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EDUCATIONAL MODELLING IN CLOUD COMPUTING USING IMS LEARNING DESIGN

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ABSTRACT

Cloud Computing is a major evolution of computing. It changes the way we produce and consume IT and actually evolved the positions of all the players in the computer. This technology is also considered a major step forward for digital development of higher education and research, response to these developments, a large volume of educational resources is produced across many universities in the cloud.
First and foremost is the use of educational modelling languages and instructional engineering methods to help decide how to aggregate learning objects in learning and knowledge management environments.
This paper presents our contribution in the educational modelling consists of learning units involved in educational cloud using IMS Learning Design, the new approach that we followed focuses on keeping interoperability between e-Learning content and facilitate the task of identification , reuse, sharing ,adapting teaching and learning resources in the Cloud

Keywords: *E-Learning, IMS-LD, Interoperability, Cloud, Modelling.*

1. INTRODUCTION

E-learning system is the key technology development trend which provides delivery and distribution of the learning contents to the end users who are from diverse environment, and having different interest, and destined away from a classroom. It also facilitates maximization of the flexibility and effectiveness of the learning system [1].

The need for e-learning is increasing constantly and the development and the improvement of the e-learning solutions is necessary. Also, the e-learning systems need to keep the pace with the technology [2].

Create a learning experience to the student, but also to the tutor, based on the configuration of a set of elements in a specific period is not always easy.

Especially if we add the aspect of cloud computing in universities, diffusion of training modules on the cloud by various institutions causes heterogeneous E-Learning systems which affect the educational quality offered by university to teachers and learners.

Using Cloud for E-Learning offers several advantages to overcome the constraints of E-Learning systems especially at the technical level [3].

In this paper we present a new model of IMS-LD to adopt e-learning in the cloud ,the model keep the interoperability, to facilitate the task of identifying, reusing, sharing and adaptation of learning and teaching resources in the cloud.

This paper is organized as follows. Section II describes how cloud computing can improve e-learning; the section III describes IMS-LD specification and the benefits of

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educational modeling in Cloud. Section IV focuses on interoperability model of IMS-LD in cloud. Section V ends this paper with Conclusion and Perspective.

2. CLOUD COMPUTING FOR EDUCATION

Nowadays, the term "cloud computing" has been an important term in the world of Information Technology (IT). Cloud computing [4] is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet).It entrusts remote services with a user's data, software and computation.

Cloud providers may offer tremendous applications to their customers. These applications may vary widely to provide many services in education, government, banking and healthcare. The hardware and systems software in the datacenters that deliver those services is what we call a Cloud [5].

One of the most interesting applications of cloud computing is educational cloud [6, 7, 8, 9].

Educational cloud computing providers are offering higher education the opportunity to substitute a presence in "the cloud" for universities' existing data centers, servers, and applications, replacing these machines' traditional "physical" presence on campus [10].

Educational cloud computing services represent a growing variety of useful services available on the internet and the most innovative and rapidly developing portion of the technology and education. It also promises to provide a variety of services that will be very useful to faculty, staff and students [11].

The cloud computing application can be of great help when a large university is considered. [12], for example; Oxford University (England), Berkeley University (U.S.A.) and North Carolina State University (U.S.A.)…..

A large university might become a provider of cloud services. More often, individual campuses will obtain services from the cloud. The trend toward greater use of mobile devices also supports cloud computing because it provides access to applications, storage, and other resources to users from nearly any device [10].

There are many different cloud computing platforms for education in use nowadays.

Justin et al. [13] has proposed Seattle, Seattle allows students to learn the concepts of networking and distributed systems on computers spread through the Internet.

Al Noor et al. [14] has proposed an architecture of cloud computing for education on the availability of widespread resources to all around Bangladesh.

Sultan [15] has demonstrated how institutions and universities are likely to embrace cloud computing as many of them are bound to suffer from under-funding due to the global economic crisis.

IronWEB [16] a distributed architecture to create pedagogical knowledge database on the Web.

The trend of educational cloud computing has been adopted by many leading IT companies [17].

Microsoft proposed Microsoft Education Cloud, is a model of resources that enables the students and researcher to move as much or as little as they want to the cloud.

Google Apps education in cloud computing is available at no cost to colleges, universities and educationally focused groups.

Amazon Web Service has provided the universities and institutions of all sizes with an infrastructure web services platform in the educational cloud.

The IBM Cloud Academy provides an application for educational institutions that are actively integrating IBM cloud computing technologies into their infrastructures for production and technical projects.

HP Cloud provides an ecosystem of thought leaders who can share best practices, ideas and technology around the design and use of cloud computing capabilities for education.

There are specific tasks for different types of actors and to better understand the contribution of cloud computing it seems essential to us to describe the system of distance education in all its complexity (learners, tutors, training, educational resources, trading tools, platforms ...) and combined with the cloud.

We have several models to manage this complexity, In [6] offer Massive Centralized Cloud Computing (MCCC) scenario for educational institutions and our previous Educational cloud model [3], that combines the different tasks of the actors in the institutions and within the cloud computing.

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3. EDUCATIONAL MODELLING

3.1 E-Learning Standards

The description schemes were considered description languages for digital education resources; the idea is to index very quickly to accelerate the task of information retrieval.

There are several standards of description schemes among others there is the LOM (Learning Object Model), which is a metadata model developed in 2002 by the IEEE consortium for the description of resources for educational purposes, it ensures the processing, evaluation, sharing, exchange and reusing of digital learning resources.

Another standard is SCORM (Sharable Content Object Reference Model) designed to create structured learning objects and to meet accessibility requirements, adaptability, sustainability, interoperability and reusability.

Another specification to create structured learning objects is IMS-LD that completes very well the LOM and is a supplement of SCORM; it defines the learning design as well-defined scenarios for learners to achieve their goals.

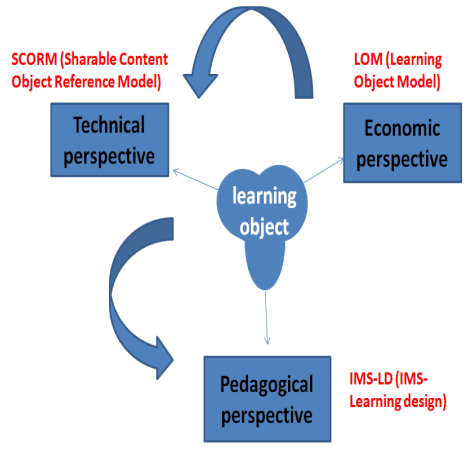

Figure 1. *Position of IMS-LD*

As shown in Figure 1 [18] three approaches focus on the concept of learning object defined as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning [19]

LOM is an indexing language for data, its purpose is to make production profitable and develop reuse (economic perspective). SCORM allows exploiting the resource in a computer system and monitoring its use (technical perspective) and finally the educational modeling languages, among the most powerful languages of modeling we found IMS-LD, it refers to the quality by integrating learning objects in the design of learning situations (pedagogical perspective), we investigated the possibility of its adaptation in the section IV.

3.2 IMS-Learning Design

The development of E-learning solutions includes steps to design of two types throughout the instructional design process [20] didactic method that focuses on the knowledge and Instructional Systems Design that focuses on the implementation of strategies around situations learning. Modelling of learning environments is to use the paradigm of learning objects and rely on a script with the notions of unit learning, resources and learning activities (IMS -LD).

IMS-LD was published in 2003 by the IMS / GLC. (Instructional Management Systems Global Learning Consortium: Consortium for global learning with systems management training, the original name, when IMS started in 1997 was Instructional Management Systems project)

This specification allows representing and encoding learning structures for learners both alone and in groups, collected by roles, such as "learners" and "Team" [21]. We can model a lesson plan in IMS - LD, defining roles, learning activities, services and several other components.

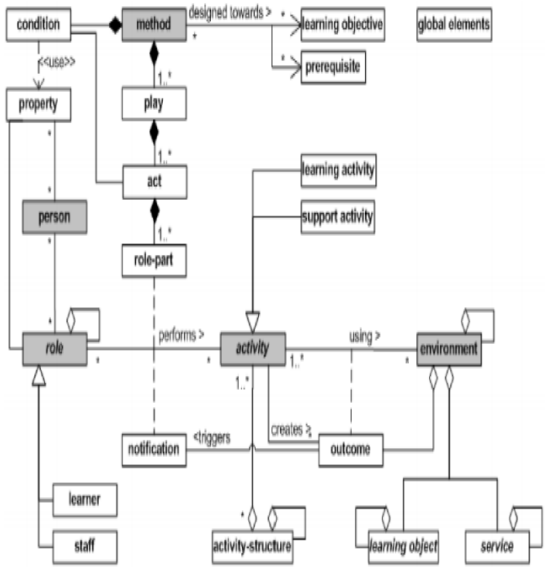

Figure 2. *The conceptual model of IMS LD*

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This static model of learning design focuses on three entities cf.Figure2 [22]: roles, activities and environment. At the base:

- Roles: as a learner and facilitator (teacher, tutor, and facilitator) are played by people described by their properties.
- Activities : performed by roles, they are part of a tree structure called method, decomposed into alternative pathways themselves broken down into sequential acts, each act is composed of scores each defined by a role and activity. All scores form the scenario of the Act which is usually composed of a structure of activities, which contains other structures activities to the learning activities or terminal supporting activities.
- Environments: includes all types of Learning Objects (LO) or services used by the roles in the activities and the results produced by the roles in the activities.

3.3 Educational modeling in distributed architectures

After a thorough study, we found several studies concerned with modeling Subject Teaching (online courses, course materials, etc...) In distributed architectures whose warehouse distributed based on the description of Learning Objects (LOs) by metadata LOM [23] which aims to make the LO easily accessible, usable and reusable.

The authors proposed a distributed architecture that put in place a system that will enable:

- Capitalize at each university, all relevant LOs produced;
- Annotate each LO to make it accessible and re-usable. This annotation is based on a description by LOM metadata and semantic annotations.
- Create an educational metadata warehouse which will be powered by all descriptors warehouses universities. And each resource can be shared between universities, and will be accessed remotely (while respecting gathered in one place).

Another work that speaks of modeling large warehouses LOs through DBpedia categories to automate the classification of LOs [24] The aim is to link the text fields based on the IEEE LOM that describe subjects of the LO, which are contained in the Universia [25] digital library with a set of semantic categories described in DBpedia.

From the research obtained in this field, we consider that the implementation of e-learning systems in the cloud didn't cover adaptation and modeling of education. Our study is focused in this area to analyze the contribution of modeling in Cloud computing rich in terms of teaching and learning resources architecture.

3. IMPLEMENTATION

4.1 Benefits of our interoperability model

The proposed new model consists to use the modeling language IMS-LD already explained in the section III to adapt training according to the needs of learners, to support, and at the same time teachers can work together to improve the quality of training provided to learners, so there are benefits for teachers and learners

Learners: They have a course with opportunities to have similar proposals of contained and support courses of other universities to complete and enrich their knowledge cf.figure3

Figure 3. Pedagogocal scenario according to IMS-LD 'Support Case'

Teacher: They have opportunity to collaborate with other teachers and use their courses from cloud as it is said "Knowledge which is shared is better" cf.figure4.

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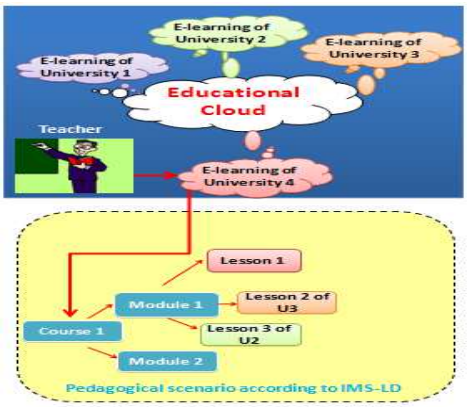

Figure 4. Pedagogocal scenario according to IMS-LD 'Collaborate Case'

4.2 Example of a Learning scenario in the Cloud

To validate our model we give in the following an example of modeling a Learning scenario 'LS' in the cloud according to IMS-LD.

4.2.1 Text of the Example

- The learners will read the course in a Educational Cloud with the assistance of their distance educators
- At the same time, they can view available courses in other universities for support and to reinforce their acquired.
- Then, they must pass an online control while answering a series of questions

4.2.2 Text transformation in a standard IMS-LD

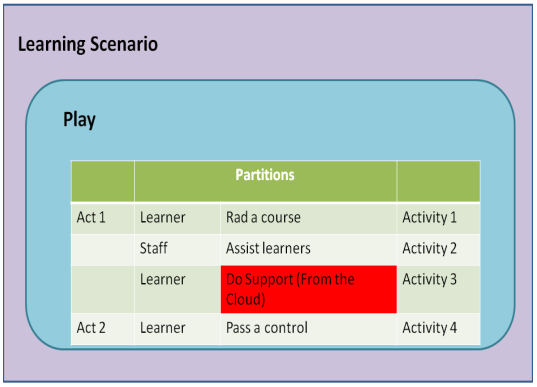

Figure 5. *Example of Learning Scenario*

4.2.3 Activity diagram of the Learning Scenario

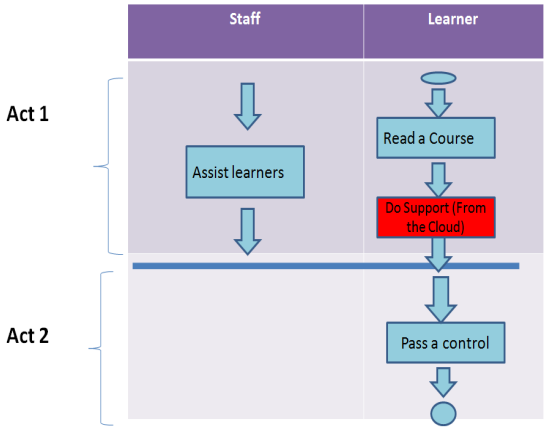

Figure 6. *Activity diagram of the LS*

What is interesting in the figures 5&6 is the red part, provides support for learner in the Cloud, to complete and enrich their knowledge.

4.2.4 Schema of the Act 1 generated by the MOTPlUS software

MOTPLUS used to model a learning activity level A.

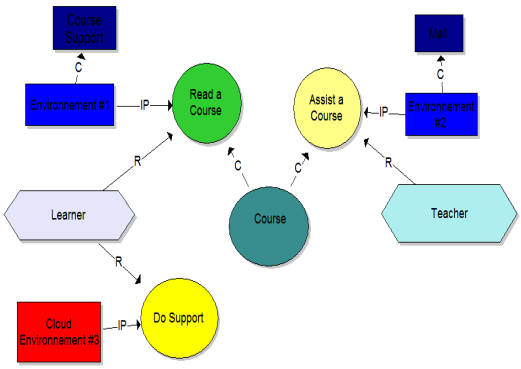

Figure 7. *Schema of the Act 1 by MOT+*

4. CONCLUSION AND PERSPECTIVE

In many countries, E-learning has become a key of bringing knowledge and the quality of education has increasingly becomes in great demand.

As we have shown Cloud computing offers several advantages for E-Learning Systems, in this article, we define the advantages and the general context of adapting distance learning in the cloud according to IMS-LD specification, it remains to find the ideal solution to suit IMS-LD to cloud so that we can

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generate each time a student need in a distributed and heterogeneous platform.

We'll have to implement our model in an educational cloud and do a student's surveys to make the Advantages that can give our model for them.

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