

## Chapter 18

# Adaptive E-Learning System Based on Semantic Search and Recommendation in the Arab World

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### ABSTRACT

*The success of any e-learning system depends on the retrieval of relevant learning contents according to the requirement of the learner (user). This leads to the development of the adaptive e-learning system to provide learning materials considering the requirements and understanding capability of the learner. This chapter aims to propose the system of personalized semantic search and recommendation of learning contents on the e-learning Web-based systems. Semantic and personalized search of learning contents is based on expansion the query keywords by using of the semantic relations and reasoning mechanism in the ontology. Personalized recommendation of learning objects is based on the learner profile ontology to guide what learning contents a learner should study. For the Arab world, to achieve the learning for all goals and meet the learner's requirements, it must build more inclusive, including the personalization services, and has semantic learning content in the learning systems. The authors' proposed system is efficient, more effective, and more learner-friendly in the Arab sector because it responds to every learner and his needs individually with a timely and precise adaptation of learning materials.*

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## **INTRODUCTION**

When an E-learning system to be delivered contains learning materials covering different levels of learning, the level of learner (user) is taken into consideration to provide the learner with the learning materials that suit his/her level and his/her fields of interest (Alian & AL-Akhras, 2010). Adaptation is needed as some learning resources may not be in a format that is acceptable for different learners' needs and that fit the capabilities of different mobile devices, additionally content adaptation is needed to provide learners with appropriate courses view. To this end, E-learning systems should employ some sort of Adaptation. Adaptation in the context of this work means that the same learning materials are represented differently to individual learners based on their interest which is determined based on their previous learning behavior.

Ontology (Fayed & Sameh, 2006) comprises a set of knowledge terms, including the vocabulary, the semantic interconnections, and some simple rules of inference and logic for some particular topic. Ontologies applied to the Web are creating the Semantic Web. Ontologies (Thomas & Juan, 2010) facilitate knowledge sharing and reuse, i.e. a common understanding of various contents that reaches across people and applications. Using ontology in learning environments aims to provide mechanisms to enhance the process of searching and finding learning resources. And, they have the capability to organize and display information that makes it easier for learners to draw connections, for instance, by visualizing relationships among concepts and ideas.

The behavior of an adaptive system (Christoph, 2005) varies according to the data from the learner model and the learner profile. Without knowing anything about the learner, a system would perform in exactly the same way for all learners. It was described the application of learner models as follows:

*“Users are different: they have different background, different knowledge about a subject, different preferences, goals and interests. To individualize, personalize or customize actions a user model is needed that allows for selection of individualized responses to the user.” (Christoph, 2005).*

Personalized information retrieval (Daoud, Tamine, & Mohand, 2009) has become a promising area for disambiguating the web search and therefore improving retrieval effectiveness by modeling the user profile by his interests and preferences. Personalizing the search for needed information in an E-learning environment (Zhuha-dar & Nasraoui, 2008) based on context requires intelligent methods for representing and matching both the learning resources and the variety of learning contexts. On the one hand, semantic web technologies can provide a representation of the learning content (lectures). On the other hand, the semantics of the learner interests or profiles can form a good representation of the learning context that promises to enhance the results of retrieval via personalization. The key knowledge in any personalization strategy for E-learning is an accurate learner model.

In existing recommender systems (Lu, 2004), the systems can be broadly categorized into content-based and collaborative. Content-based recommender systems provide recommendations to a user by automatically matching his preferences with content. In content-based systems, contents are described by a common set of attributes. User preferences are predicted by analyzing the relationship between the content ratings and the corresponding content attributes. A central problem in content-based recommender systems is the need to identify a sufficiently large set of key attributes. Collaborative recommender systems estimate a user's preferences for a content based on the overlap between his preference ratings for the content and those of other users. The main difference between collaborative and content-based

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