The Art of the Start. Self-Help Publishers, 2009.

[3)]

Gruber, Thomas R. A translation approach to portable ontology specifications. Knowledge acquisition, 5: 199-220, 1993.

[4)]

Gruber, Thomas R. A translation approach to portable ontology specifications. Knowledge acquisition, 5: 199-220, 1993. cited by Noy, Natalya F., and Deborah L. Mcguinness. Ontology Development 101: A Guide to Creating Your First Ontology, 2001.

[5)] , [7)]

Noy, Natalya F., and Deborah L. Mcguinness. Ontology Development 101: A Guide to Creating Your First Ontology, 2001.