engines can look for pages that refer to a precise *concept* in an ontology instead of collecting all pages in which certain, generally ambiguous, keywords occur. In this way, differences in terminology between web pages and queries can be overcome.

In addition, web searches can exploit generalization/specialization information. If a query fails to find any relevant documents, the search engine may suggest to the user a more general query. It is even conceivable for the engine to run such queries proactively to reduce the reaction time in case the user adopts a suggestion. Or if too many answers are retrieved, the search engine may suggest to the user some specializations.

In Artificial Intelligence (AI) there is a long tradition of developing and using ontology languages. It is a foundation Semantic Web research can build on. At present, the most important ontology languages for the web are the following:

- RDF Schema is a vocabulary description language for describing properties and classes of RDF resources, with a semantics for generalization hierarchies of such properties and classes. In addition, domain and range of properties may be defined.

- OWL is a richer vocabulary description language for describing properties and classes, such as relations between classes (e.g., disjointness), cardinality (e.g., "exactly one"), equality, richer typing of properties, characteristics of properties (e.g., symmetry), and enumerated classes.

1.2.3 Logic

Logic is the discipline that studies the principles of reasoning; it goes back to Aristotle. In general, logic first offers *formal languages* for expressing knowledge. Second, logic provides us with *well-understood formal semantics*: in most logics, the meaning of sentences is defined without the need to operationalize the knowledge. Often we speak of declarative knowledge: we describe *what* holds without caring about *how* it can be deduced.