A PROPOSED MODEL OF E-LEARNING MANAGEMENT SYSTEM USING SEMANTIC WEB TECHNOLOGY

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Abstract: *Today's World Wide Web (WWW) known as Web 2.0 includes social networking sites, blogs, wikis, and video sharing sites, hosted services, web applications, and so on. It also includes E-learning Management system. It is a process in which we use the electronic medium to access the defined set of applications. Research works in the field of E-Learning are represented by a broad spectrum of applications, ranged from virtual classrooms to remote courses or distance learning. For creating E-learning management system, now-a-days we use Web 3.0 which is known as Semantic web. In this paper we represent a proposed model of "E-learning Management system using Semantic web technologies", where course syllabus, teaching methods, learning activities and learning styles are included and it will be more suitable in different learning institutions. We hope that it will provide a great feedback from both teachers and students.*

Keywords*: E-Learning Management System, Semantic web, RDF, Ontology.*

1. Introduction

Education via the Internet, network, or standalone computer. E-learning is essentially the network-enabled transfer of skills and knowledge. E-learning refers to using electronic applications and processes to learn. E-learning applications and processes include Web-based learning, computer-based learning, virtual classrooms and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. In a word, Electronic base training is known as E-learning A learner learns the instructional contents through the electronic technology. E-learning has a wide range of learning strategies and technologies; from CD-ROMS, videoconferencing, TV lectures, and virtual educational work, corporate universities and many more but our main focus is on virtual education, based on Semantic web [1].

Semantic Web is a group of methods and technologies to allow machines to understand the meaning - or "semantics" - of information on the World Wide Web. It was "invented" by Tim Berners-Lee (amongst others), a physicist working at CERN in 1980s. Furthermore, Semantic Web is about explicitly declaring the knowledge embedded in many web-based applications, integrating information in an intelligent way, providing semantic-based access to the Internet, and extracting information from texts [2].

Unfortunately, the Web was built for human consumption, not for machine consumption, although everything on the Web is machine-readable, it is not machine-understandable [3]. We need the Semantic Web to express information in a precise, machine interpretable form, ready for software agents to process, share, and reuse it, as well as to understand what the terms describing the data mean. That would enable web-based applications to interoperate both on the syntactic and semantic level. In this paper, we adopt a conceptual proposed model of E-learning Management system using Semantic web technologies such as Resource Description Framework (RDF), RDF Schema (RDFS), Web Ontology Language (OWL), Uniform Resource Identifier (URI), XML, and SPARQL.

2. Related Works

F. P. Rokou [4] *et al*. distinguished three basic levels in every Web-based application: the

Date of submission : 20.12. 2011 Date of acceptance : 19. 07. 2012

Web character of the program, the pedagogical background, and the personalized management of the learning material. They defined a Web-based program as an information system that contains a Web server, a network, HTTP, and a browser in which data supplied by users act on the system's status and cause changes. The pedagogical background means the educational model that is used in combination with pedagogical goals set by the instructor. The personalized management of the learning materials means the set of rules and mechanisms that are used to select learning materials based on the student's characteristics, the educational objectives, the teaching model, and the available media.

Juan Quemada and Bernd Simon [6] have also presented a model for educational activities and educational materials. Their model for educational activities denotes educational events that identify the instructor(s) involved and take place in a virtual meeting according to a specific schedule.

Juan Quemada's and F. P. Rokou's models [6] add more pedagogical background by emphasizing educational contents and sequences using the taxonomy of learning resources and stereotypes of teaching models. But the educational contents and their sequencing in these models are dependent on the system and lack standardization and reusability. Thus, we believe that if an educational contents frame of learning resources can be introduced into an e-learning system, including ontology-based properties and hierarchical semantic associations, then this e-learning system will have the capabilities of providing adaptable and intelligent learning to learners.

IMS and SCORM [5] define and deliver XML-based interoperable specifications for exchanging and sequencing learning contents, i.e., learning objects, among many heterogeneous e-learning systems. They mainly focus on the standardization of learning and teaching methods as well as on the modeling of how the systems manage interoperating educational data relevant to the educational process.

The IMS and SCORM [5] models describe well the educational activities and system implementation, but not the educational contents knowledge in educational activities.

For this purpose, ontology is introduced in our model. It can play a crucial role in enabling the representation, processing, sharing and reuse of knowledge among applications in modern Web-based e-learning systems because it specifies the conceptualization of a specific domain in terms of concepts, attributes, and relationships. The hierarchical (ontological) contents structure is able to show the entire educational contents, the available sequence of learning, and the structure of the educational concepts, such as the related super- or sub-concepts in the learning contents. Furthermore, some of semantic relationships among the educational contents, such as 'equivalent', 'inverse', 'similar', 'aggregate' and 'classified', can provide important and useful information for the intelligent e-learning system.

Moreover, the number of ontology-centered researches has increased dramatically because popular ontological languages are based on Web technology standards, such as XML and RDF(S), so as to share and reuse it in any Web-based knowledge system .Thus, we have devised a model that provides the contents structure using an ontology for a adaptive and intelligent e-learning system.

Followings objectives are set to achieve our aims.

1) To identify the main reasons that brought up the semantic web development,
2) To identify the problems for individual and a learner to adopt the semantic web
3) To propose a ontology based Learning management system model.
4) To test and analysis the performance of the proposed Learning management system .

3. Why Choose Semantic Web For Our Proposed E-LMS:

A new web generation, the Semantic web have a promising technique for improving the semantics Interoperability for e-learning components. Most of the Semantic web domain ontology is to receive a formal conceptualization of a single domain. The new-generation web, the Semantic web has the best capabilities for composition and reuse of

materials and contexts of e-learning. The Semantic web provides an opportunity to improve the metadata connected with e-learning materials and also expansion of the existing opportunities for e-learning stipulations [8].

Again it becomes possible to use concepts of the Semantic Web integration process in the adaptive composing of learning materials. Different specialized pedagogical knowledge becomes accessible for all interested systems over the Semantic Web. Note also that current LMSs like Blackboard Course Info or WebCT cannot be easily made intelligent educational systems not only because they lack ontological support [7]. They also lack intelligent learner modeling, reasoning and adaptively, although they do provide presentation and management of learning material and scenarios, as well as database management and administration of learners.

4. Proposed Model

In this paper we have proposed an Ontology based E Learning Management System where basic tools *administration, Instructor, Learner* are interrelated through Learning Resource (RDF) and Ontology-based Contextual Knowledge (OWL). Where each tools contains several elements that are given in the figure-1.This model is designed with six subsections. that are marked(1,2,3..6) in our Proposed ontology based E-LMS model in Fig-2.

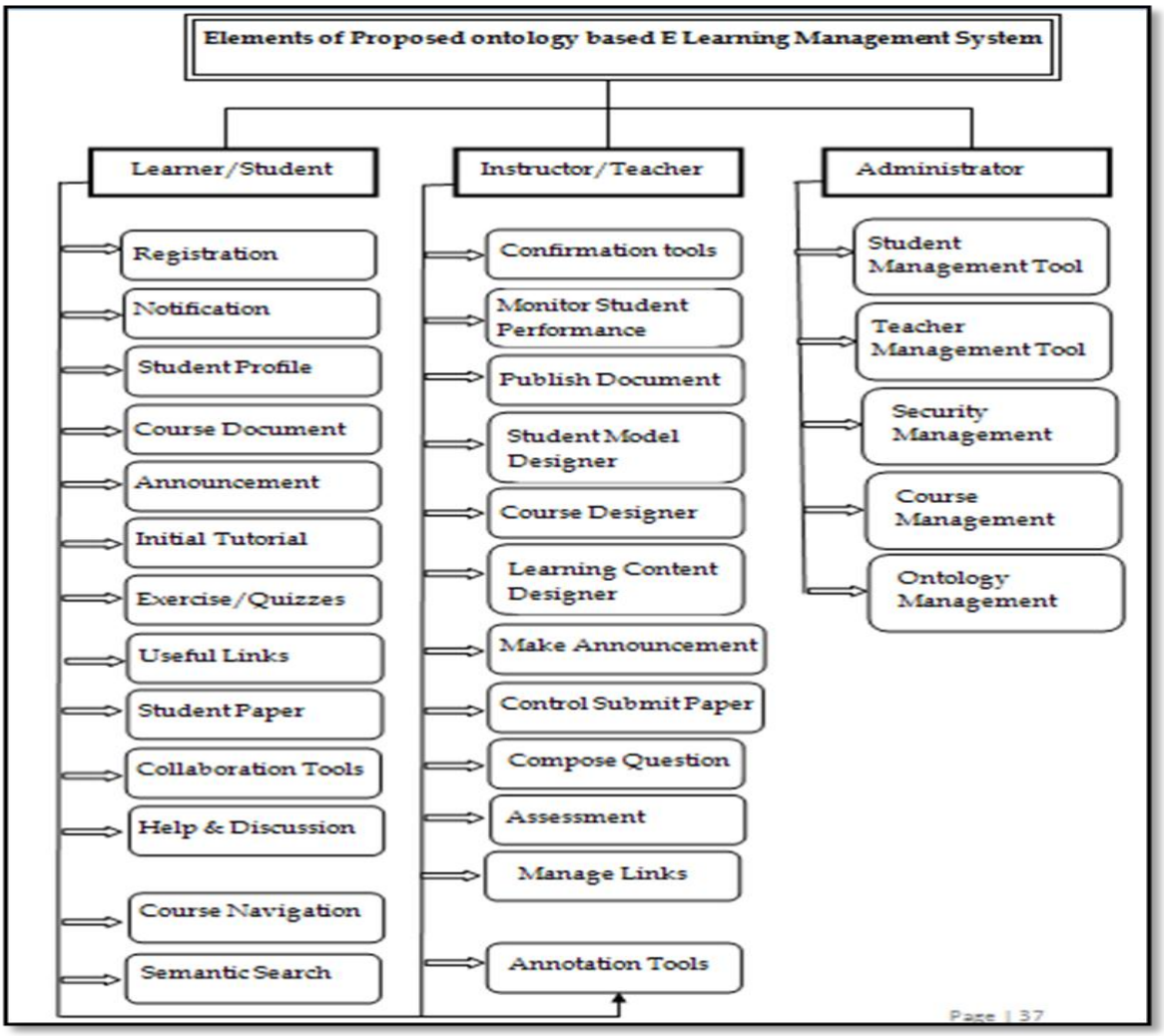

Fig 1: Elements of Proposed Ontology Based E Learning

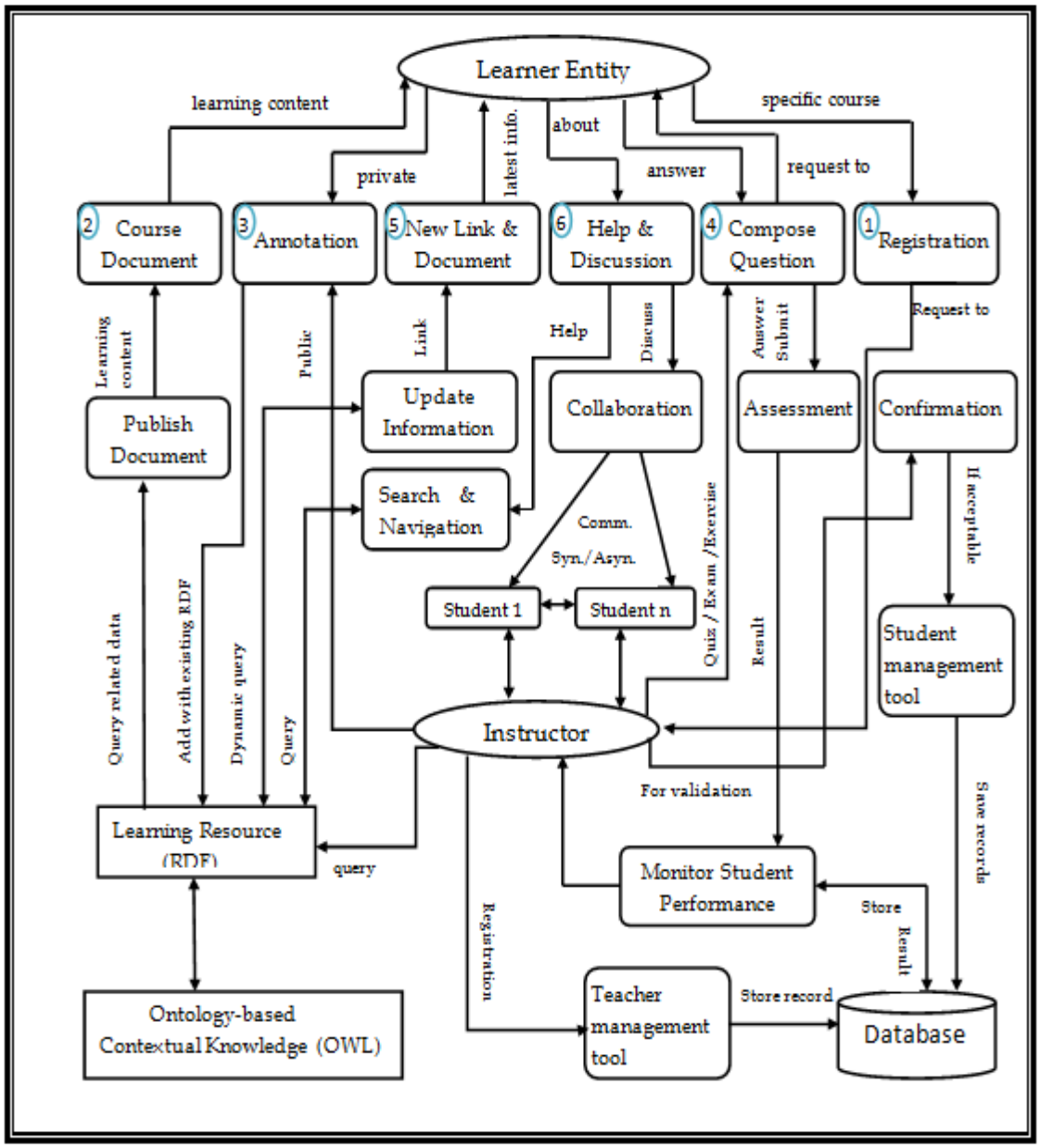

Fig 2: Proposed Ontology based E-LMS Model

The subsections are:'

1.Registration and Conformation
2.Course document distribution
3.Annotation
4.Assessment
5.Useful Links and Tutorials
6.Help & Discussion

The tasks of these subsections are given below:

4.1 Registration and Conformation

To illustrate the overall procedure, we will go through an e-learning scenario. A student first search for an online course: the broker handles the request and returns a set of choices satisfying the query. If no course is found, the user can register with a notification service. Otherwise, the user may find a suitable course among the offerings and then makes a final decision about registering for the course. Processing the registration can be seen as a

complex service involving registering with the system, creating a confirmation notification, creating a student account (authentication/ authorization), and providing learning materials. Here the figure-3 shows a model that represents how to register with our proposed LMS. Firstly a *registration* request is sent to the *Instructor* and instructor forward the request to the *confirmation tools* to check the validity of the learner. Then accept or reject message according to the result of *confirmation tools* is sent to the *notification tools.* If *confirmation tool* accept the learner request then *student management tools* under the *Administrator* parts doing the following things:

1. Create a s*tudent profile*, that is the learner get his/her learning resources after log in.

2. Save the Records to the database for further use.

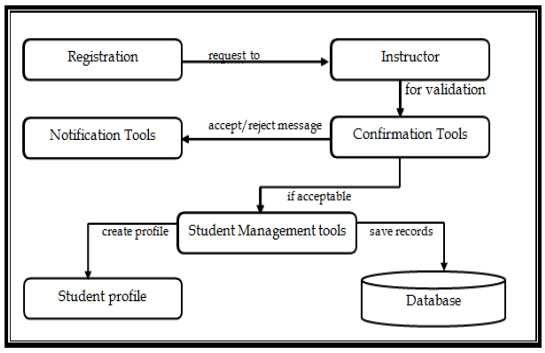

Fig 3: Registration Model

4.2 Course Document Distribution

LMSs are high-distributed systems over the Web. One course presents an integrated structure of many learning resources that can be hosted on different Web locations. The same resources can be combined with others in different courses. Also, more student groups can learn many courses at the same time. When *Instructor* finds new student under his specific course, he sends queries to the *learning resources* to search for learning content that is appropriate for the learner entity component. The *ontological knowledge* is added to the learning resources as a resource for contextual learning, and it may be searched by means of queries. Here in figure-4 shows a course document model where *publish document* sequencing the query related course document by using a knowledge base of learning resources.

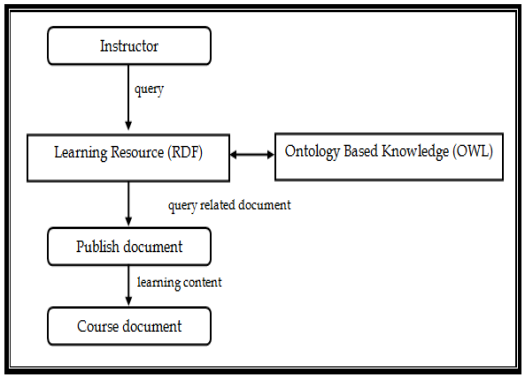

Fig 4: Course document model

To implement the knowledge base, first of all, the leaning resources have to be described by means of metadata. The metadata consists of the contextual knowledge of the learning resources. Then after completing all this procedure learning contents are delivered to the *course document* section of *Learner entity* statements to the *existing RDF statements* repository for further use.

RDF specifications provide XML syntax for writing down and exchanging RDF statements (called *RDF/XML), the repository is implemented as a set of RDF/XML files.* However, the RDF/XML syntax is quite complex and developing an RDF parser is not a trivial task. Motivated by the need for an RDF parser and automatic conversion is done by using the Jena API, rap API, etc.

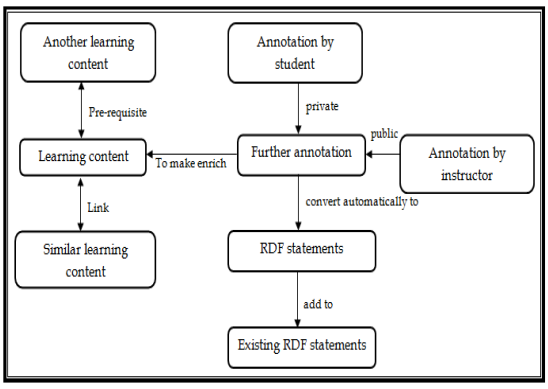

Fig 5: Annotation model

4.3 Annotation

In our proposed LMS model, annotations might include the context in which the document is placed, links toward other similar objects, the relationship to other documents (some learning contents might be prerequisites for access to others), rating (which will be updated with other users' ratings), etc.

Importantly, however, the *Learner* will also be able to add his own, further annotations to personalize and enrich the learning material and *Instructor* may also include some annotation on that particular contents.

Moreover, these annotations are not necessarily collected in one document – they may be dispersed throughout the Web. Here in the figure-5 when *further annotation* is added with the *learning content* it also **automatically converted** this additional information to the *RDF statements* and add this new

4.4 Assessment:

Main purpose of Assessment tools is to evaluate the performance of learners. Instructor provides exercises, quizzes or exam question towards learner for evaluation. Learner submits *answer script* to the assessment tools. Student may also submit papers on various topics to the *control submit paper* tools.

Here in the figure-6 after evaluating the script and paper the *assessment* tools sends result the *Monitor Student performance tools.*

Then finally the result is stored on the database and one copy is sent to the *announcement* tools for learner. In LMS, every moment the teacher can monitor his students' results.

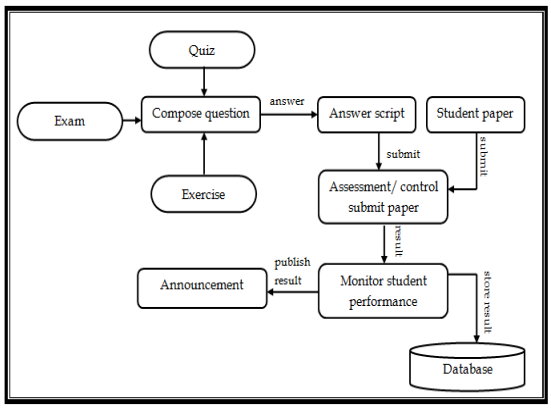

Fig 6: Assessment model

4.5 Useful Links and Tutorials

As our system is web based thus instructor may update information like useful links (displays a list of useful URL links that have been identified by the course instructors), interactive tutorial (about any course topics). All this job is performed by the m*anage Link & and other document* tool. He can modify the learning contents during the students learning.

In case new links or documents the *update information* tools does the followings:

1) When new link are added by the instructor then all related course document will be updated according to the link document.

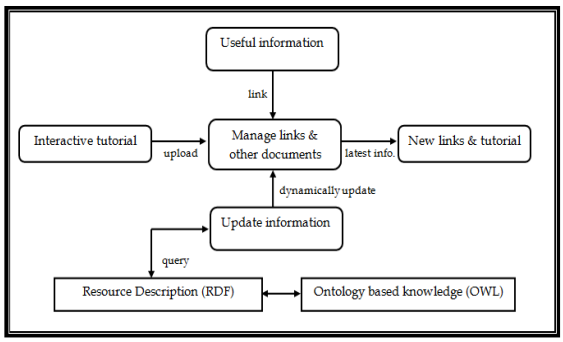

Fig 7: Useful links and tutorials model

Here in the figure -7 shows one of the most important tools of our model is *update information.* As most of the contents will initially be provided by the instructor in the form of links to small learning objects. All of these links will be annotated with RDF statements that will provide a description about the document/URL linked.

2) Especially when learners read some contents and instructor add or update link or information related to that contents then the lesson will update automatically without the request of learner.

This *update information* is not a part of *Learner* or *Instructor*, it is an autonomous tool that performs its operation when any kind of update occurs in LMS.

4.5 Help & Discussion

This tools mainly deals with learners help by means of search, navigate or discussion. Here

in figure-8 *semantic search* is used for finding contents with learner interest about any topics. *Course navigator* is used mainly for navigate through the all courses with its contents and related information. Both *semantic search* and *Course navigator* retrieve result to the learner by applying query on learning resource (RDF) and Ontology Based knowledge (OWL).

In the given figure through collaboration *tools t*he learners can also collaborate with other learners and teachers. This communication is mainly Synchronous or Asynchronous. When two or more learners or instructors are logged on, they can directly communicate with each other is Synchronous communication. But communication like e-mail to instructor is Asynchronous communication. There is also a predefined given time when *Instructors* are in online for synchronous communication with their respective *Learners*.

5. Conclusions

The main contribution of this paper is our new model for E-learning Management system using Semantic web, using the Semantic Web technology. In our paper there are two primary advantages; one is that the proposed model, which contains a hierarchical contents structure and semantic relationships between concepts, can provide related useful information for searching and sequencing learning resources in web-based e-learning systems. We hope that this proposed model will be very beneficial than other proposed model that we got from other research papers. The other is that it can help a developer or an instructor to develop a learning sequence plan by helping the instructor understand the why and how of the learning process. This proposed model will help to create E-learning management system using semantic web in any learning institutions.

Acknowledgement

Special thanks to Md. Samsuzzaman, Assistant Professor, Department of Computer & Communication Engineering , Faculty of Computer science & Engineering, Patuakhali Science & Engineering for his helpful comments on Semantic Web and E-learning. We also thank the anonymous reviewers for their helpful and constructive comments.

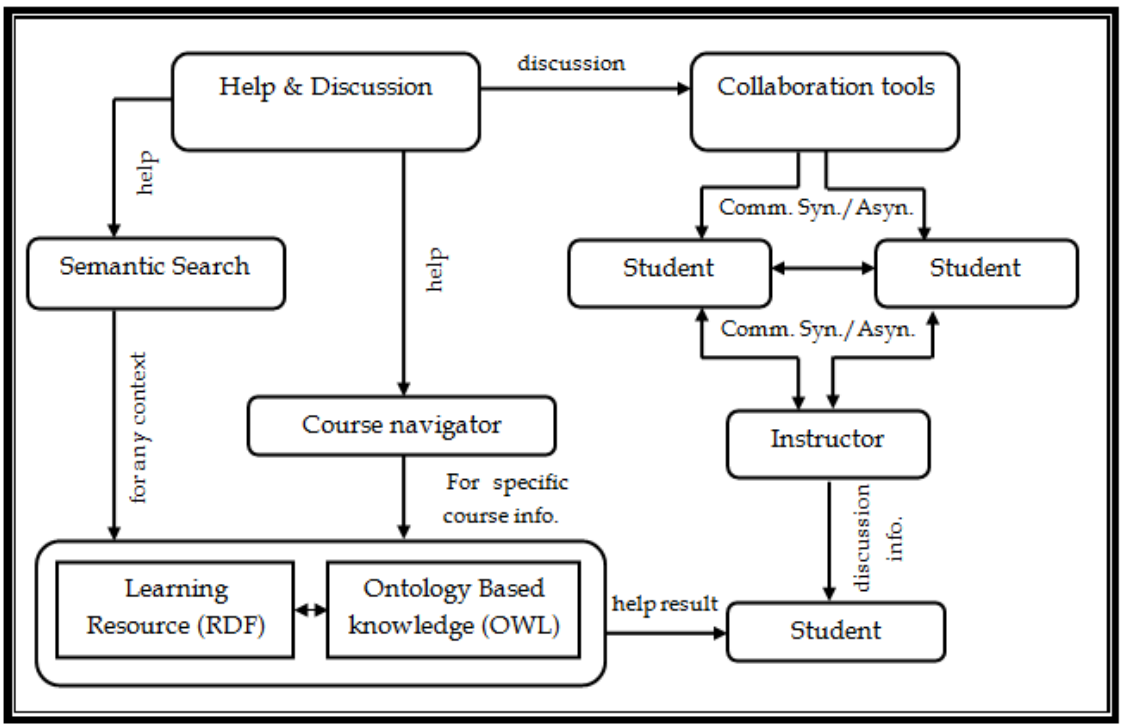

Fig 8: Help & discussion model

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