

Creating a Knowledge Base to Enhance Knowledge Sharing: A Case Study of Computer Department at Kathmandu University

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Abstract

Knowledge Management (KM) is a process of development, retrieval, storage and improvement of knowledge and information from various sources within an organization. Knowledge storage for future usage is one of the basic motives behind knowledge management. KM has many useful domains and one of those domains can be its usage in creating effective learning environment in universities. Different batch of students pass every year and during this, they need to go through different academic activities. If managed in a proper way, knowledge from one generation of students can be transferred to another generation of students. This can be performed in many ways and one can be by the creation of web based knowledge-base. So this paper proposes to create a knowledge-base that can be used by many generations of students for their academic purposes in universities. A website with functions like posting problems, suggesting solutions, rating, commenting and reviewing on selected subject topics, if developed and used for a long time and by many generation of students, can turn itself into a dynamic knowledge-base, where a user can find relevant information on his/her subject matter.

Keywords: Knowledge management; Knowledge base; Knowledge repository; Certainty based marking

Introduction

Knowledge can be thought of as information combined with experience, context, interpretation, reflection and is highly contextual. It is a high value form of information that is ready for application to decisions and actions within organizations [1]. The most important source of wealth in the contemporary post capitalist society is knowledge and information [2]. Knowledge Management (KM) is a process that helps an organizations to find, select, organize, disseminate, and transfer important information and expertise necessary for activities such as problem solving, dynamic learning, strategic planning and decision-making [3].

Knowledge within an organization remains within the people it constitutes and for a university; it is mainly the faculties, students and researchers. The explicit work they produce is in the form of reports, research papers, thesis and other paper and electronic documents. Both business and academic communities believe that by leveraging knowledge, an organization can sustain its long term competitive advantages. The knowledge from these sources can be shared and transferred to the new generation of students and researchers. A lot of energy in KM has been spent on treating knowledge as an entity separate from people, who create and use it. The typical goal is to take documents with knowledge embedded in the memos, reports, presentation, and articles and store them in a repository, where they can be retrieved easily. Another less structured form of knowledge is the discussion database, where participants record their own experience on an issue and react to others comments [4]. So for the capture, transformation, and distribution of highly structured knowledge that changes rapidly, computers are more capable than people. They are increasingly useful though still a bit awkward for performing these same tasks on less structured textual and visual

knowledge. But it is still the case that most people don't turn to computers when they want a rich picture of what is going on in a particular knowledge domain [4]. To improve the effectiveness of knowledgeable experts, information systems groups at several organizations have started creating databases for knowledge, information maps and custom-made applications [5]. The knowledge base if indexed with many variables like subjects, its contents and experts related with it, can serve as a knowledge source for many students and researchers so that they can utilize the past knowledge developed in that particular subject matter. This will be beneficial for teaching staffs, students and researchers in their work. Development of a simple website with features like posting problems, their solutions, lecture slides and articles, research papers, ratings of solutions from experts and users, when developed and used for a long period of time, can turn itself to a dynamic source of knowledge; in other words, to a knowledge base. This knowledge base will be helpful to those students and researchers seeking knowledge in those subjects which has been stored to the base. These websites with features like rating from users and reviewing from experts will make knowledge content more reliable as experts in particular subjects will review the content. In addition, users using the content will rate it and suggest positive or negative view on that subject matter. Based on those variables, solution content can be rated and selected for future use by a user. This base will also help to find and consult proper expert in a subject matter, if available in the knowledge base. So this research proposes a web portal, which serves as a knowledge base when used by students, researchers and experts. The users of the knowledge base will be:

- Students
- Faculties
- Researchers

The portal will have following features:

- Posting lecture slides and assignments by respective teaching staffs.

- Problems posted by users.
- Solution to the problems.
- Problem topics and its solutions.
- Posting research articles.
- Reviewing and rating articles.
- Rating calculation based on the feedbacks given by experts, users.
- Storage of past problems and solutions.
- Categorical storage of experts based on their area of expertise.
- Categorical storage of subject matters.
- Searching based on subjects.

Methodology

The paper proposes an implementation of certain components of knowledge management like expert selection, knowledge transfer, and knowledge creation for the effective knowledge sharing in computer department of Kathmandu University. The system needs to be developed in different phases. The paper proposes the following phases for the development and implementation of the system.

Phase 1: A simple blog with contents regarding the lecture

The first phase incorporates the idea about developing, designing and implementation of a website which will take the form of a blog. The blog is to be primarily maintained by the lecturers in the university. Each lecturer is to be given task to maintain the contents regarding his/her subject.

Step 1: User login: To validate the user and for the uniformity of the mail used, the users should first get their university mail (@ku.edu.np in this case) to access the system [6]. Once access to the system is given to the users depending on the type of user the course materials can either be uploaded or viewed by the personnel.

Step 2: Profile on the lecturers: To enhance expert identification process, profile of each lecturer containing his field of expertise can be updated in the website. The lecturers will update their mailing address of Kathmandu University in their profile thus bringing uniformity and any external person can easily get in touch with the lecturer.

Step 3: Updates on lectures: The portal is to be subdivided into categories as per the schools running under the supervision of Kathmandu University. They then will be further divided into departments under the category schools. Each department will provide a course booklet containing the information about the subjects taught in each semester. Each course will be provided a short description along with the names of teachers who have/are supposed to teach the subject. In addition, the course will be presented with its syllabus and the evaluation system and the lectures prepared by the teachers will be presented alongside. The updated lectures prior to the class can help students to be prepared and thus will help gather the materials required for the upcoming lecture. This will encourage knowledge sharing and the students can present their ideas regarding the topic.

Phase 2: An interactive bulletin board

The second phase is about giving the portal a better and a newer perspective with a better design and additional functionalities. This phase is primarily designed for the students where the students can get detailed knowledge about any topic. The questions proposed by a student can be reviewed by other students, alumni, staffs and teachers

as well and get responses for the topic. This interaction methodology can enhances knowledge sharing.

Step 1: Online discussion: Students can put as much queries as they want which can be attended by other student users as well. Hashtags can be used for the maintenance of the ratio of questions asked to answers received we can make use of the topics will be pre-listed with hashtags. For any questions to be asked the user will have to look for the hashtags and use it to put forward queries regarding the topic. To eliminate the probability of the repetition of the question and limit the scope of the queries the list of other similar questions asked previously regarding the topic will be displayed alongside which could even contain the answers that user was searching for. A thread is to be opened for each question where other student users including the teachers can give their view and the student will most probably get the answer he was looking for.

Step 2: Sharing of tricks and tips: Students usually learn the course materials from YouTube or find them on Google. These materials can be shared with other students as well. It is not a compulsion for students to memorize everything that was taught, since there are always the easier and fun ways to do a task. So for this purpose an additional section is created that allows the students to learn from the tricks and tips that are shared by other students or teachers themselves.

Phase 3: Teacher's role and evaluation strategies

In a longer run there might be ambiguity and unnecessary questions can be posted. To help reduce the chances of occurrence of such things, the faculties are provided with some privileges. The validation of the questions asked can be done by the teachers.

Step 1: Review and rating: The system of review and rating can be implemented to validate the information. For any information that is posted there can be rating and review system. Rating is done by all the students themselves. The ones with low rating can be eventually removed from the system. Review is done by the expert and the ones which are passed can then be uploaded on the knowledge repositories.

Step 2: Expert system: Expert must be identified in order to verify the information flowing in the system. A problem might arise when the load of verifying all the information is given to just one person. A solution can be forming a team of experts consisting of the subject teacher and a group of selected students decided by the students. In the case of Kathmandu University, this paper proposes two types of experts: students and teachers. The subject teacher can be considered an expert. However, for a student to be considered an expert, the following criteria must be met:

- The student must have completed the given subject of interest and/or
- The student's account must have a high rating

Step 3: Evaluation strategies: Interactive tasks with the students can be performed by the teacher using the platform such as online discussion regarding certain topics. Student can be evaluated by the teacher based on the activity of a student i.e. the questions asked by them, their responses to others queries. So it can help to evaluate a student. In addition, the students can be asked to create their own blog and update the solution of their assignments in separate blog. Plagiarism can be kept in check by this method as the student is less likely to copy their friends' assignment when published in a blog with the timestamp on it. Certainty Based Marking (CBM) [7] is proposed for this situation.

Certainty-Based Marking

CBM in Moodle is based on strategies developed by Prof. Gardner-Medwin at UCL (London, UK). After each answer, teacher says how sure they are that students answer is correct.

- This is on a 3-point scale: C=1 (low), C=2 (mid) or C=3 (high).
- It does not rely on words like 'sure' or 'very sure' because this can mean different things to different people.
- The mark scheme and the risk of a penalty determine when each C level should be used: (Figure 1).

Certainty level	C=1	C=2	C=3	No Response or 'No Idea'
Mark if correct	1	2	3	(0)
Mark if wrong	0	-2	-6	(0)
Probability correct	< 67%	67–80%	>80%	-
Description	Unsure	Mid	Quite sure	-

Figure 1: Score given according to level of confidence [7].

- Certainty levels 1, 2, 3 always give marks 1, 2, or 3 when correct.
- If a student is wrong, then unless the teacher opted for C=1, he/she will lose marks: -2 at C=2 and -6 at C=3.

Why use CBM?

- To make students think about how reliable their answer is.
- To encourage students to try to understand the issues, not just react immediately to a question.
- To challenge: if a student won't risk losing marks if wrong then they don't really know the answer.
- If a student is a careful thinker but not very confident, they will gain confidence.
- It is fairer - a confident correct answer deserves more marks than a lucky hunch.
- Students need to pay attention if they make confident wrong answers: think, reflect, and learn.
- Efficient study requires constantly questioning how our ideas arise and how reliable they are. How to decide on the best certainty level
- If the student is sure, obviously they do best with C=3. But they will lose twice over (-6) if they are actually wrong.
- If unsure, the student should avoid any risk of penalty by choosing C=1
- In between, the students are best to use C=2: you gain 2 or lose 2 depending on whether they are right.

- The graph shows how the average mark at each C level depends on the probability that the answer will be right (Figure 2).

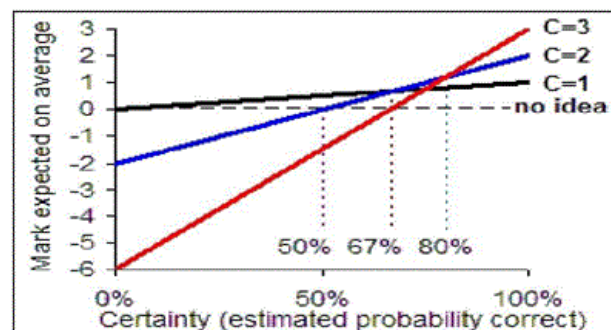


Figure 2: Marking with respect to certainty [7].

- Suppose the student thinks they only have 50% chance of being right: The highest graph for 50% on the bottom scale is black (for C=1). So they will expect to boost their marks on average most by acknowledging their certainty (C=1).
- If they think they can justify their answer well, with more than an 80% chance of being correct, then the red graph is highest, for C=3. Opt for this.
- The students can't ever expect to gain by misrepresenting their certainty. If they click C=3 (the red line) when they aren't sure, they will expect to do badly - with very likely a negative mark. They might be lucky; but on average they will lose marks. If they understand the topic well, and think their answer is reliable, then they will lose if they opt for C=1 or C=2 rather than C=3. The students will do their best if they can distinguish which answers are reliable and which are uncertain.

Feedback about CBM performance

- If CBM with feedback given is used after each answer, then the mark tells the student a lot: -6 will make them ask how they justified confidence in a wrong answer.
- If they repeatedly get answers right with C=1, then ask yourself if perhaps they know the subject better than they think.
- When submitted, the students will see their percentages correct for each C level they used. Ideally these might be around 50%, 70%, 90% for C=1,2,3 whether you know the subject well (lots of answers at C=3) or poorly (lots at C=1). The feedback will warn if students are tending to overestimate or underestimate how reliable their answers are. This can be used to guide their study and to improve interaction with teachers.

CBM average mark and accuracy

- The CBM Average can range between 3 and -6. If all the questions have the same weight, then it is simply the average CBM mark, as shown in the CBM table above. If the weights (w) vary, then for CBM marks (m) awarded on each question:

$$\text{CBM Average} = (\sum wm) / (\sum w) \quad [7]$$

- Accuracy is a conventional measure of how much the student got right, ignoring CBM ratings. If all questions carry equal weight, it

is the percentage of answers that were correct (with perhaps some answers being counted as partially correct). If questions have different weights w , and answers have fractional correctness f (between 0 and 1) then

$$\text{Accuracy} = (wf)/(w) \quad [7]$$

- Partially Correct Answers: If Moodle answers are partially correct (assigned a fraction f greater than zero), then for $C=1, 2$, or 3 the mark awarded will be f , $2f$ or $3f$. If f is negative (implying that any correct portion of a response is outweighed by errors) then the mark awarded will be the same as for a wrong answer ($0, -2$ or -6).

What do average cbm marks and accuracy tell?

The graph shows the scores (Accuracy and CBM average) for several thousand online submissions on a variety of voluntary CBM self-tests for learning and revision, mostly with university students. It is annotated with interpretations of the students' knowledge in different zones of graph (Figure 3).

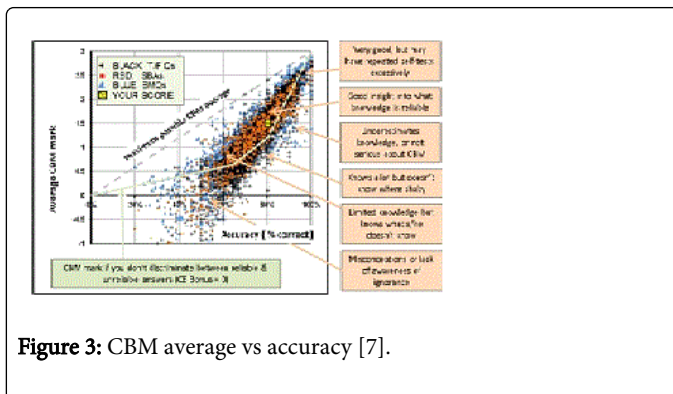


Figure 3: CBM average vs accuracy [7].

The graphical form is used in CBM Self-Tests (not currently in Moodle) to present a student's score after submission.

Phase 4: knowledge repository

Knowledge base is the database, where all the structured and unstructured information are placed. Repository is a computerized system that has all the structured information. When the students upload some materials for discussion or for sharing, it is placed on knowledge base; they can then go for rating and review. The ones which have been reviewed and rated can be pushed to repositories. The knowledge repositories will be accessed to user, who has the account and permission to view. This account can be given by the authorized personnel such as a teacher or school admin or a manager.

Result and Analysis

This research discussed on creating a knowledge base for effective learning in universities. The research suggests the development of knowledge repository to be accessed by the students of the university, which consists of old works of students on particular subject matter. Further, it also discusses about CBM marking scheme for evaluation of the assignments and works of students by their respective teachers. This helps to reduce irrelevant knowledge contents to be stored in the repository and displayed and also helps in the marking scheme. If developed and used effectively, following the principle of knowledge management and E-learning, it is expected to help in enhancement of moodle, an e-learning system implemented at Kathmandu University.

After the implementation of proposed idea in moodle, the following things can be expected:

- More active participation from the students as well as teachers regarding course studies.
- Preservation of knowledge within Kathmandu University.
- Risk of plagiarism is minimized while doing assignments.
- A better way to organize, publish and display student-generated content (Figure 4a,b,c).

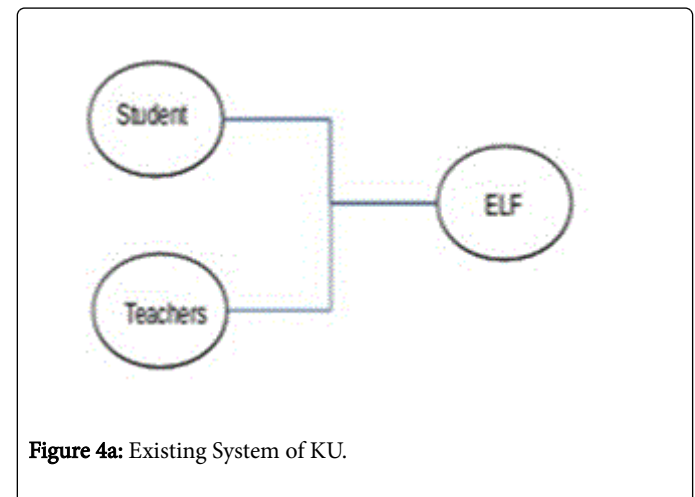


Figure 4a: Existing System of KU.

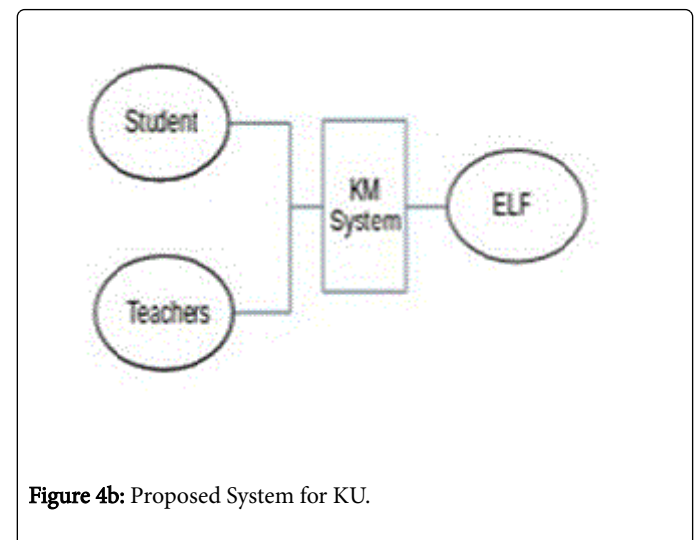
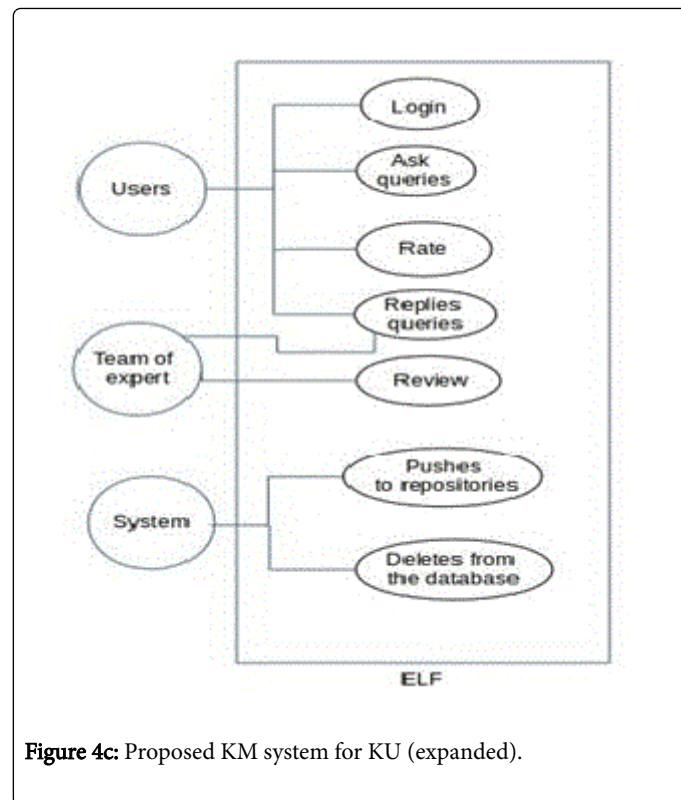


Figure 4b: Proposed System for KU.



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