



Specification of a Knowledge Management System for an Academic Institution

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Abstract: This paper establishes the need to create a self learning Knowledge Management System for an academic institution tailored to effectively meet the learning needs of the students in the current competitive environment. It goes on to propose a specification of this system, with all the major use cases and the use case diagram.

Keywords: Knowledge Management; Intelligent system; Knowledge Object; Self learning; Knowledge Based Systems

I. Introduction

There is a serious issue of student non performance in certain institutions engaged in technical education, especially in India, where the writer is located, as reported in the leading Indian newspaper, Times of India [10]. It is also well acknowledged that there is a huge talent gap in the country and fresh graduates from many colleges are not directly employable in industry, as also observed by Mehra [7]. There is a dearth of quality faculty in the field of technical education, which makes it difficult in many institutes to have a recommended student- faculty ratio; this fact has been re-iterated by Bahuguna [2].

It would be worthwhile in such a scenario to be able to devise a cost effective strategy which makes students employable without a lot of interaction with scarce faculty resources. It is noteworthy at this point that All India Council of Technical Education (AICTE), which is the regulatory body of such education in India, mandates provision of internet facilities to students on campus, as recorded by Rao [9]. The issues in student education are against the backdrop of a wealth of information available to students enrolled in recognized universities with access to Internet. Unlike a few years ago, information is now available at a very small cost. Yet, students are not able to utilize this effectively, as is evident from the reports mentioned before.

Though internet is used by students to obtain knowledge resources, locating relevant information to learn from it requires a certain amount of skill as observed by Griffiths and Brophy [6]. It is more effective when a student searches for specific targeted questions or topics but not for broad based learning. So there is need for an effective solution which is based on the inexpensive internet to a large extent and which can be tailored to the knowledge needs of the students.

II. Methodology And Learnings

From a survey conducted among 121 graduate students in computer science, the writer finds that a sizeable portion of the students are unable to utilize the various available resources effectively for self learning or in order to solve assignments set by teachers. Many avoid using the textbooks available in the institution's library and request teachers for notes. Many among them are dependent on the faculty member to deliver classes in a manner of primary classes for full spoon feeding and there are a few students who find it difficult to learn even with this.

The writer has found that in an environment where students can personally interact with teacher, their performance improves. However, this is not a scalable solution in the Indian demographics as explained before. Also there are many students from cultural backgrounds which prevent them from speaking out openly and asking for help. Then there are some students whose pace of learning is less compared to that of the majority of the class. Such students shy away from interacting with teachers and this hampers their academic growth. This also brings out the strong need for directed self learning in an offline environment.

There are differences with respect to method of learning followed hitherto by students due to differing boards of primary and secondary education followed. Also, grasp of English as a medium of instruction is different and many students are not effective because of this key skill. They avoid good textbooks due to lack of comprehension of the language. In certain institutions, especially those in rural areas and those who are not yet widely sought after in the whole country for admissions, there is homogeneity based on language, culture and region.

Following this analysis, an intelligent Knowledge Management System is proposed tailored for the knowledge needs of the college/institution. It will be based on internet resources This system will be intelligent and self leaning so as to dynamically adapt to the knowledge needs of students on an ongoing basis.

III. Literature Study

A. Knowledge Management (KM)

Knowledge Management is an interdisciplinary business model that focuses on enabling the usage of knowledge inherent within the organization to provide competitive edge, as elucidated by Awad and Ghaziri[1]. It deals with making use of the knowledge present within the documents, databases, people and processes of the organizations.

If effectively managed, available knowledge can be harnessed without the need to re-invent the wheel. This necessitates capture of knowledge in usable formats, ease of locating and accessing knowledge and knowledge experts and continuous updating of the knowledge to retain its validity in dynamic environment. If a knowledge asset can be re-used, there will be ROI in terms of increased productivity. This is due to avoidance of wasted effort in re-creating available knowledge from scratch. This leads to lesser losses in terms of cost as well as time. This also motivates creation of new knowledge, when current knowledge is readily available to improve/update/innovate.

B. Knowledge Management in Academics

The current academic environment as detailed in the Introduction impresses the importance of knowledge management in order to achieve increased productivity of students. There is research happening internationally on the need and effectiveness of KM in the academic environment. In the Indian scenario in particular there is evidence to suggest that Knowledge Management is important for long term sustainability of the academic institution as per Basu and Sengupta [3]

As per Buzzetto-More and Pinhey [4], a learning object is a knowledge based object that is self contained and re-usable. In the context of Knowledge Management, Debowski [9] states that Knowledge Objects are the explicit knowledge artefacts that are the outcome of knowledge creation. Knowledge Objects are also re-usable.

C. Artificial Intelligence

Artificial Intelligence is also known as machine intelligence, computational intelligence and includes (intelligent) agent-based systems, software agents and robots. This is as per Poslad [8]. Artificial intelligence is inspired by Human Intelligence, by the unique capability of humans to think and reason.

Artificial Intelligence is capable of self learning about the contexts, can reason about events, form conclusions and act based on them. The contexts can be of physical environment, human or computer context. AI incorporates learning algorithms which iteratively improve themselves after each use. Learning systems, also known as machine learning incorporate a typical control system. These systems require sensor component(s) to measure current performance, comparators to compare with benchmark and actuators to use the difference in order to effect change leading to improvement.

An Intelligent Agent has been defined as a software program that can perform specific tasks for a user, and possesses intelligence to be autonomous and interact in a useful manner with the environment, in the book edited by Girija [5]. Multi agent based technology can be used such that one type of agent caters to a specific category of functionality of a KMS. Different kinds of agents can be used for Information retrieval, information filtering and personalization of web agents [5].

IV. Specification Of The Proposed System

A. Overview

There are 3 distinct stages through which the proposed Knowledge Management system passes. At first it is captured or created from a variety of sources e.g. it can programmatically be captured from the internet or it can be created in an original form by students and teachers. The capturing module should extract only authentic documents relevant to the topic. Thus captured/created, the knowledge object needs to be codified such that it can be used effectively by knowledge workers who in this case are students and teachers.

Codification includes initial data cleansing to remove redundancy and application of algorithms to ascertain relevancy and ignore irrelevant material. It creates metadata for the knowledge object and fits it in the right position in the taxonomy. It saves the knowledge object with metadata into the knowledge repository. This also involves presenting the knowledge objects such that relevant articles are more prominent.

The third stage involves the actual knowledge transfer, sharing and evaluation. Knowledge transfer is achieved through user friendly web pages. Collaboration is achieved through tools like collaborative documents, mails, forums. Evaluation is achieved through features which enable users to rate relevance and quality of the knowledge objects. This stage gives feedback to other stages for quality control and intelligent self learning. Feedback given by students and teachers should be gathered over a period of time, and inference based on this performed to normalize the feedback given. The reasoning logic will consider the tendency of students to give a certain type of ranking to K.O.s, for example some students have a tendency to have extreme dislike or are perfectionists, and some give ratings in an absent minded manner. The KMS should gather intelligence from this and infer the reasonable rating of the K.O. based on such propensity of individual students. The same logic can be applied when the users are teachers.

B. Actors of the proposed KMS

The Primary Actors are Student, Teacher, Group (of students). The Supporting Actors are Teacher Expert, Student Expert and Knowledge Champion. Teacher Expert is a teacher who has special privileges of approving any knowledge object submitted by students before it can be shared on the KMS. Profile of teacher expert will be uploaded. Student Experts are students who have their profiles available on the system. It will be possible for others to send message related to a knowledge object to experts. Knowledge Champion has authority to create taxonomy, configure Intelligent Agent etc.

C. Use cases of the proposed KMS

1) Knowledge creation

- Manage knowledge taxonomy

This should enable the Knowledge Champion to Create/Update/View/Delete items in the knowledge map/taxonomy.

- Create categories of knowledge objects

The system should show default categories - notes/articles, exercises with solutions, unsolved exercises, animations and videos.

- Manage list of sources of knowledge

The Knowledge Champion should be able to create/update/view and delete list of websites which serve as sources of knowledge.

- Intelligent Knowledge Agents

There should be intelligent Agents deployed as part of the iKMS which will periodically monitor the source sites and other sites to find new knowledge objects belonging to the set category and topics of the taxonomy. Authentic and relevant documents should be shortlisted to become knowledge objects, by the agent. Such artifacts will then be updated into the Knowledge Repository as knowledge objects.

- Intelligent Knowledge Taxonomy Agents

There should be intelligent Agents deployed as part of the KMS which will be periodically monitoring the source sites and other sites to find changes in taxonomy. These will then be updated into the Knowledge Repository.

- Control Intelligent Agents

System should give option to the Knowledge Champion to Start/Stop intelligent agents deployed as part of the system for maintenance or trouble shooting reasons.

- Schedule Intelligent Agents

System should give option to Knowledge Champion to decide the schedule of the intelligent agents monitoring the internet.

2) Knowledge codification

- Determine relevance of the K.O.

System should use an appropriate algorithm to find relevance of K.O.s for the topic and store the relevance in the metadata of the K.O.

- Data cleansing

System should remove data redundancies in the knowledge repository by ignoring duplicate/very similar content.

3) Knowledge sharing

- View Taxonomy and K.O.s

System should enable students to navigate the knowledge taxonomy in chart form and text form. The K.O.s should be listed, viewable and rate able.

- Search for articles in a topic

System should enable all actors to search for a topic in the taxonomy.

- Create and submit K.O. individually and in Groups

System should enable students to collaborate in groups to create knowledge object through collaborating tools like documents and mails.

- Approve/Reject K.O.

System should enable teacher expert to approve/reject K.O. as appropriate. System should update status for submitter to view.

- Manage K.O.

System should enable teacher expert to manage (add, delete, update, view) URLs of K.O.

- Manage profile

System should enable teacher expert and student expert to add and update their own profiles for all users to view.

- View profile

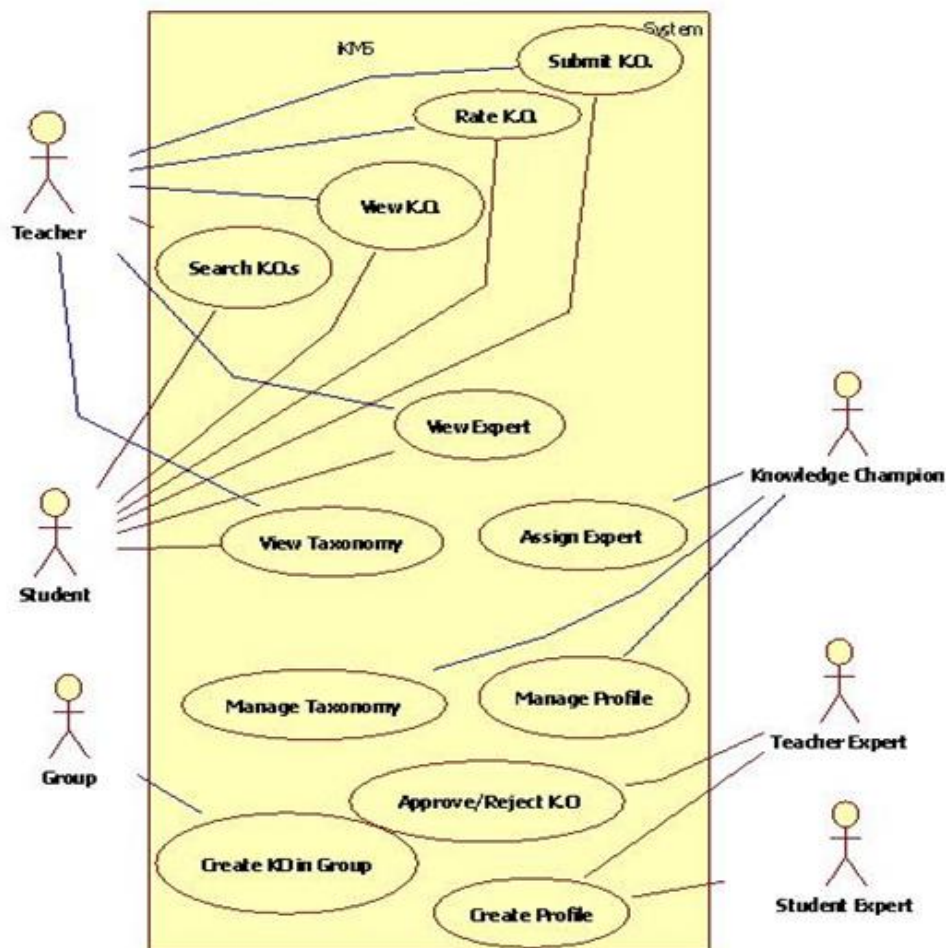
System should enable all users to view profiles by topic of expertise.

- Update Taxonomy

System should enable the teacher expert to update taxonomy. Status should be updated, if it was in response to a request.

- Retrieve previous revision of K.O.
- System should enable teachers, teacher experts and Knowledge Champions to retrieve any previous revision of a knowledge object.
- View archives
- System should enable teachers, teacher experts and Knowledge Champions to view archives.
- Conduct discussions on K.O.
- System should provide discussion forum with a the K.O. title set, to enable students , either individually or as group to have discussions or ask questions related to the specific knowledge object and find answers in a collaborative manner.
- Communicate with Expert
- System should enable all users to send message regarding any knowledge object. Expert should be able to send reply.
- 4) Administration
- Registration
- System should enable all users to be registered into the system.
- Authentication
- System should enable all users to be authenticated into the system, if they are successfully registered.
- Allocation of experts
- System should enable Knowledge Champion to allocate teacher(s) and student (s) as expert in a topic
- Manage Expert Profile
- System should enable Knowledge Champion to add/update/view and delete profile of experts.
- Access Control
- System should enable Knowledge Champion to manage access control of K.O.s.
- Maintain archive
- System should enable the Knowledge Champion to archive K.O.s

Figure 1: Use Case diagram of proposed Knowledge Management System for an Academic institution



V. Conclusion

The study conducted as part of this work to understand the needs of the student profile, validated certain assumptions that the writer had, as well as dispelled some of them. A major assumption which got validated and formed the basis for subsequent work on this was that students did not prefer to restrict themselves to lectures. They keenly felt the need for learning material suitable for self learning. The fact that they had comprehension issues with complicated English language was also validated. The study found that majority of the students felt that internet had a vast resource pool but they avoided using it as it was time consuming. It also invalidated the perception that students did not use textbooks at all. It came out that they preferred textbooks with simple language. For the same reason, they preferred books by Indian authors when available.

An interesting discovery of this study was the huge popularity of group study. Also it was evident that students trusted the opinion of other students. This could be in part due to the evaluation system in this university which does not include relative grading, which might be leading to better cooperation among students. This study brings out recommendations for all faculty members to identify relevant knowledge objects available on the internet apart from developing new ones.

Hence the development of an intelligent Knowledge Management System which has functionality suited to the learning behavior and preferences of students would be useful for them for effective learning and knowledge acquisition.

VI. References

- [1] Awad, Elias M and Hassan M Ghaziri. Knowledge Management. Delhi: Pearson Education, 2004.
- [2] Bahuguna, PP. "Faculty Crunch in Technical Institutes in India and Possible Solutions." India Education Review. available online at <http://www.indiaeducationreview.com/article/faculty-crunch-technical-institutes-india-and-possible-solutions> accessed on 29 Jan 2014
- [3] Basu B and K Sengupta. "Assessing Success Factors of Knowledge Management Initiatives of Academic Institutions – a Case of an Indian Business School." The Electronic Journal of Knowledge Management 5 (2007): 273-282. available online at www.ejkm.com.
- [4] Buzzetto-More, N.A., and K. Pinhey. "Guidelines and standards for the development of fully online learning objects." Interdisciplinary Journal of Knowledge and Learning Objects, 2 (2006): 96-104.; Paris, France.
- [5] Girija, N. Web Mining - an Overview, Hyderabad, India : ICFAI University Press, 2006: 26-34.
- [6] Griffiths, Jillian R. and Peter Brophy. "Student Searching Behavior and the Web: Use of Academic Resources and Google." LIBRARY TRENDS 53 (2005): 539-554.
- [7] Mehra, Lokesh. "Bridging the skills gap with industry: Academia partnerships." CISCO Knowledge Network. available online at http://www.cisco.com/web/IN/about/network/academia_partnerships.html accessed on 29 Jan 2014
- [8] Poslad, Stefen. Ubiquitous Computing: Smart Devices, Environments and Interactions London: Wiley, 2009.
- [9] Rao, G. Babu. "AICTE'S New Regulations - A Critical Study." Pratibhaplus Articles 16 Mar. 2011. available online at <http://www.pratibhaplus.com/Articles.aspx?ArticlesID=577>, accessed on 29 Jan 2014
- [10] Staff Editor "Govt. to turn heat on self-fin colleges" Times of India [Kerala, India] 07 July 2012, Kochi ed.: 1. Print.