THE DESIGN OF LEARNING MANAGEMENT SYSTEM THAT ADAPT CONTENT LEARNING PATH AND LEARNING TASK ACCORDING TO LEARNER

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ABSTRACT

This research is aimed to design the Learning Management System of which the lessons can be adapted to the individual learners, and to drive the learners’ ability to study in accordance with their potentials, interests, which, consequently, lead to the motivation in learning and the better learning achievements. In this study, there were 3 types of adaptive methods; namely, adaptive content, adaptive learning path, and adaptive learning task. Researchers followed the learning theory of Honey & Mumford in terms of learning style of the learners. In addition, researchers designed the lessons in form of learning object, which possessed the structure of SCORM standard. With regarding the other relevant learning information such as student database, test bank, statistic and so on, we stored such information in the structure of IMS standard so that the designed system can be interoperating with the other softwares. The Learning Management System designed in this study was conducted for teaching computer related subjects. The results obtained from this study can be the prototype for developing the further adaptive Learning Management Systems.

Keywords  Adaptive LMS, design LMS

1) INTRODUCTION

Adapting Learning Management System which is able to adapt the content suite for the individual learners, in order to them can learn for their abilities and interest. From many kinds of researches find out that there are 4 types of strategies to improve the content suit for individual learners. They are Adaptive Content, Adaptive Navigation, Adaptive Presentation and Adaptive Learning Task (Panarat Sangvigit, Sursak Mungsing and Anuchai Theeraroungchaisri, 2007:26), in present standard instruct for collecting learning information in many systems such as AICC, SCORM, IEEE LTSC, IMS, LRN, etc. The Design of Learning Management System that is able to adapt the content suit for the individual learners can work with standard structure. It can provide the adapting e-Learning working with other component of learning styles. Learning Management System which cooperate with the same standard structure as such Content Management System, Assessment system that providing the adapting e-Learning can apply in different circumstances. In this presentation, researchers is going to present about designing the adapting Learning Management System for individual which cooperate with standard structure of IMS Global Learning Consortium.
According to the previous studies, researchers found that there are 3 components consisted in adaptive Learning Management System which is able to adapt the content suite for the individual learners, there are based on 3 components. They are Domain Model, Pedagogical Model and Learner Model. The examples of the systems developed under the scheme mentioned are EDUCE (Brusilovsky, 2003), NetCoach-Couses (Gerhard Weber, Hans-Christian Kuhl, and Stephan Weibelzahl, 2002), and Inspire (Kyparisia A. Papanikolaou, Maria Grigoriadou, Harry Kornilakis, George D. Magoulas, 2002) system. The details for each of them are elaborate as follows (Marcus Specht and Reinhard Oppermann, 1999, 4)

2.1 Domain Model is the component that collect the content structure. It divides into unit. It can be called in different in each course for example Knowledge Items, Topics, Knowledge Elements, Learning Object, Learning Outcomes (Brusilovsky, 2003), etc. However, in divides the content structure like this, the content must be arranged in order such as the prerequisite course in order to increase the ability in adaptation the learning path of the learners through their basic knowledge (Brusilovsky, 1996). In addition, the divides content must be related to the current knowledge of the learners as well so that the learning path of the learners would be appropriate to individual.

2.2 Pedagogical Model is the component that collect the unit presentation, by adapt learning style that according with the learning styles of individual learners. It provides each learner practice and succeeds the lessons.

2.3 Learner Model, this component is important. Because of it collects the learner’s information to adapt content, adapt learning path, and adapt learning task according with each individual learning.

According to the component architectures, researchers has designed a Model. It is the Adaptive Learning Management System as follow figure 1 (Panarat Sangvigit, Sursak Mungsing and Anuchai Theeraroungcaisri, 2007: 25-31).

3) ADAPTIVE METHOD

The working process of 3 components mentioned is consisted of 3 types of reaction processes which are in accordance to the content presentation and learning activities as follows (Nora Parcus de Knoch, 2000), (Panarat Sangvigit, Sursak Mungsing and Anuchai Theeraroungcaisri, 2007: 25-31).

3.1 Adaptive Content: It is the presentation method basing on the former knowledge of the learners. The system will test the basic knowledge of the learners, the learning goals, as well as their preferences. In the adaptive content process, it would process the appropriate priority for presenting the content, adding the extra content to the basic knowledge and the goal of the learners.

3.2 Adaptive Learning path: It is the tool for adapting the learners’ learning path as appropriate to the individual. The aim of this part is to drive the learners realizing the relation of the spatial map and lead to the learners’ learning goals finally. The working process between adaptive content and adaptive learning path is related to each other through the adaptive process.

3.3 Adaptive Learning Task: It is the channel for adapting the order in presenting learning activities in accordance with learning styles. In this research, the researchers has chosen the learning style by Honey & Munford’s theory. They divided the learning style into 4 types to provide the method that according with learner’s learning style as follow (Richard Mobbs, 2005).
• **Activist**: It is the learning style emphasizing on “learning by doing” concept. Therefore, they believed that to instill the learners about doing the activities at the beginning of learning process would make them successful in learning easier. They have to learn from the simulation first then they will easily succeed.

• **Reflectors**: It focuses on the intuition before doing. The learners in this group prefer observing things and very careful in working; hence they can work effectively when there is not time constraint. Beginning from the example provides learners think and understand by themselves first and they will easily succeed.

• **Theorists**: It is the learning style clinging to the understanding of the theories before doing any activities. The learners in this group always study the principles and theories. On the contrary, they can not do well in the circumstances which emotions and feelings are crucial for making the decision or reading strategies. It can provide this group easily succeed.

• **Pragmatists**: It is the learning style that the learners prefer applying or testing the things they study with the work they face. They try to transform the techniques they obtained to personal needs. They can understand everything easily. However, they are offended with the rules, theory, and principles. They have to learn from the exercise first then they will easily succeed.

From the learning styles by Honey & Mumford, each learner groups would begin with different activities (but contents of 4 types of learning styles) Choosing the appropriate activity learning styles give the chance the learners understand the contents very well. Researchers has designed the Model of easier understanding learning activities as figure 2 (Panarat Sangvigit, Sursak Mungsing and Anuchai Theeraroungcaisri, 2007:25-31).

The learners’ responding by Adaptive that according with individual learner is valuable toward adaptive Learning Management System in present. However, adaptive LMS has occurred variously. The structure of LMS is different from each other. Therefore, designing towards the individual learners’ responding has to consider about standard structure of adaptive Learning Management System be interoperability. It is worth-while and reduces the expenses of production.

Intentionally, as represented by Picture 3, the analyst has designed a model to describe factors relative to co-functioning system based on Adaptive Content, Adaptive Learning Path, Adaptive Learning Task principle with the aim to enable the Adaptive Learning Management System benefits each learner.

**Figure 3**: Adaptive Method Integration Model

4) SCREEN DESIGN OF ADAPTIVE LEARNING MANAGEMENT SYSTEM

The analyst has designed applications on monitor that suits each learner for the Adaptive Content, Adaptive Learning Path, and Adaptive Learning Task, as being shown in figure 4, 5, 6 as follows.

**Figure 4**: Learner Login
Figure 4: Monitor is ready to work whenever learner wishes to login the Adaptive Learning Management System.

![Image of monitor](image)

**Figure 5:** Subject unit example

From the figure 5, researchers can describe the details of subjects available in the system is listed out, enabling learner to make choice.

![Image of subject units](image)

**Figure 6:** Spatial map of Adaptive Learning Management System

From the figure 6, the aim of this part is to drive the learners realizing the relation of the spatial map and lead to the learners’ learning goals finally. The working process between adaptive content and adaptive learning path is related to each other through the adaptive process. By means of special map in varying colors, learner is able to view and recognize own learning path.

![Image of spatial map](image)

**Table 1: COLOR DESCRIPTION**

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
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<tbody>
<tr>
<td>grey</td>
<td>represents learner’s past lessons represents the selectable lessons based on learner’s basic knowledge represents lessons for learner who has no sufficient basic knowledge - or - represents prerequisite content from instructor represents lessons that learner is occupying - or - represents status of learner’s knowledge level</td>
</tr>
</tbody>
</table>

**Figure 7:** An example of lesson about variable and operation in the Adaptive Learning Management System is presented.

![Image of lesson example](image)

**Figure 7:** Present unit in the Adaptive Learning Management System

4) **LEARNING MANAGEMENT SYSTEM IN STANDARD**

In developing the Learning Management System, there are many organizations issuing the concerned standard. Those are considered well-known are AICC, SCORM, LTSC, IMS, LRN, (IMS Global Learning Consortium, Inc., 2007), (U YRU, 2006) etc. The system developed by the analyst is related to SCORM since Thailand’s Moodle learning management system is interchangeable. Therefore, it is considered as best if all analysts develop the system in relation to SCORM, for it will benefit interchangeability with Moodle or other systems. Additionally, the system
developed by the analyst is designed to interchange with IMS database as illustrated in Table 2.

Table 2: IMS IN STANDARD

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>IMS LD</td>
<td>This standard helps in providing the priority of learning structure and the content. It can also add the content as appropriate to the basic knowledge of the learners as well as their learning goals. It would manage the structure for the adaptive content and adaptive navigation as appropriate to each learner.</td>
</tr>
<tr>
<td>IMS QTI</td>
<td>This standard can help in providing the structure for examination storage for testing the learner achievement. It also helps in providing the database of the examination storage which enables LMS to use the same examination.</td>
</tr>
<tr>
<td>IMS CP</td>
<td>This standard is useful in providing the structure of “package” which is the tool for learning activities to use with the other types of LMS.</td>
</tr>
<tr>
<td>IMS LIP</td>
<td>It is the standard used for designing the structure for learners’ information storage. It is considered the heart of information recalling part for the adaptation in various types. It can also be used with the other systems of LMS.</td>
</tr>
</tbody>
</table>

Studies of remedial standard to design a proper Learning Management System for each learner are hereby presented as developing guidelines in Figure 8 (Panarat Sangvigit, Sursak Mungsing and Anuchai Theeraroungcaisri, 2007:25-31).

5) IMPLEMENTATION OF LEARNING MANAGEMENT SYSTEM

Figure 8: Integration Standard in Adaptive Learning Management System

5) IMPLEMENTATION OF LEARNING MANAGEMENT SYSTEM

Figure 9: Adaptive Learning Management System in USE CASE

Learner’s Part: When the learner log in to the system, the system would test the learner’s knowledge, learning styles as well as learning goals by the system engine which will transform the information to the other models.

Teacher’s Part: When the teacher login to the system, the system is designed to enable to get into it for lesson composition, learning and create activity, and managing learner of each subject.
Conclusively, Learning Management System development is regarded as a tool to adapt content, adapt learning task and adapt learning task to individual learner under 3 main architectural parts (Domain Model, Pedagogical Model, and Learner Model). The researcher has a design Activity diagram in Figure 10.

![Figure10 : Adaptive Learning Management System in ACTIVITY DIAGRAM](image)

7) CONCLUSIONS AND FUTURE WORK

In this study, the researcher has proposed the frame for designing adaptive Learning Management System used to design Algorithm under the standard of IMS. It is helpful for reducing the working joint of LMS which is various. In addition, the cost in developing teaching and learning materials can be reduced, the systems can be worked together effectively, and the investment is worthy by focusing on the adaptation in reusability, interoperability and flexibility of the system development.

Reference


