Journal of Theoretical and Applied Information Technology
15th November 2016. Vol.93. No.1

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

AN ONTOLOGICAL EXTRACTION FRAMEWORK OF THE ACTORS' PEDAGOGICAL KNOWLEDGE

[1]ABDELLADIM HADIOUI, [2]SAMIR BENNANI, [3]MOHAMMED KHALIDI IDRISSI, [4]EL FADDOULI NOUREDDIN

RIME TEAM-Networking, Modeling and e-Learning- LRIE Laboratory- Research in Computer Science and Education Laboratory
Mohammadia School Engineers (EMI) - MOHAMMED V UNIVERSITY IN RABAT Agdal AV. Ibn Sina Agdal Rabat BP. 765 Morocco
E-mail: ahadioui@gmail.com, sbennani@emi.ac.ma, khalidi@emi.ac.ma, faddouli@emi.ac.ma

ABSTRACT

An actor in an online learning system produces knowledge via events taking place in the platform. Stored in various places, such knowledge is of different types (Tutors, Learners) and formats. This article proposes a conceptual Framework for extraction of ontology based knowledge of educational actors through integrating knowledge management (KM) in a scenarization process of online learning subject by analyzing the interactions, and integrating assissement critiria of actors. To achieve this aim, we proposed this conceptual Framework which provides two results: First, a structured model for the extraction of actors knowledge, analyzing inetractions of actors events. The second, an ontological model automatically generated for semantic representation of this Framework knowledge.

Keywords: Ontology, knowledge Management, E-learning, activities, learning object.

1. INTRODUCTION

Since ICT's integration in the online learning process, a number of changes have been made during the operation of E-learning. These changes affect the educational and technical aspect as well as the method of the deployed training due to the generation of several operating restrictions for tutors and restrictions of use for learners.

To address and resolve such problematic, a number of research studies have dealt with the consequences generated by this change, proposing different solutions. In [1] the author suggested the implementation of a joint training mixing between online education and training in presenteil (Blended learning).

In this connection, many e-Learning systems have been proposed by the scientific community. For instance, we find MOODLE, BlackBoard, Open EDX and other systems. Building on The analysis made by researchers [26], we notice a variety of storage in the majority of systems: database, XML, etc.

The scenarization process [2], being introduced since e-Learning emergence, is a catalyst that allows for the implementation of a learning session. Many tools and techniques have been proposed by [3] for this purpose.

When using or creating learning scenarios a pedagogical actor generates knowledge through his events in the platform. The generated knowledge was heavily treated in the relevant literature by several researchers. Some researchers have proposed the extraction of existing knowledge in traces [27]. In this work, the authors have proposed models and an approach to the representation of knowledge found in learners traces. Other works [28] proposed to extract knowledge from discussion based forums. [29] In this paper the author proposed a solution of extraction of knowledge found in social networks. By contrast, in [30] the author proposes an approach for extracting knowledge of tutors in an online learning system.

Our main objective lies in proposing a framework which combines the existing knowledge extraction approaches and which solves the lack of extraction of all types of knowledge without accounting for its sources in addition to the extraction of knowledge regardless of the type of actors, tutor or learners etc.

Educational actors including tutors, learners and designers each play a role according to their profiles in the platform, but the problem is raised in a session learning, knowledge of educational actors have encountered several problems.

In this article we propose an ontology-based framework of extraction of educational actor's knowledge. Our system will be a means for tutors

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

and learners members of the platform to reuse the knowledge generated by the actors of the same level. To design this Framework, we should address the following points: making explicit the individual knowledge in order to make it shareable, motivating the actors in an online learning session, extracting knowledge from the system, sharing it and finally developing their autonomy, commitment, and responsibility in a learning session.

The article at hand is structured as follows:

In Section 2, we will provide an overview of the scope of our research objective and methodology. In section 3, devoted to the state of art, we will identify the best sources of knowledge available in the system, (1) some extraction techniques, (2) types of data storing for education systems (3) the ontology knowledge based representation. In Section 4, we will present our method of implementing the ontology approach based on the knowledge of educational actors. In Section 5, we will present our knowledge model. Section 6 is dedicated to a summary of our work that has been carried out so far.

Finally, we will draw conclusions and present new further prospective work.

1.1 The problem statement

Sharing educational knowledge in a learning system is a concern for all educational actors. This is to enhance the learner's motivation. Moreover, learners' knowledge in a learning session cannot be used due to the lack of monitoring.

Motivation and ambition of e-Learning systems usage are constrained by many restrictions due to the fact that the knowledge that circulates in such platform type has multiple aspects.

This work is designated for the analyzing ontology based methods and techniques to extract knowledge of actors. This is through investigating events interactions of actors during a training session. Following that, this work aims for the analysis of the best sources of actor's knowledge as well as its nature of storage in the platform.

Hence, the main points of this research are as follows: the identification of the knowledge generated by actors; the reorganization and structuring of knowledge received following of actors events interactions; analysis of the processing means of such interactions; transformation tools and techniques of an ontology based on a semi-structured scheme; integration of the semantic aspect to solve problems relating to knowledge management on the basis of the data; analyzing the storage nature of interaction of actors events; unifying knowledge received by means of actors interactions.

This research is characteristic of providing a conceptual framework for the extraction of relevant knowledge of any type of actors and whatever the source of the extracted knowledge, which the existing works do not account for in the relevant literature.

For this objective, a Framework for extracting knowledge of educational actors aims at producing relevant skilled knowledge.

In our framework we propose a conceptual model on education systems to build a Framework that shares knowledge of educational actors in an e-learning session, while integrating criteria of actor's evaluation [22].

2. THE STATE OF ART

In the literature, we noticed the existence of several works handling the problem of knowledge extraction in a given system. Such works have proposed several ontology-based Frameworks. Such Ontology is introduced with the aim of dealing with the many challenges of knowledge management systems (KMS).

Great many researchers have suggested the development of KMS based ontologies for several fields. [4] In this work, the author has proposed an approach for managing knowledge from documents of different formats. [5] He has developed an information retrieval system based on ontology of domain to manage and recover a non-metallic pipe of oil field. [6] He presents an approach of ontological knowledge management for e-learning systems and the incorporation of quality data. [7]He describes a method based on the ontology of knowledge management of the forest. [8] a combined approach based of reasoning based on ontology of domain for critical areas such as road accidents. [9] Illustrates a general Framework for knowledge management from various sources using the ontology of domain. [10] Proposed three ontology knowledge management systems with multiple basis.

In an online learning system, we noted the existence of methods and techniques that make use of data mining algorithms in analyzing and preprocessing raw data. In [31] the author proposed a cloud computing based approach with the aim of analyzing and processing a large amount of data

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

produced by e-Learning systems. In [32] the author put forward an approach for the discovery of learner's knowledge in e-learning using data mining techniques. [33] In this work the author has made a report on knowledge, learning and educational data mining analysis for working out the elements essential for extracting knowledge.

The integration of the semantic aspect into data has been proposed by a number of works respecting rules of correspondence between ontologies terms and those data. In [34] the author proposed the integration of ontologies for learner's representation of knowledge via ontology. In [35] the authors suggested integrating ontology within the phases of digital resources indexation in order to appropriate resources with the semantic aspect. This aim is achieved by OWL that affects the semantic aspect in the raw data. In other studies [36] the authors proposed the semantic web integration in order to transform raw data into knowledge. The approaches proposed in this work are based on ontologies for semantic representation of the acquired knowledge. Doing so, there are works [37] which have put forward the rules of correspondence between the elements of ontology and those of the raw data.

Drawing on our analysis on ontologies that treat knowledge management, there is no clear and uniform Framework for knowledge representation. Such framework provides effective classification rules of structuring and exploiting acquired knowledge of a learning system that combines the knowledge extracted from forums and the one received from traces. Our solution, in this regard, is to propose an extension of the Frameworks existing on the market. This is through analyzing the suggested approaches and identifying deficiencies that exist in their approaches.

3. METHODOLOGY

The Conceptual Framework that we propose in this study provides an environment of knowledge extraction relevant for the educational actors.

This extraction was made on the basis of formal language XML (eXtensible Markup Language) with XSD (XML Schema Definition).

However, XML ensures interoperability in all machines and environments without considering pedagogical environment.

Our idea, in this respect, is to combine: (1) XML that produces formal data, operational and interoperable aspect; (2) the standards of the existing specifications of learning objects and techniques of knowledge representation for a better operationalization of our ontology.

The choice of XML formal representation is made in accordance with its multiple uses in several disciplines, which gives meaning to data extracted from a given system.

This Framework is developed in three stages:

- The crude knowledge repository that is represented by a meta-model of knowledge received from educational actors

- The stage of actor's knowledge qualification through incorporation of criteria for assessment of the skills of actors,

- Finally, the stage of archiving and dissemination of knowledge taken to be relevant in e-learning system. Our Framework results are: two representations, XML and OWL (Web Ontology Language).

The following figure shows the possible transformations.

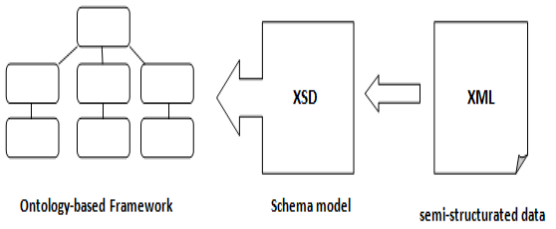

Figure 1: Type of transformation of our ontology based data source

4. THEORETICAL UNDERPINNINGS AND DATA ANALYSIS

4.1 Data Analysis

The process of knowledge management in the educational sector is done in three stages: 1) the identification and acquisition of knowledge, 2) analysis and organization of knowledge, 3) Archiving and disseminating knowledge. To achieve these findings, four transformation modes were proposed by NANOKA in the SECI model. [12] (Externalization, internalization, combination and socialization).

An online learning system develops the actor's knowledge in a tacit way.

The current education system has undergone many changes in terms of the training mode in that the learner as an example covers a monotonous

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

language during a training session. In this respect, there is a lack of resources existing in the former training mode (presentiel). This results in a negative effect on the learner who suffers from a lack of motivation and concentration following an online training.

For achieving our research objective, we will confine our efforts to the following points:

- The nature of storage of actor's events in an online learning platform.
- The tools provided by the systems for analyzing the interactions of actors.
- Studying opportunities offered by XML formal language and their interoperability throughout all systems.
- Searching knowledge representation languages for any given field.

Accordingly, we have drawn the following assumptions:

H1: A pedagogical actor generates knowledge via his/her interaction events.
H2: Actors events interactions are made use of by the online learning system.
H3: The structured formal representation solves the problem of analysis and preprocessing of knowledge generated by means of actor's events.
H4: The formal ontology-based representation allocates semantic aspect to data extracted via actor's traces.

4.1.1 The type of storage in an e-Learning system

E-learning solutions are intended for educational actors through making a learning platform available to them, which develops their skills with textual content or multimedia learning material through an educational strategy and activities of knowledge validation [13].

We conducted a study on the type of storage of some educational editors open sources existing on the market, which is defined in Table 1.

Publisher	Developed with	Storage XML	Storage SQL
Moodle	PHP/MySQL/PostgresSQL	√	√
Atutor	PHP/MySQL		√
Claroline	PHP/MySQL		√
Dokeos	PHP		√
…			

Table 1 .Study of some educational editors

We observed that there are several ways to store the e-learning systems.

4.1.2 Knowledge Sources

The analyses of sources of educational knowledge in the e-learning system help identify and acquire knowledge. In [14] the researcher has analyzed the knowledge found in the traces and the proposed a knowledge model drawing on trace theory. Furthermore, in [15] the researcher proposed to analyze the human behavior; this is together with the extraction of individual and collective knowledge. By contrast, in [4] he has chosen to use the documents as knowledge sources.

On the other hand, knowledge context may influence this operation, since it may be in an educational scenario during a discussion among educational actors, in forums, in social networks…[17].

Knowledge of tutors can be of different types; in [17] the researcher presented four categories (disciplinary, general, content-related, and other contexts linked the knowledge).

For this purpose, many knowledge sources were detected in an online learning system.

4.1.3 Techniques of knowledge extraction

A number of techniques have been implemented in online education system. We noticed in the literature the existence of data Wherehouse tools (Extract-transform-load ETL) such as Talend, Pentaho and others. In other works there are Ontop mapping tools for ontologies creation on the basis of SQL source. There are also algorithms based data mining proposed by researchers and community [18].

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

As a result, the ETL can be used for the enrichment or extraction of educational knowledge.

4.1.4 knowledge representation method

Several techniques have been implemented in online education, including the modeling of pedagogical actor's profile. In these works [19] Gilbert Paquet focuses on the role of graphical representation of a learning system. This is through the use of the language of graphical modeling such as MOT software which is based on XML formal language. Other studies [20] have set up domain ontologies for knowledge representation. Several techniques of knowledge representation as well as related reasoning mechanisms have been developed in many research projects [21]. Each of these techniques makes interesting contributions within the field of knowledge representation, while revealing some deficiencies.

We notice that each of the methodologies, be it cognitive or software engineering, cannot meet our needs, the reason which has pushed us to develop a new modeling formalism most appropriate for our problem.

Consequently, ontologies have extensive use in the Framework of knowledge representation.

4.2 Theoretical underpinnings

Our knowledge management Framework integrates all the processes of knowledge management in online learning system (e-learning).

For such purpose, knowledge management made the digital capital of the pedagogical environment shareable and reusable by other actors; it measures the relevance of acquisition and the dissemination of knowledge.

These objectives are proposed by the Framework quoted in Figure 2. This architecture reveals how we can incorporate knowledge management within the process of scenarization of a learning course.

In this Framework we have: {A1, ..., An} representing the set of learners, {T1, ..., Tn} representing the set of tutors (each actor must have a profile in the system). AkNOWLEDGE, TKNOWLEDGE represent knowledge that can be extracted for learners and tutors during a learning session. The qualification of knowledge is taken into account by the integration of the evaluation criteria for learners (CA) and tutors (CT). Total of qualified knowledge will be validated and archived in a knowledge repository-based ontology.

Knowledge modeling could be done through using the following relational formula:

- ACTORS = {ID_ACTORS;FIRSTNAME; LASTNAME}
- CR = {ID; LIBELE}
- KNOWLEDGE = {ID; ACTIVITIE; SOURCE; DESC}

Accordingly, we can define relational formula of the function of knowledge in align with their assessment criteria for actors, tutor and learner as follows:

- AKNOWLEDGE = JOIN LEARNER CR JOIN KNOWLEDGE ;

  = {ID; LIBELE; FIRSTNAME; LASTNAME; ACTVITY; SOURCE; DESC}.
- TKNOWLEDGE = JOIN TUTOR CR JOIN KNOWLEDGE ;

  = {ID; LIBELE; FIRSTNAME; LASTNAME; ACTIVITY; SOURCE; DESC}.

Broadcasting is made following the request of actors. The model puts the relevant knowledge at the disposal of actors for reuse.

For qualifying the extracted knowledge, we have suggested a paper which proposes the two actors assessment criteria [22].

The relevant knowledge proposed by this model is extracted from the individual and collective knowledge of educational actors. Each criterion may have a value from 1 to 5. This choice was made for the purpose of measuring the relevance of each sort of knowledge.

5. OUR CONCEPTUAL FRAMEWORK

Progress in many disciplines, particularly in the domain of education [23]. In our work, we opted for the exploitation of the ontological representation of knowledge extracted from the educational field in order to identify the best sources of knowledge. We also adopted it to automate enrichment of concepts and relationships, provide shared representations of such field and ensure the interoperability and reusability among actors and systems.

In what follows, we present our knowledge-based Ontological Framework that can be integrated into any sort of educational platform, more specifically in a learning session. This system makes extracted

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

knowledge reusable by actors as part of preparation in a learning session.

We have summed our understanding of the field in a textual form as follows: The Figure 3 in the annex which gives a conceptual model of our ontology-based Framework.

An overview of the relations of our conceptual model is described below:

- A learning object can be in the form of a course, demonstration or an exercise.
- A learning object comprises a set of activities that can be in the form of: duty, test, BD, and others.
- A learner can track multiple learning objects throughout his path.
- A learner has a note in a learning session.
- Knowledge can be that of learner or tutor.
- A learner generates his knowledge either in forums or traces etc.
- A tutor generates knowledge either in a teaching scenarios or traces.
- An activity comprises forums, lessons, databases ...
- A learning object can have multiple internal and / or external resources.
- A trace, which is the result of the learner assessment, is used for developing the skills of the learner.
- Knowledge is generated either in traces or forums
- An object of learning is linked to a learning scenario published by the tutor.
- An actor is required to have a profile in a learning session.
- An actor follows one or more learning objects.
- The forum is a means of sharing and developing knowledge among actors.
- Etc.

Our ontology can be used as a basis for production of any sort in the field of shared knowledge-based approach. Indeed, this ontology would reduce or even eliminate the conceptual and terminological confusion and ensure a common understanding to effectively adopt such approach. It also represents the design of environment of our future ontology-based e-learning system.

6. RESULTS AND DISCUSSION

6.1 Results

6.1.1 XML

The conceptual model adopted in this Framework generates a XML data file for the set of objects that can be found in our target object. For such purpose, we managed to extract a set of files; however, due to their multiplicity, we have taken into account the following models:

6.1.1.1 XML Knowledge Model

```
<?xml version="1.0" encoding="UTF-8"?>
<Knowledge Model >
<Learner Knowledge >
   <Identifier>Id-0001</Identifier>
   <Sources>Forums</sources>
   <Identifier object > Learning Object
</Identifier object >
   <Description> the learner Knowledge
extracted during the use of learning
object </description>
<Sources>Traces</sources>
   <Identifier object > Learner Object
</Identifier object >
   <Description> the learner Knowledge
extracted during the use of learning
object </description>
……
</Learner Knowledge >
< Tutor Knowledge >
<identificateur>Id-0001</ identificateur >
  <Sources>pedagogical scenario</sources>
<identif objet> Learning Object </ identif
objet >
<Description> the tutor Knowledge
extracted during the use of learning
object <Description>
</Tutor Knowledge >
 <Sources>Traces</sources>
<identif objet> Learning Object </ identif
objet >
<Description> the tutor Knowledge
extracted during the use of learning
object <Description>
</Tutor Knowledge >
……
</Knowledge Model >
```

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

This model introduces how we can extract the knowledge disseminated in a platform. The learner's knowledge exists in the traces and forums. Whereas, for tutor, we can extract their knowledge from both educational scenarios and traces.

These forms of knowledge have been defined by a meta-model for knowledge sources that we have chosen to incorporate into our ontological system.

6.1.1.2 XML assessment criterion–based model

```
<?xml version="1.0" encoding="UTF-8"?>
<Assessment criteria model >
<Learner criteria >
<Identifier>C-0001</Identifier >
<Values>1</Values >
<Description>Memoire Test</Description>
…
</Learner criteria >
<Tutor criteria >
<Identifier>C-0001</ Identifier >
<Values>1<Values >
<Description> Pedagogical
Test</Description>
…
</ Tutor criteria >
</Assessment criteria model >
```

This model reveals how one can position an actor in the system in accordance with the established criteria. This should be done through a test of prerequisite at the beginning of each training session.

6.1.1.3 XML assessment Model

```
<?xml version="1.0" encoding="UTF-8"?>
<Assessment model >
< Learner Note >
<Identifier>C-0001</ Identifier>
<Course Id>1</ Course Id >
<Note> 15/20 </Note>
<Course Id>2</ Course Id >
<Note> 12/20 </Note>
……
</ Learner Note>
</Assessment model >
```

This model of assessment highlights how to gauge learner's level for the section of a learning object, this occurs through examination in the end of module in the end of each learning session.

6.1.2 XSD (XML Schema)

The conceptual model proposed by this Framework enabled us to create a XML file schema that includes all the Classes found in our system, and the relationships among classes extracted from our system. We present above a sample of XML file schema generated by our UML model. We will focus on the knowledge model of both learners and tutors.

```
…
<xs:complexType name="TKnowledge">
<xs:complexContent>
<xs:extension base="Knowledge">
<xs:sequence>
<xs:element     name="Forums"     type="Forums"
minOccurs="1" maxOccurs="unbounded"/>
<xs:element               name="LearnerScenario"
type="LearnerScenario"             minOccurs="1"
maxOccurs="unbounded"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="LKnowledge">
<xs:complexContent>
<xs:extension base="Knowledge">
<xs:sequence/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="LearnerScenario">
<xs:sequence>
<xs:element name="idScenario" type="xs:int"
minOccurs="1" maxOccurs="1"/>
<xs:element name="nombreSection" type="xs:int"
minOccurs="1" maxOccurs="1"/>
</xs:sequence>
</xs:complexType>
…
```

In this XSD file, the existing relations among the classes, representing knowledge of learners and that of tutors, are shown. Such knowledge has been generated by the e-Learning system, namely: Forums, traces and the learning scenario itself.

6.1.3 OWL

In this stage we have conducted a lot of research on the techniques and means dealt with in the literature on which we have based the transformation of our XSD file to OWL [24]. Among the techniques we noticed for example: Topbraid that provides integrate plug-in of transformation XSD in OWL file. There is also a Framework called XS2OWL [25];

Drawing on the aforementioned techniques and tools, such transformation generated an ontology which is presented in Figure 4 and which presents all the classes useful for the functioning of our Framework.

6.2 The result opportunities

Analyzing the results achieved in our work, we have an environment developed in layers. The operational data layer and the ontological layer. This proposal together with the obtained results

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

allows us to reach an effective framework pertinent for the speed of these transactions, which is the result of initial treatment performed on the raw data. The operational data layer provides an intermediate environment for analysis and pretreatment of actor's interactions. Besides, this Framework provides reliable data due to the use of data mining techniques [38] for the raw data. Our system is made for all that is integrable into any type of e-learning system.

The ontological layer provides the semantic aspect needed for the terms extracted by the operational data layer, thus putting the extracted data into context in order to reach knowledge of the actors. The organization of this framework is easy to use since it makes two processes, the first process makes use of the wealth offered by data mining algorithms, and the second makes use of those ontologies that affect the semantic aspect of the data.

Learning such Framework is automated by the mapping techniques existing on the market. [11] Subsequently, with this latter we can measure the proper functioning of our target which will be a good intoxication relevant knowledge at the disposal of actors. We can do more work on the knowledge extracted via this system; this is for a possible recommendation of relevant knowledge.

6.3 Discussion

Our work falls within: the first of this article deals with modeling of knowledge of the actors in an online learning system; whereas, the second presents our Framework of knowledge management in a scalable e-Learning system.

In the first part, we have shed light on the following points: (1) the definition of the best knowledge sources taken to be useful for any actor, (2) the means and techniques of knowledge extraction that can be integrated into our system automation (3) the integration of the assessment criteria for each actor (4) the possibility of incorporating our system into educational content publishers.

As an example of designing the knowledge of a learner in a learning session, we have produced our system building on the abilities, qualifications and context of the learning session.

However, for making knowledge shareable in a learning session, according to the actor's profile in the system, we proposed this framework which provides services to help actors develop their skills in a learning session.

Accordingly, we are certain that our presentation, which is based on ontology, contains important elements that may be a better source of relevant knowledge to be used by an actor.

The second part of this article points out the objective of our future Framework, in which the learners or tutors can acquire a body of knowledge either individually or collectively, taking into account their needs and their position in group.

We offer continuous services which recommends relevant knowledge within educational publisher's interfaces, and which will be a means to facilitate the actor's knowledge development in a learning session.

7. CONCLUSION AND PERSPECTIVES

In this paper we have introduced a new Framework for extracting knowledge-based ontology adapted to an online learning environment. Our approach is integrated into the process of learning scenarization. This system is based on the knowledge generated in the tracks, forums and learning scenarios generated by events of educational actors as input values. Then, our system proposes the relevant knowledge as output values following the stage of acquired knowledge qualification. We opted for the ontological representation of our Framework due to its multiple uses for the extraction of knowledge.

We assume that the integration of validation process of our framework will allow for a better assessment of the degree of relevance of the knowledge acquired via the process of scenarization. This occurs through analysis and pretreatment of knowledge sources and, then, our ontology learning drawing on the techniques adapted to our context. We finished with a recommendation on the knowledge acquired by our ontology framework. This will be a subject of our approach in the further future works on the implementation and validation.

REFRENCES:

[1] D. R. Garrison and N. D. Vaughan, Blended Learning in Higher Education: Framework, Principles, and Guidelines. John Wiley & Sons, 2011.

[2] B. Riad, H. Mourad, G. Nourredine, and S. Hamid, "The scenarization: a new task for teachers," *Procedia-Social and Behavioral Sciences*, vol. 31, pp. 732–737, 2012.

[3] G. Lazar, A. Malureanu, V. Cojocariu, E. Faciu, V. Nedeff, and I. Lazar, "Designing A

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Template For Scriptwriting E-Learning Units For The Curricular Area Of Technology," Edulearn13 Proceedings, pp. 3390–3395, 2013.

[4] L. Gitelman, Paper knowledge: Toward a media history of documents. Duke University Press, 2014.

[5] S. Jazzar, "L'ontologie de l'économie pétrolière en Arabie Saoudite et analyse terminologique anglais-français-arabe," Besançon, 2010.

[6] A. Sankar and others, "A semantic approach for enhancing Knowledge management based E learning services," 2015.

[7] J. Fan, X. Liu, Y. Shen, and T. Dong, "Ontology-based knowledge management for forest channel," in Fuzzy Systems and Knowledge Discovery (FSKD), 2012 9th International Conference on, 2012, pp. 1523–1527.

[8] M. Hülsen, J. M. Zöllner, and C. Weiss, "Traffic intersection situation description ontology for advanced driver assistance," in 2011 IEEE Intelligent Vehicles Symposium (IV), 2011, pp. 993–999.

[9] F. Roda and E. Musulin, "An ontology-based framework to support intelligent data analysis of sensor measurements," Expert Systems with Applications, vol. 41, no. 17, pp. 7914–7926, 2014.

[10] S. Zhang, F. Boukamp, and J. Teizer, "Ontology-based semantic modeling of construction safety knowledge: Towards automated safety planning for job hazard analysis (JHA)," Automation in Construction, vol. 52, pp. 29–41, 2015.

[11] G. Vega-Gorgojo, J. I. Asensio-Pérez, E. Gómez-Sánchez, M. L. Bote-Lorenzo, J. A. Muñoz-Cristóbal, and A. Ruiz-Calleja, "A Review of Linked Data Proposals in the Learning Domain.," J. UCS, vol. 21, no. 2, pp. 326–364, 2015.

[12] O. Allal-Chérif and M. Makhlouf, "Using serious games to manage knowledge: The SECI model perspective," Journal of Business Research, vol. 69, no. 5, pp. 1539–1543, May 2016.

[13] L. Picard, V. Roy, P. Villeneuve, N. Jacques, M.-È. Arsenault, and P. Gariépy, "Soutenir la formation aux pratiques avancées à la maîtrise en travail social: Ébauche d'une stratégie pédagogique," Canadian Social Work Review/Revue canadienne de service social, vol. 32, no. 1–2, pp. 133–150, 2015.

[14] A. Traoré, A. Mille, and H. Tattegrain, "Assistance à la découverte de connaissances contextuelles à partir de l'analyse des traces," in IC2015, Rennes, France, 2015.

[15] J. Reason, L'erreur humaine. Presses des MINES, 2013.

[16] Y.-J. Lan, S.-Y. Fang, J. Legault, and P. Li, "Second language acquisition of Mandarin Chinese vocabulary: context of learning effects," Educational Technology Research and Development, vol. 63, no. 5, pp. 671–690, 2015.

[17] C.-W. Huang and E. Z. F. Liu, "E-Tutor Perceptions towards the Star Rural Area E-Learning Project," International Journal of Online Pedagogy and Course Design (IJOPCD), vol. 5, no. 1, pp. 20–29, 2015.

[18] M. Mahfoudh and W. Jaziri, "Approche de couplage de BD et d'ontologie pour l'aide à la décision sémantique. Contribution pour la satisf action des requêtes SQL et SPARQL.," Technique et Science Informatiques, vol. 32, no. 7–8, pp. 863–889, 2013.

[19] G. Paquette, "L'ingénierie pédagogique à base d'objets et le référencement par les compétences," Revue Internationale des Technologies en Pédagogie Universitaire, vol. 1, no. 3, pp. 45–55, 2004.

[20] A. Beloued, S. Lalande, and P. Stockinger, "Modélisation et formalisation RDFS/OWL d'une ontologie de description audiovisuelle," Les Cahiers du numérique, vol. 11, no. 3, pp. 39–70, Sep. 2015.

[21] S. Lallé, V. Luengo, and N. Guin, "Assistance à la conception de techniques de diagnostic des connaissances," in actes de la conférence EIAH 2013, 2013.

[22] A. Hadioui, S. Bennani, M. Khalidi, and E. Faddouli, "Modèle de Qualification des connaissances pédagogiques dans un système E-learning."

[23] R. Mizoguchi, K. Sinitsa, and M. Ikeda, "Task ontology design for intelligent educational/training systems," in Position Paper for ITS'96 Workshop on Architectures and Methods for Designing Cost-Effective and Reusable ITSs, Montreal, 1996.

[24] F. T. Ammari, J. Lu, and M. Aburrous, "Chapter 37 - Intelligent Banking XML Encryption Using Effective Fuzzy Logic," in Emerging Trends in ICT Security, Boston: Morgan Kaufmann, 2014, pp. 591–617.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

[25] C. Tsinaraki and S. Christodoulakis, "XS2OWL: a formal model and a system for enabling XML schema applications to interoperate with OWL-DL domain knowledge and semantic web tools," in Digital Libraries: Research and Development, Springer, 2007, pp. 124–136.

[26] A. Agrawal, A. Kumar, and P. Agrawal, "Massive Open Online Courses: EdX. org, Coursera. Com and NP_{TEL}, A Comparative Study Based on Usage Statistics and Features with Special Reference to India," 2015.

[27] M. Ji, "Exploiting activity traces and learners' reports to support self-regulation in project-based learning," Lyon, INSA, 2015.

[28] C.-P. Wei, W.-B. Lin, H.-C. Chen, W.-Y. An, and W.-C. Yeh, "Finding experts in online forums for enhancing knowledge sharing and accessibility," Computers in Human Behavior, vol. 51, pp. 325–335, 2015.

[29] C. Limongelli, F. Sciarrone, and M. Temperini, "A social network-based teacher model to support course construction,"Computers in Human Behavior, vol. 51, Part B, pp. 1077–1085, Oct. 2015.

[30] C. L. Donohoe, J. B. Conneely, N. Zilbert, M. Hennessy, S. Schofield, and J. V. Reynolds, "Docemur Docemus: Peer-Assisted Learning Improves the Knowledge Gain of Tutors in the Highest Quartile of Achievement but Not Those in the Lowest Quartile," Journal of surgical education, vol. 72, no. 6, pp. 1139–1144, 2015.

[31] A. Fernández, D. Peralta, J. M. Benítez, and F. Herrera, "E-learning and educational data mining in cloud computing: an overview," International Journal of Learning Technology, vol. 9, no. 1, pp. 25–52, 2014.

[32] J. A. Lara, D. Lizcano, M. A. Martínez, J. Pazos, and T. Riera, "A system for knowledge discovery in e-learning environments within the European Higher Education Area – Application to student data from Open University of Madrid, UDIMA," Computers & Education, vol. 72, pp. 23–36, Mar. 2014.

[33] R. Naqvi, "Data Mining in Educational Settings," Pakistan Journal of Engineering, Technology & Science, vol. 4, no. 2, 2015.

[34] V. Luna, R. Quintero, M. Torres, M. Moreno-Ibarra, G. Guzmán, and I. Escamilla, "An ontology-based approach for representing the interaction process between user profile and its context for collaborative learning environments,"Computers in Human Behavior, vol. 51, Part B, pp. 1387–1394, Oct. 2015.

[35] M.-H. Abel, "Knowledge map-based web platform to facilitate organizational learning return of experiences," Computers in Human Behavior, vol. 51, Part B, pp. 960–966, Oct. 2015.

[36] R. J. Gil Herrera and M. J. Martin-Bautista, "A novel process-based KMS success framework empowered by ontology learning technology," Engineering Applications of Artificial Intelligence, vol. 45, pp. 295–312, Oct. 2015.

[37] W.-P. Lee and C.-H. Lin, "Combining Expression Data and Knowledge Ontology for Gene Clustering and Network Reconstruction," Cognitive Computation, vol. 8, no. 2, pp. 217–227, 2016.

[38] K. Dejaeger, W. Verbeke, D. Martens, and B. Baesens, "Data mining techniques for software effort estimation: a comparative study," IEEE Transactions on Software Engineering, vol. 38, no. 2, pp. 375–397, 2012.

Journal of Theoretical and Applied Information Technology
15th November 2016. Vol.93. No.1

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

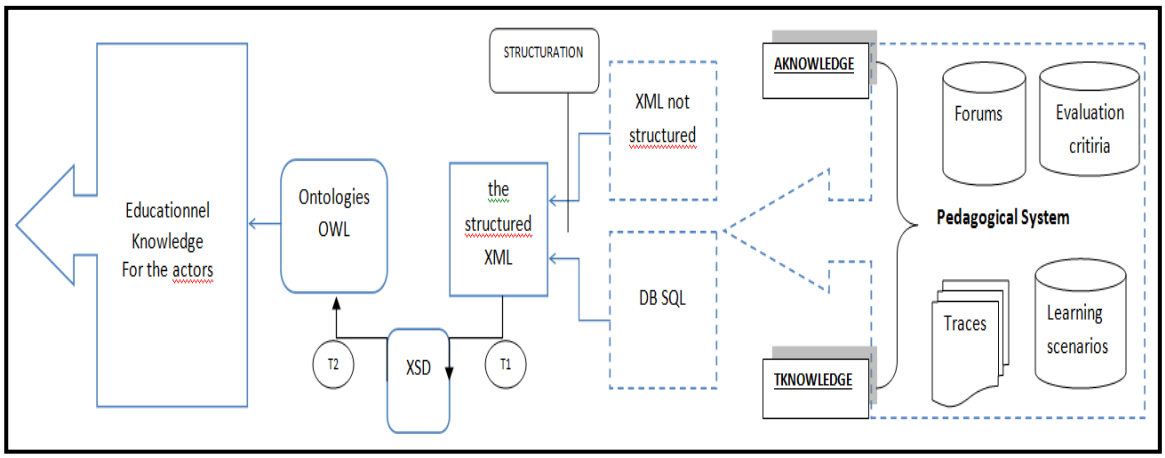

Figure 2: Framework of educational actors Knowledge Management

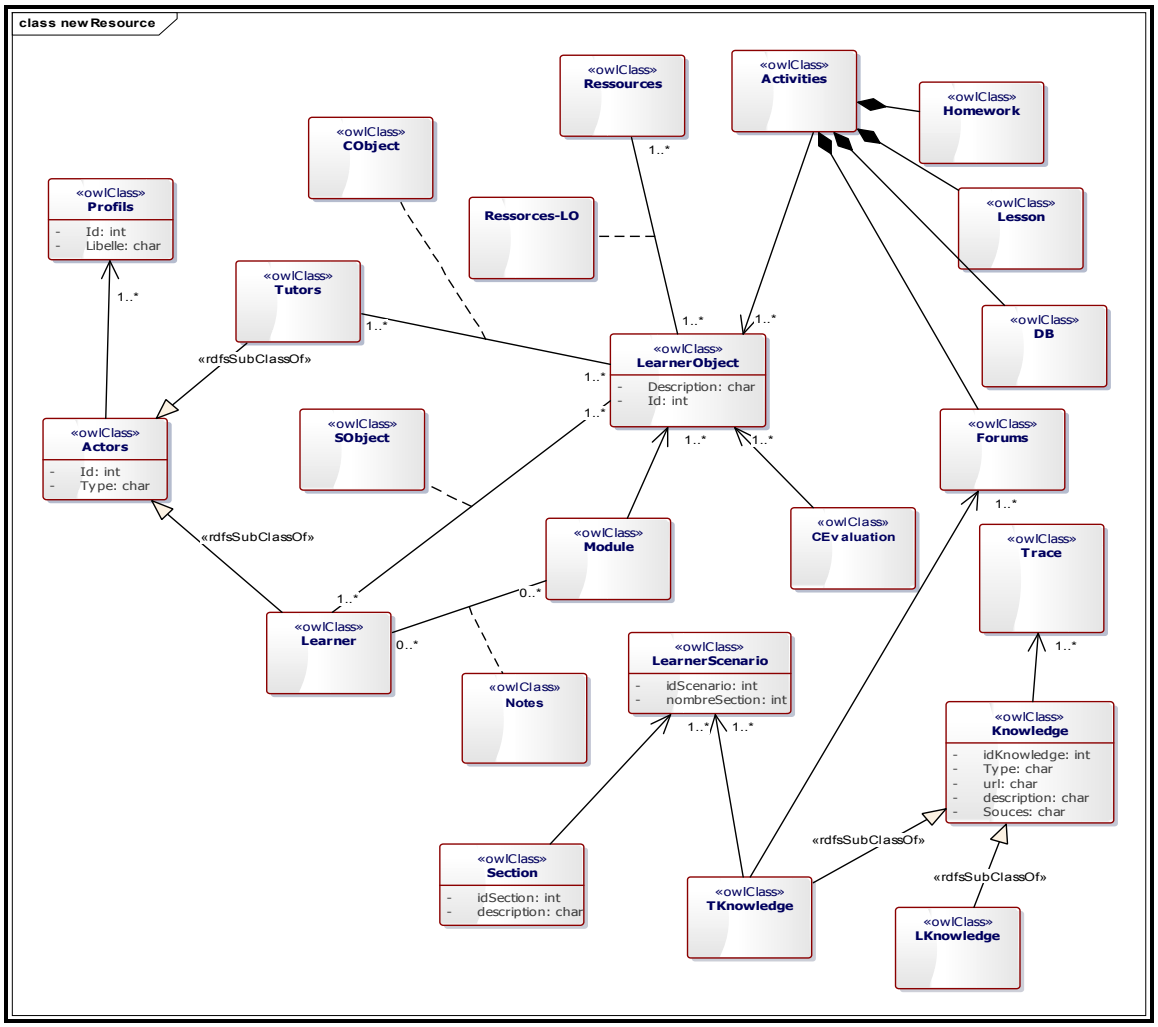

Figure 3: Conceptual model of our ontology-based Framework.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

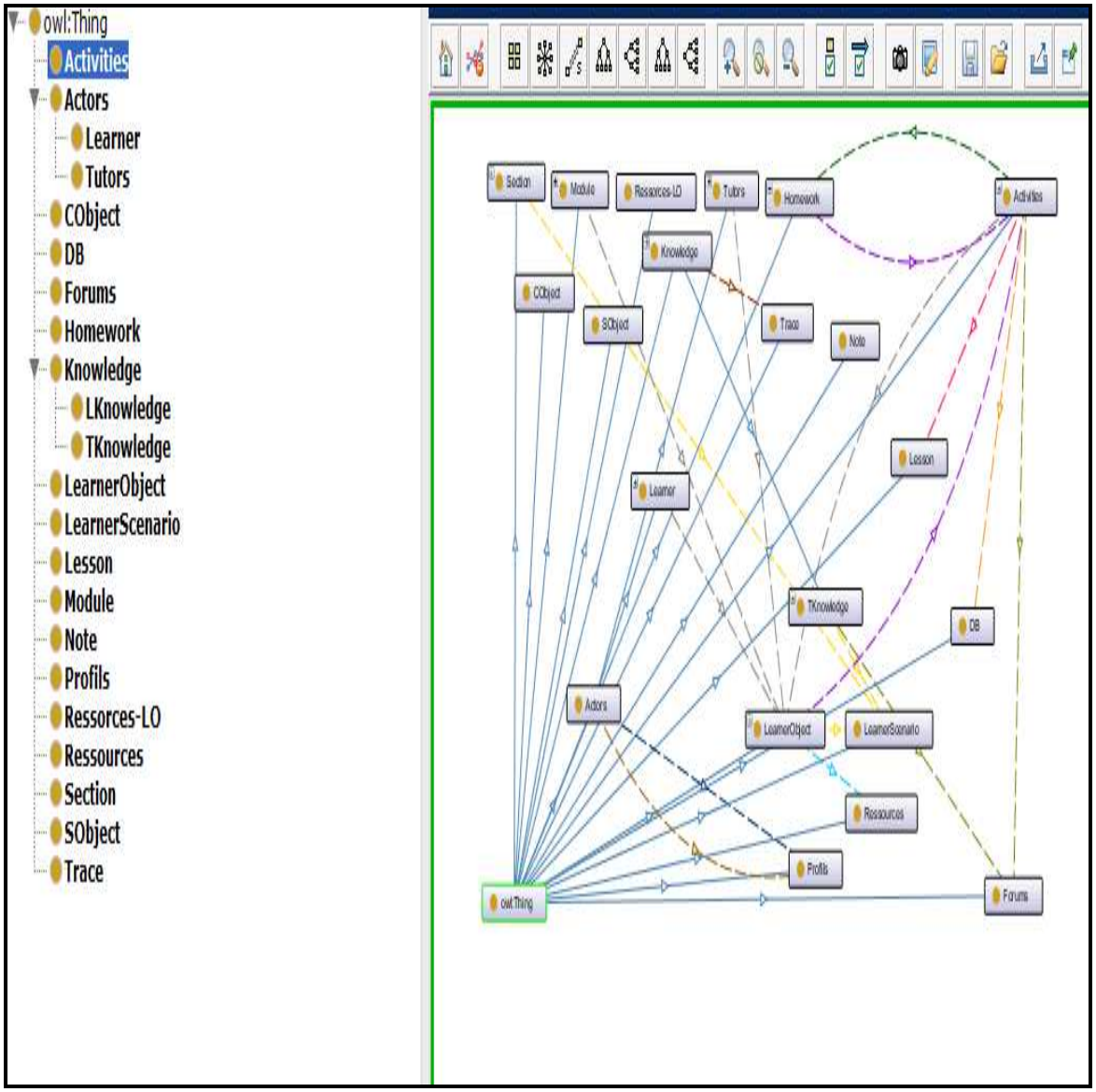

Figure 4: Ontology generated by our conceptual model