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Personalization Of Lms Using "Gnyan Sandhan"- Knowledge Management Layer

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ABSTRACT: A web based eLearning environment like Learning Management System (LMS) enables the student to learn in a self directed way without any location or time constraints. Personalization plays an important role in providing individualized learning by catering to diversity in background, skills, learning styles and preferences of individual learners. In this paper, we propose "Gnyan Sandhan", a Knowledge Management (KM) layer as a part of 'Gnyan Setu' Campus Data Grid front end user interface. The major objective of this grid is to provide a Distributed Learning and Knowledge Management environment to students and authoring support for teachers across colleges. The Gnyan Sandhan KM layer is built on top of LMS and provides learner centric personalization.
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KEYWORDS:LMS, KM**,** Gnyan Setu.

I. INTRODUCTION

Nowadays Knowledge Management (KM) becomes the power of all the systems in the world. The education system is not also being untouched with KM. Education field uses it for its innovation, creativity, teaching learning performance [1, 22]. KM is well accomplished by delivery content, knowledge sharing. A KM plays environment where it provides new knowledge form one can create new one[2]. LMS is a widely used tool which performs the function of KM in an educational Institute. LMS is a web based e-learning environment which enables the student to learn in a self directed way without any location or time constraints [3]. It provides flexible learning which is a student centered form of education. [4,5]

A typical Learning Management System (LMS) is a managed big storages of courses. Every and each course has learning material and an assessment environment to collaborate facilities like email, forum and question answering on chat[6]. The word "managed" indicates provision for administrative functions like access control for students and instructors, statistical tools for monitoring student performance, etc. Currently most of the existing LMSs provide the functionalities like Content, Interaction and Management [7,8]. The Content area addresses the display of course content their structure and their organization. The interface with interaction makes the ability to do the communication between the teacher and the learner. It also provides collaboration space which includes uploading of assignments, tests, discussion forums, etc. The section of the management caters to the essential requirement to test, examine and regularly assess the student's access to LMS, maintain and monitor their attendance and scores.

In any learning environment, diversity in the learner's knowledge is quite common in terms of the background, skills, learning styles and preferences [9]. Hence a standard LMS content may prove difficult for many students because it may not sufficiently cater to his/her levels of comprehension and synchronicity. Secondly, it is not easy for the author to cater to diverse levels of comprehension of all the students while developing a single LMS content module. Furthermore, unless the author has advance knowledge of the student's level of understanding s/he may find it difficult to provide the appropriate level of content. To resolve the above issues it is desirable that a

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typical LMS should also support selection of instructional content by the learner in case s/he wishes to digress from the standard pedagogical model.

Hence personalization plays a vital role in catering to the individual learning needs. It takes the diversified parameters into consideration. In practice two personalization models are present. In the assessment-based instructor-driven model the suggestions are taken from the information. It is given by the instructor. In the personalized space, learner driven modelallows students and learners to make an individualized view of the learning environment. It includes such as learning space and appearance costomisation, re-shuffling the contents of learning, inclusion and exclusion of learning services and also learning materials. So that everyone should feel essential for learning.

In the present paper, we discuss "Gnyan Sandhan", a knowledge management layer for personalizing LMS. This layer is proposed to act as a front end to the student, an interface to LMS and provides learner centric personalization and thus improves the efficacy of any generic LMS. The paper is structured as follows. In the next section we give a short overview of Gnyan Setu Campus Grid and personalization. Gnyan Sandhan design and implementation is discussed at length in sections 3 and 4 respectively. In section 5 we conclude with some pointers on future work.

II. GNYAN SETU AND PERSONALIZATION

The proposed Campus data grid-Gnyan Setu [10] caters to the need of providing a Distributed Learning and Knowledge Management environment among geographically dispersed colleges. This Campus grid provides a centralized repository of curriculum related instruction and supplementary learning resources which can be shared among the networked institutes. These networked resource centers are called "Gnyan Kosh" consisting of learning resources for various subjects, supporting documents, streamed videos, and related articles from technical and scientific journals as shown in figure 1.

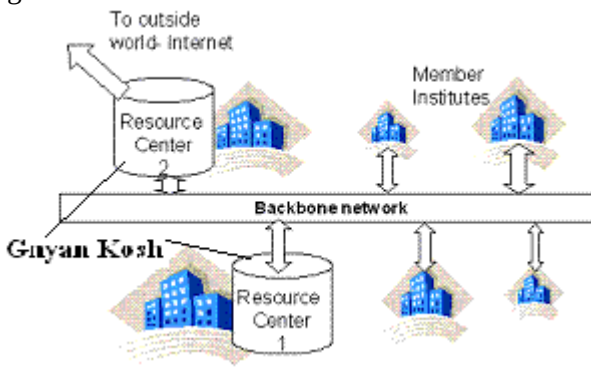

Figure 1: Gnyan Setu

The architecture of Gnyan Setu is a model of three tiers consisting of physical infrastructure, the data grid services layer and the front end portal services layer as shown in figure 2. The lower most physical infrastructure layer provides the required database storage for Gnyan Kosh –Resource Centers, backup management and mechanisms for restoring and quick recovery. Cluster servers take care of resource sharing, load balancing, reliability and fault tolerance. The data grid services layer acts as an agent to support data management, load management, resource discovery and monitoring mechanisms across the grid. The topmost layer-the front end portal services layer provides a user interface to Gnyan Setu by supporting portal services to enable the users to access the application and the grid services.

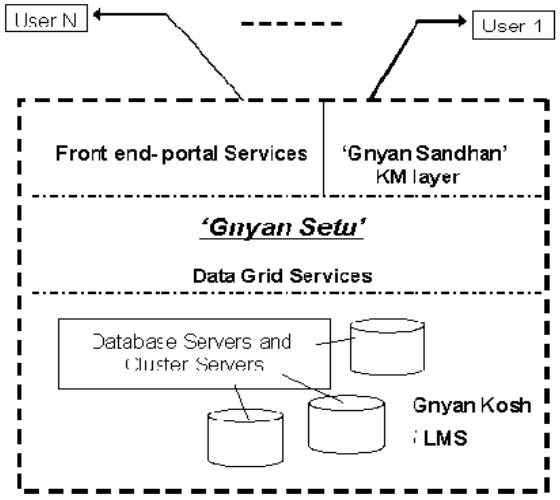

Figure 2: Gnyan Setu Architecture

The idea of Gnyan Sandhan was conceived from the initial survey of research done on existing LMS and its effective use by authors and students. To make the LMS teaching learning process effective; we felt the need to make the course learner-centered. We propose to integrate this KM Layer into the proposed 'Gnyan Setu' Campus Grid design to add value to the authors and students both by providing a personalized environment.

III. GNYAN SANDHAN DESIGN

Personalization allows the learner to choose the pedagogic view pre-decided by the author or the default view generated by the LMS [11]. The proposed Gnyan Sandhan layer is built on top of LMS to provide a personalized learning environment for the learner and also the author.

First, the LMS interconnect automatically the different Learning Objects (Los) present. These LOs compose a course to other courses in LMS. Then it builds a richer net of hyperlinks according to the requirement of students or learner. Second, it has to suggest concerned related information material to the author, so that the author builds useful linked connected references. It becomes more result oriented and productive by re-utilizing existing learning linked material [12]. However, such richer contents let the students to construct and construct more crux, complete personal learning alternative paths and ways to do accomplishment of it.

A typical LMS incorporates five main components, namely the student model, expert model, domain knowledge module, the communication module and pedagogical module. The pedagogical module is more responsible to see the principles. In most LMSs which implement sequencing techniques, the pedagogical module is responsible for setting the principles of instructional planning based on a set of teaching rules as per the course curriculum.

To make learning from LMS effective it would help to sequence the learning objects such that they make instructional sense to the individual learner. The technique of adaptive course-ware generation is utilized to provide personalization. The goal is to achieve specific learning goals after taking into account to generate an individualized course. The second goal is to get the student's knowledge- prerequisites at initial level. Based on the student's interaction and progress in the course, the Gnyan Sandhan-KM layer dynamically accumulates the course according to the student's requirements.. If the performance of the student does not satisfy his expectation/ requirements and s/he needs additional learning objects that's why the course is dynamically replaced.

We use an ontology based scheme to design the KM layer. LMS learning study materials and contents are grouped as learning objects. Contextualising these objects in an ontological manner is of primary importance for personalization to provide quality and effective learning [13,14]. Context comprises of raw data, media, structure and metadata. In any context, to express subjective views, we must come on same platform of the vocabulary i.e. common vocabulary. This vocabulary must specify what we mean. A vocabulary terms and relationships between these terms should be in a given domain. Ontology is useful for reusing and sharing of critical knowledge[15]. The utilization of Ontologies in the proposed model is the knowledge which descriptions can be noticeable by different operators and users. It is used for platform independent implementation [16,17]. Gruber [18,19] calls this ontology: it is a core ingredients part of proposed architecture. Then ontology catagorises and classifies this core ingredient in the domain of conceptual.

Metadata is for representing and guide search. It navigates of the content components of the learning objects. When courses are increased by semantic metadata, the classification of the learning content material becomes more efficient. This metadata also allows interoperability, shareability and reusability of learning objects [20,21].

A course in the LMS is basically a related resource collection consisting of hyperlinks of two types, namely internal links

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and external links. Internal links show the related material in the same course. Outsider (External) links shows the t material resources outside the course for the student.It may even outside the LMS itself. They are generally for as additional information for students. These additional information is used to know more about exact and deep some specific or difficult topics. Nowadays, both kinds of links can be constructed and build by subject author. External links are however somewhat difficult and problematic.The reason is, they are not in the hand of the author of the course. External material evolves in time.

External material cost the time. On another side, a nondyanamic compilation of outsider (external) links is almost always not satisfying the required solution. However, the author doesn't have an idea about the useful material which may be available internally or externally. This happens eventhough while the course or subjectis written properly. That's why,"Gnyan Sandhan", our proposed scheme for knowledge management plays an important role.

We have designed ontology for Computer Engineering (CE) which has a set concepts, subconcepts and superconcepts with each one having specific attributes related to each other hierarchically. We define Computer Engineering as a "Discipline" having about thirty five courses spanning over a four year period. These courses are of three broad categories first one is an Elementary, second Intermediate and third one Advanced courses. Each "Course" consists of a fixed set of "Chapters" and each having "Topics" which are the basic leaf elements- the lowest chosen granularity in the ontology that illustrates elements of the domain (which is shown in Figure 3).

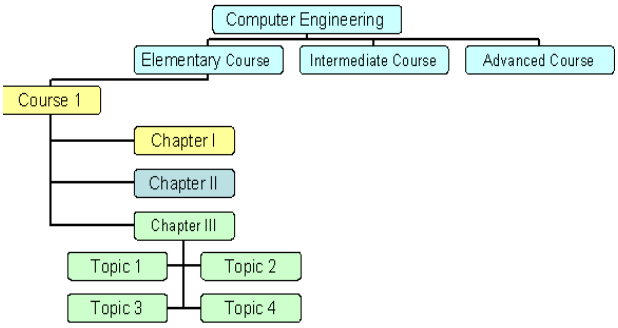

Figure 2: Computer Engineering Discipline Ontology

The association relation between data and metadata is linked and maintained by the "Catalogue". This is a data structure which relates to association for each topic with one or more topics explaining the concepts differently or containing some specific examples. Data can be contained in either the same course or another course of local Gnyan Kosh- LMS. So it might not be otherwise accessible through linked web URLs from other linked Gnyan Kosh. We do not assume how these data are put in, structured, stored and represented. The basic requirement of ours is the material and information has to be available and accessible through a web browser.

CE ontology defines the Computer Engineering discipline with a suite of courses, undertaken by students in their four year span from First Year (FE) to Final Year (BE). For each of the same number of courses falling into three broad categories as it is told earlier, i.e. first Elementary, second Intermediate and third Advanced courses. The prerequisites and the syllabus are specified as per Mumbai university norms (We can take any University). If we want to define anything of these courses, fine-grained elements and some minute level are to e identified: Course topics are the smallest part and grain elements. We have the examples are "DRAM", "Paging and segmentation" and "High speed Memories". Such topics are collected in chapters, suchas "Memory Management". Chapters are further gathered into a course like

"Computer Architecture and Organization". Courses like Digital Logic Design, Microprocessors, Data Structures, Computer Networks, Operating Systems, Data Warehousing, Databases, etc. all together fall under the banner of the Computer Engineering Discipline.

IV. GNYANSANDHAN IMPLEMENTATION

We have implemented e-content for three courses of CE curricula in Acado LMS in the initial phase with the above ontology scheme. To personalize the LMS, the KM layer requires additional three tools: a Topic Navigator (TN), a Topic Link Generator (TLG) and a Personalized Catalog Builder (PCB).Navigation in the age of the Web means following links between information objects. Interact with the information objects means using the services which the objects can offer [22].

By using ontological relations, a topic can navigate through the related one by Topic Navigator (TN). Initially we can start with learning object that can find first related topic to it . Then it goes on finding sibling objects related and associated with it. It can find out some related by using exploitation of the added ontological relations. So proposed work proposes to give additional support to the learner/students. It is done by automatically compilation a list of connected related material. This is already in the "Catalogue". A Topic Link Generator (TLG) tool does take the task of automatically executing a limited exploration of the ontology. It does it in the phases closer to the learning object where the student is connected presently and using. Ultimately, it outputs a learning materials and it's list which are related to what the learner is currently going through for the study.

Metadata contains information like title, author and format. Other metadata, particularly which is semantic metadata. This semantic metadata is for to make the (re) use of the materials. This metadata can be used by authors, by curriculum designers and by producers. These metadata are not easy to express, as they are not defined in an objective manner.

Authors can categorize and classify their learning resources by using the ontology when they produce it. However, it is better if such operation can be performed in a semiautomatic way. The final tool of the model is the Personalized Catalog Builder (PCB). It is used for testing of the learning material. It provides a simply temparory classification to be validated manually for courses available in LMS.

To provide a personalized environment, we need to give to the learner access to Gnyan Sandhan layer. In our proposed scheme, it is a part of Gnyan Setu front end. To do that, we need to decorate all the learning material that is delivered to the user with an active element that allows using the KM tools. However, in order to be able to use a generic LMS without modifying it a different solution is needed. This led us to the idea of developing "Gnyan Sandhan", to bridge the gap between the LMS and the need of the student in a personalized learning environment. The personalized web server is used. It is an live element of the web continueosly. It gets user's required requests, then forwards to the LMS.

In our implementation : Tomcat is our a servlet web server as the Broker. Whenever the he/she wish to make operation on ,"Gnyan Sandhan", they can connects to "Gnyan Sandhan" home page. This is the KM-enhanced type learning material.The learning Data material URL is asked by home page on broker. The LMS is connected in the place of user. It acecess desired page from the LMS.

All the link in the page is modified, updated accordingly. At the end of the page, it puts a button. The replacement of the links between is done by active element links and previous link. Then it passes the link as a parameter in the form of : http://brokerName/servletName?originalLink. This will redo and repeat the same operation again. This page is on by the Automatic Link Generator (ALG). This acts as a servlet running on the Broker. ALG come to know

the calling page URL. It uses the Catalogue to find out which topic(s) is the currently related with the page. While the topic(s) is/are on and known, a second query on the Catalog is going to find all the concerned material on the searching topic. This material is utilized for constructing the page. It is sent back to the user. The learning material is sorted or filtered explicitly by the user. It may implicityly be done by using the user's preferences. Hence , he/she can make a request for the material. It is only (or preferably) in a given language. He/She may ask the material belonging to some special site. User may ask and get the produced material by a given author etc.

The ALG generated pages contain a link connection to the Knowledge Navigator (KN). It is in the button form. It gives opportunities to the user to navigate explicitly the ontology. KN is simply an applet. This is downloaded to the browser. Whenever you click on the Topic, ALG generates the list of resources. This list is connected within a new browser window. Our applet visualizes only the data. Only needed material or data can be retrieved by keeping the applet lightweight. This has to be done each time and can be done by interaction on the socket of the Broker. As it is already mentioned, the KN applet has to be triggered by the user from the ALG generated page. Topic titles are taken as keywords to enable quick search.

V. CONCLUSION AND FUTURE WORK

We proposed an approach to create a personalized "Gnyan Sandhan" KM layer, a front end service to access LMS stored in Gnyan Setu, Campus Grid. This KM layer will be used to provide a personalized learning environment by supporting diversity in background, skills, learning styles and preferences of individual learners. Ontology for the CE domain is retrieved and built e-content for a few courses that show the feasibility of our approach. Development of a prototype, implementation of the detail and entire KM layer is the future work. Also, its evaluation by learners and experts is still the topics of further research.

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