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We have successfully received your paper:

Authors : Irwan Alnarus Kautsar, Shin-Ichiro Kubota and Yasuo Musashi
Title : PORTABILITY MOODLE XML TO IMS QTI FOR SUPPORT INTEROPERABILITY OF ASSESSMENT TEST ON LEARNING
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Thank you for your participation, we are looking forward to seeing you in Bali.

Sincerely yours,

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----- REVIEW 1 -----

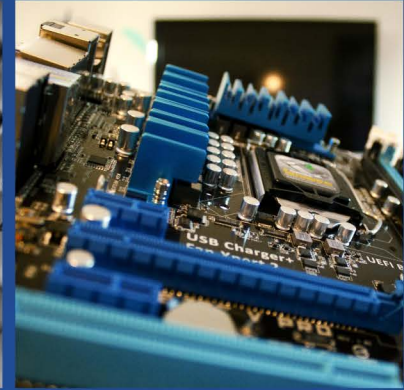
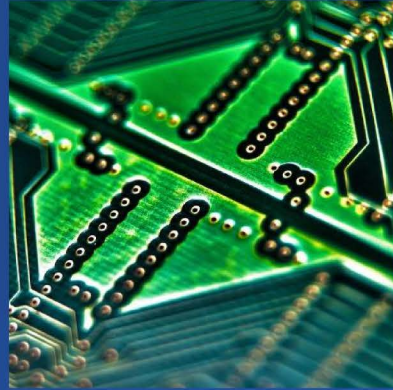
PAPER: 9
TITLE: MOODLE XML TO IMS QTI ASSESSMENT TEST PORTABILITY ON LEARNING MANAGEMENT SYSTEM
AUTHORS: Irwan Alnarus Kautsar, Shin-Ichiro Kubota, Yasuo Musashi and Kenichi Sugitani

----- REVIEW -----

The title is clear and ok, this paper contributes in a technical aspect of data exchange between LMS application.

**ICTS
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The 7th International Conference on Information & Communication Technology and Systems



ITS - Surabaya



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Institut Teknologi Sepuluh Nopember (ITS) Surabaya
Gedung Teknik Informatika, ITS
Jalan Teknik Kimia, Kampus ITS Sukolilo, Keputih, Surabaya, Indonesia 60111
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MOODLE XML TO IMS QTI ASSESSMENT TEST PORTABILITY ON LEARNING MANAGEMENT SYSTEM

Irwan Alnarus Kautsar *1, Shin-Ichiro Kubota*, Yasuo Musashi*, and Kenichi Sugitani*

*Center for Multimedia and Information Technologies Laboratory

* Graduate School of Science and Technology, Kumamoto University

2-39-1 Kurokami, Central W., Kumamoto, JAPAN, 860-855

1: 120D9307@st.kumamoto-u.ac.jp

ABSTRACT

Learning Management Systems (i.e. LMS) is one of the most popular solutions towards the e-Learning objective in different universities all around the world, where this environments are used to not only deliver contents but to perform assessments, tests and other tasks related to learning. Although, there are popular LMS such as Moodle, and more developed, such as Chamilo, there is no assessment/test portability among their LMS. Each assessment export formats make difficult to transfer well done Moodle-based online courses into young platforms such as Chamilo. The purpose of this paper is to address this portability issue and to show possibility of exporting Moodle assessment data (i.e. Moodle XML), into a more standardized format, which is IMS Question & Test Interoperability (IMS QTI). That can be used not only in Chamilo, but also other LMSs globally. The present paper shows the first approach towards a more global portability tool in which not only assessments but the whole structure of the course could be easily exported to other platforms. Contribution of this work is providing data exchange between LMSs.

Keywords: LMS, Moodle XML, IMS-QTI, Portability.

1 INTRODUCTION

Educational Institution, especially in Indonesia, many universities implements Moodle as LMS, with over 1500 sites registered [1, 2]. To share contents with other universities is not a problem, although using different LMS, because Moodle already support SCORM (Sharable Content Object Reference Model) format for export and import learning contents. Besides learning contents itself, question or assessment is the main component for some LMS [3]. While Moodle own XML format enables sharing assessment among Moodle, sharing assessments to other LMS is becoming a problem [4].

Chamilo, a user friendly LMS with built in social network features, offers richer learning resources with different forms of communication for learners, which are already implemented in primary school, for instance in the ONLP per child project [5, 6, 7, 8]. Chamilo can already import SCORM type contents and import IMS QTI type assessments. IMS QTI standardization is organized by IMS Global Learning Consortium, with the goal of enable the exchange of question components, such as item, test and results data, between authoring tools, item banks, test constructional tools, learning systems and assessment delivery systems on other LMS [9].

Many question components can be exported in the Moodle XML format, because many universities already implemented well-known LMS Moodle and have many question components in it. It is natural that those question components are shared among universities [2]. The next generation LMS (e.g. Chamilo) users must also wish to share the question components. If the Moodle XML format is translated to the IMS QTI format, more question components could be shared. This is why LMS should be collaborative and interactive, to improve the quality of contents and assessments in learning process using any LMS [5, 10, 11, 12].

2 ANALYSIS, DESIGN AND IMPLEMENTATION

2.1 Analysis IMS QTI Chamilo And Moodle XML Format

In this research, we analyze Moodle 2.4, which is Moodle XML format has not been supported in IMS QTI [4]. We analyze the format difference, based on question/assessment component in Table 1 [13]. And for the sake of ease, our target question is the multiple-choice type.

The problem we found after analyzing Moodle XML and IMS QTI is:

- a. The multiple choices type question, is not clearly defined in IMS QTI, as it is in Moodle XML. In Moodle XML, to define type of question is:

```
<question type="multichoice">
```

- b. When creating an example question in Moodle, there is the section “question 0” that not use in IMS QTI.

```
<!-- question: 0 -->
<question type="category">
  <category>
    <text>$system$/Default for System</text>
  </category>
</question>
```

For the purpose of this research, we start targeting the example multiple choice question type as first experiment, because this type of question is usual and simple, and they are adapted to our future work.

For analysis purposes, we describe the main keys of some questions such as type, text, answer, correct answer, correct answer value, and other option [12]. The example question shown in Table 1.

Table 1. Question Component and Value

No	Question Component	Value
a	Text	Is AED Important?
b	Type	Multiple-choice
c	Answer	- Yes - No Really - Less Important - No Need To Know
d	Correct Answer	Yes
e	Correct Answer Value/Score	10
f	Other Option	Random

Using Table 1, we presented Moodle XML and IMS QTI formats one by one:

- a. Question - Text
Moodle XML Format is is :

```
<questiontext format="html">
<text>
<![CDATA[<p><span style="font-family: times new
roman,times,serif; font-size: large;"> Is AED Important
?</span></p>]]>
</text>
</questiontext>
```

And in IMS QTI is :

```
<prompt> Is AED Important ? </prompt>
```

- b. Question – Type
In Moodle XML:

```
<question type="multichoice">
```

In IMS QTI:

```
Not Define
```

- c. Question - Answer

In Moodle XML, the answer option, for instance multiple-choice question, stored in the answer element tag:

```
<answer fraction="100">
<![CDATA[<span style="font-family: times new
roman,times,serif; font-size: large;">Yes<br /></span>]]>
</answer>

<answer fraction="0">
<![CDATA[<span style="font-family: times new
roman,times,serif; font-size: large;">No Really<br /></span>]]>
</answer>

<answer fraction="0">
<![CDATA[<span style="font-family: times new
roman,times,serif; font-size: large;">Less Important<br
/></span>]]>
</answer>

<answer fraction="0">
<![CDATA[<span style="font-family: times new
roman,times,serif; font-size: large;">No Need To Know<br
/></span>]]>
</answer>
```

In IMS QTI, answer/option store in the legacy of the “choiceInteraction” element tag:

```
<choiceInteraction responseIdentifier="QST_1" >
<simpleChoice identifier="answer_1" fixed="false"><p>Less
Important</p>
</simpleChoice>

<simpleChoice identifier="answer_2" fixed="false">
<p>Yes</p>
</simpleChoice>

<simpleChoice identifier="answer_3" fixed="false"><p>No
Need to Know</p>
</simpleChoice>

<simpleChoice identifier="answer_4" fixed="false"><p>No
Really</p>
</simpleChoice>
</choiceInteraction>
```

d. Question – Correct Answer.

In Moodle XML, the correct answer is indicated by the value of the “fraction” attribute in “answer” element, in each question answer/option.

```
<answer fraction="100">
<text>
<![CDATA[<span style="font-family: times new roman,times,serif;font-size:large;">QuestionAnswer/Option<br/></span>]]></text>
<feedback format="html">
<text></text>
</feedback>
</answer>
```

In IMS QTI, correct answer is defined by “value” element in “correctResponse” element.

```
<correctResponse>
<value>answer_2</value>
</correctResponse>
```

e. Question – other option

To randomize the answer, in MoodleXML, it sets the value “TRUE” in shuffleanswers element.

```
<shuffleanswers>true</shuffleanswers>
```

In IMS QTI, to get random question answer/option, it sets the value “Random” in “order_type” attribute of “order” element:

```
<order order_type="Random" />
```

2.2 Portability Design

We propose in this research the use of the file named Bridge.xml (Figure 1) as a container file from the data obtained through Moodle XML. We will use the data contained in Bridge.xml as a source to write the IMS QTI format.

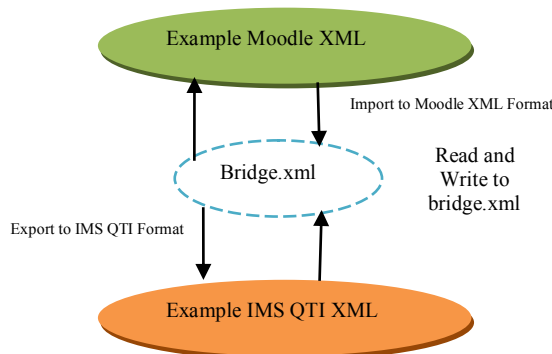


Figure 1. Portability Assessment process model item in both Moodle XML and IMS QTI.

The workflow of our research with the goal to create bridge.xml is:

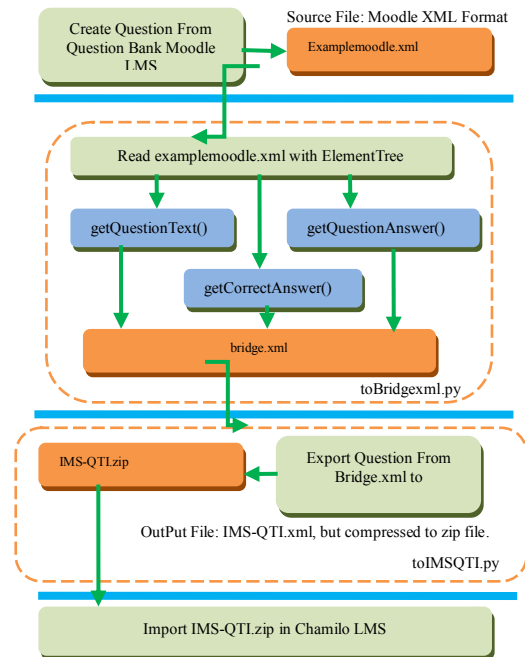


Figure 2. Get assessment workflow item from Moodle XML.

Another function of Bridge.xml is used to store and became a question bank in the future work. With Bridge.xml, we enable getting other Moodle components learning content besides assessments. The structure of bridge.xml element is:

a. Root Element.

Bridge XML, start “question” tag as root element tag. Purpose of this element tag is as direction for our script collected data, which is store in bridge.xml. The Element tag is:

```
<question> </question>
```

b. Question Data Element.

In some assessment, could be contain not only one or single question. For this matter, used “questiondata” to store one single question, which some question, have question component and value, related to Table 1. The element tag is:

```
<questiondata> <questiondata>
```

c. Question Text Element. Element.

This element contains a sentence that defines the question in this assignment. The element tag is :

```
<questiontext> </questiontext>
```

d. Question Type.

This element contains information about what type of question is being used, multiple choice, or True/False.

```
<questiontype> </questiontype>
```

e. Question Answer Element.

This component contains options that should be chosen by the learner. The element tag is :

```
<questionanswer> </questionanswer>
```

The attribute for question answer element, use for store information of each question answer shown in Table 2.

Table 2. Attribut of Question Answer Element.

No	Attribute	Example Value
1	Id	1
2	Score	100
3	Text	Yes

Score attribute contains the correct answer or contains penalty score for an incorrect answer.

f. Correct Answer Element.

This component contains information about the correct answer to the question. The element tag is :

```
<correctanswer></correctanswer>
```

g. Other Option Element.

This Element contains other options for this question. The element tag is:

```
<randomoption></randomoption>
```

2.4 Implementation

To get some example question from Moodle (Figure 1), we can export it through question bank menu in Moodle LMS. We show the example question in Figure 3, which is corresponding to Table 1.

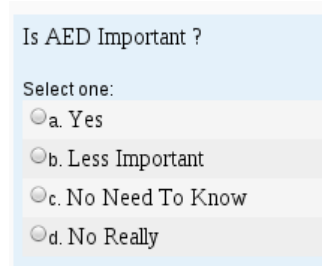


Figure 3. Example question from Moodle XML.

Using both python modules ElementTree [13] and BeautifulSoup4 [14], we get the necessary elements, attributes and values from Moodle XML (i.e. Question Type):

```
def getQuestionType(): # getting Question Type.
    global qtype
    qtype = ""
    tree = ET.ElementTree(file='examplemoodle.xml')
    for elem in tree.iter('question'):
        qtype = str(elem.get('type'))
    if qtype == 'multichoice':
        qtype = "multiplechoice"
```

The selected data from both assessment types (Moodle XML and IMS QTI), are stored in the bridge.xml file, where the structure meet our design approach. With example value from Table 1, the bridge.xml file that we generate with our python script is:

```
<?xml version = "1.0" encoding = "UTF-8">
<question>
  <questiondata>
    <questiontype>multiplechoice</questiontype>
    <questiontext>Is AED Important</questiontext>
    <questionanswer id=1 score=100 text=Yes/>
    <questionanswer id=2 score=0 text=No Really/>
    <questionanswer id=3 score=0 text=Less Important/>
    <questionanswer id=4 score=0 text=No need to know/>
    <correctanswer>
      <correctanswerid>1</correctanswerid>
    </correctanswer>
    <randomoption>True</randomoption>
  </questiondata>
</question>
```

After importing the question components from Moodle XML to Bridge.xml, and using this contained information as a source of the IMS QTI file, we succeed into show the quiz in the Chamilo LMS (Figure 4).

2. Is AED Important ?

Yes

No Really

Less Important

No Need to Know

Figure 4. Quiz in Chamilo LMS from Moodle XML.

3 RESULT

Having the portability between Moodle XML and IMS QTI, we can use both Moodle and Chamilo LMS to present assessments, as shown and done with our approach. Bridge.xml is used to solve the format difference from Moodle XML to IMS QTI.

4 CONCLUSIONS

The present paper shows the first approach towards a more global portability tool for share other question component/assessment, question with different types and other learning object (learning content, forum and portfolio). This means not only assessments but the whole structure of the course could be easily exported to other platforms. As a future work, is necessary to develop to the following conditions:

- a. Adding more other question types such as matching, True/False, Short Answer/Essay.
- b. Enabling import from Moodle into IMS-QTI and vice versa with XSLT.
- c. Translating Moodle XML to IMS QTI employing the XML Schema Design (XSD) from IMS Global Learning Consortium.
- d. Integration between content and assessments in both Moodle and Chamilo.

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