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MULTI-CRITERIA BASED NEGOTIATION FOR LEARNING CONTENT SELECTION

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Abstract

With the rapid evolution of information technology and continuous expansion of all sorts of content on the internet, enormous opportunities have become available for learners to enhance their learning. Consequently, learners need effective support mechanisms that assist them in efficiently selecting the most appropriate learning content for achieving their learning goal, rather than blindly grabbing materials that are largely available on the internet.

However, it is a challenging problem to provide appropriate learning content selection facilities for the learners to efficiently identify learning content that best suit their needs, due to the large varieties of the factors that influence the process of learning content selection. Previous research has presented various solutions targeting the facilitation of learning content selection. Many of them provide content selection rules by simply grouping learners into different pedagogical categories merely based on limited theories or designers' own judgments. Disadvantages of these approaches are obvious: the lack of comprehensive supports of pedagogical theories reduces the preciseness and reliability of the content selection results.

Based on the literature review regarding the factors that influence learning content selection, standardized educational metadata, and current computer software technologies, this project therefore proposes a web based interactive system for learning content selection by introducing a multi-criteria decision making methodology. Based on the methodology, a mechanism for matching learning content with subject matter characteristics of the learning resources and learner's preference is developed. By taking dynamic and interrelated parameters as user inputs, recommendations for the content selection are generated based on the built-in parameter dependency rules.

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Chapter 1 Introduction

1.1 Introduction

This chapter first presents a brief introduction of the research background and specifies the motivation of this thesis. Then the design objectives of this project are discussed, followed by the outlines of the research. Finally, the overall structure of the thesis is presented.

1.2 Background

While performing learning, it is self-evident that the learners need to obtain the most appropriate training content in order to effectively achieve their learning goals. However, the selection of the electronic learning content is considerably difficult, because the amount of the potential learning content that is available on the internet is tremendous. It is a complex and time consuming process for the instructors to artificially identify the most suitable learning content that fulfill the individual learner's needs within this huge amount of learning resources. Especially, in the self-guided learning situation, if the learners have to autonomously find the learning content that best suits their need, the problem is even more severe. It is highly possible that the learners could access the content that is of little use and not appropriate for the subjects of interest at all. Therefore, a need exists to develop a mechanism to assist learners in reducing the learning content searching space and at the same time, to help learners in more efficiently selecting learning content that best satisfy their requirements.

To achieve the successful development of such a mechanism for effective and efficient learning content selection, a diverse range of factors that influence the process of content selection need to be considered. These factors could be individual's learning preferences, knowledge of the domain to be taught, characteristics of the learning

resource itself, and so on. The learning content selection could then be considered as the process and consequence of the concurrent collaboration of these influential factors. As a result, how to address the correlations among the relevant factors and associate them with the learning content is a crucial step in the development of learning content selection system. Following this idea, solutions have been designed to offer the assistance for learning content selection. However, many attempts are facing a basic problem, which is the lack of support for proven pedagogical theories and instructional principles. This design limitation directly leads to the weak educational offering of the developed system. The major endeavor of this thesis is therefore to address the problems stated above, and develop a multi-criteria based learning content selection framework that is underpinned by proven theories. As the consequence, a web-based learning content selection system driven by the proposed framework is implemented by using current state of art web technologies, so as to provide an effective tool for learners to more easily select appropriate learning resources that suit their needs.

1.3 Objective of the Research

The selection of learning content is the most essential step for any learning process. An adaptivity enabled learning content selection system can remarkably improve the efficiency of the content selection process. The implementation of such a learning content selection system is not as easy as it sounds to be. One of the major reasons is, as descriptive variants, factors such as the attributes of the learning content, the learner's preferences, characteristics of the learning domains, and so on will notably influence result of the learning content selection. More importantly, these influential factors are largely diverse. It is very difficult to determine, without the support of proven instructional theories, which of and how these factors can effectively influence the learner's selection. Therefore, this project attempts to address this problem by developing a learning content selection system on the basis of a multi-criteria based negotiation mechanism.

The key objectives of this research are summarized as follows.

- Based on the proven pedagogical theories, develop a content selection framework with multiple correlated criteria to address the various influential factors during learning content selection.

- Implement a web-based learning content selection system based on the proposed multi-criteria framework, so as to offer a negotiating environment for assisting learners to more efficiently select suitable learning content.

1.4 Research Outline

As a whole, the research is conducted in six steps, which can be conceptually divided in four main sections: background research, concept design, prototype system implementation, and evaluation.

1. Review current educational literature to confirm the overall range of the influential factors that is pedagogically relevant to the learning content selection.

2. Investigate the current educational metadata standards, and adopt appropriate elements as the criteria for describing the unit of a learning content.

3. Based on the extensive review of instructional and psychological theories, identify the correlations between each parameter, and build dependency rules for the parameter.

4. Review related web development technologies, and design the system architecture.

5. Implement a web-based learning content selection system based on the identified parameters and their dependency rules.

6. Evaluate the implemented content selection system.

Figure 1 illustrates the research outline of the thesis.

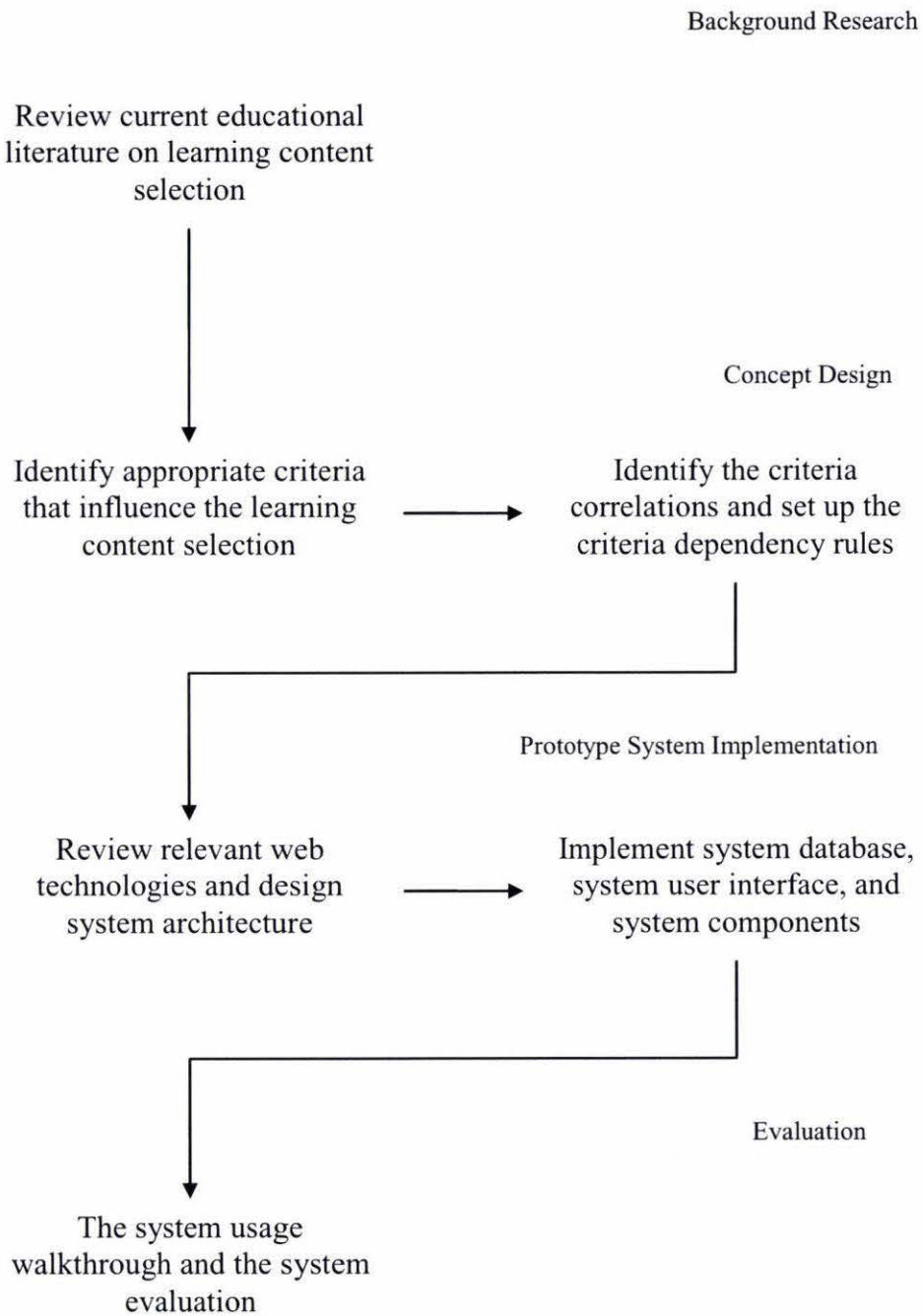

Figure 1 the Research Outline

1.5 Structure of the Thesis

Based on the research outline, the thesis is organized in 7 chapters, which are listed below.

Chapter 1 provides a general introduction that mainly covers the motivation, objectives, and overall structures of this research.

Chapter 2 provides a comprehensive literature review that is relevant to the learning content selection. The review includes the relationship between content selection and educational systems, relevant instructional theories, and current development of various educational metadata standards.

Chapter 3 presents the details of the framework concept design and analysis. Based on the literature review, the identification of appropriate criteria and the development of the criteria dependency rules are carried out.

Chapter 4 depicts the detailed process of the system implementation, which includes the reviews of the adopted technologies, system database design, system architecture design, and the development of system components.

Chapter 5 mainly describes the deployment of the implemented system, and presents a comprehensive walkthrough to demonstrate the usage of the prototype system.

Chapter 6 presents the evaluation of the implemented system, and analyzes the feedback gathered from the evaluators.

Chapter 7 draws the conclusions for the research based upon the results of the system evaluation.