

# KNOWLEDGE COMMUNITY

## *Moving Beyond Conventional Learning Management Systems*

Hsiang Hui Lek and Danny Chiang Choon Poo

*School of Computing, National University of Singapore, 13 Computing Drive, Singapore, Singapore*

**Keywords:** Knowledge Community, K-Comm, knowledge, Collective intelligence, Knowledge capturing.

**Abstract:** In this paper, we present a platform called Knowledge Community (K-Comm) which provides a higher level of engagement for student learning on the web. This platform is a knowledge-based social network which allows users to contribute and seek information. Users can ask questions or answer questions asked by other members. K-Comm also captures user profile, and based on a user's participation, identifies his/her area of interest and expertise. The platform is built around the philosophy that each individual is an expert in their own area and has the potential to share and contribute. K-Comm is driven by community effort and being a social network, students are more willing to participate; but unlike other social networks, K-Comm does not distract, instead, it encourages knowledge sharing and contribution.

## 1 INTRODUCTION

Over the last decade, there has been a major shift in the education scene. With growing popularity of the World Wide Web (WWW) and the increasing connectivity, the WWW has become a channel enabling learning in the form of e-learning ('electronic learning'). Educational institutions realized the potential of e-learning and hosted their own LMS (learning management systems). A LMS is a software platform that allows administration of various classroom activities. Typically they allow various roles like the administrator or teaching staff, and student. Teaching staff of an educational institution teaching different courses can log into the system to create contents for the course like lesson plans, tutorial questions, reading materials, etc. to be viewed by students. Students, on the other hand, are required to log into the system to download the materials. Common LMS include Blackboard (Blackboard, 2010) and Moodle (Romero et al., 2010).

LMS has indeed enabled e-learning through the web. However, it has typically been used to distribute learning materials to students and to keep track of students' academic progress. There are usually little interaction between the students and educators or even with their fellow classmates. There is thus a lack in "active e-learning". LMS therefore lacks the element to engage students and

an environment for online interactions. Moving beyond, we see that Web 2.0 which focuses on information sharing and collaboration can increase students' level of engagement beyond the LMS. Social networking sites, blogs, and wikis are some examples of Web 2.0 sites. They offer students the power to create, share content and interact with others.

In this paper, we introduce a platform which embraces the advantages Web 2.0 brings. The platform, known as Knowledge Community (K-Comm), is a knowledge-based social network site which allows users to contribute and seek knowledge in a web-based environment with the purpose of sharing knowledge. Being in a community, users will be more willing to share, contribute and participate because their participation will eventually benefit them.

The rest of the paper is organized as follows. In the next section, we describe K-Comm. In section 3, we look at the components of K-Comm. In section 4, we describe how we use K-Comm in our university setting and discuss some of the insights we gathered through our study. We then conclude the paper.

## 2 KNOWLEDGE COMMUNITY

Knowledge Community (K-Comm) is a knowledge-based social network that allows users to contribute and seek knowledge in a social networking environment with the purpose of sharing knowledge. As the name suggests, it is a community where members can form groups, link and interact with like-minded people.

Unlike most conventional social networking sites, the main focus of K-Comm is knowledge sharing which is mainly achieved through a question and answer (Q&A) approach where users can ask questions or answer questions posed by other users.

In the spirit of knowledge sharing, we recognize that every individual has something to share and contribute, whether it is factual knowledge or experiential knowledge, and K-Comm provide a means to realize and capture tacit knowledge. By having such a platform, we can capture an individual's tacit knowledge and tap onto the full potential of individuals.

Based on our experience with the previous prototype of K-Comm (Agarwal and Poo, 2008) which has no social networking aspect, and previous study on barriers to knowledge sharing (Agarwal et al., 2007), we have identified social networking as an essential knowledge-contributing barrier breaker. Sclater (2008) also indicated that social networking sites, blogs, and wikis offer student unprecedented opportunities to enable knowledge sharing and enable interactions. As such, the underlying K-Comm system is a social networking system that is knowledge centric in nature that allows us to unleash the full potential of individuals. Furthermore, in previous study (Lek et al., 2009), we have also demonstrated that since K-Comm is driven by community effort, it can formalize collective intelligence.

## 3 K-Comm ARCHITECTURE

### 3.1 Design and Implementation

We have used Elgg (Elgg, 2010), a PHP open source social networking framework to build K-Comm. This framework is used instead of the usual Content Management Systems (CMS) because we wanted an extensible framework that has social networking as the central theme. Elgg provides us with extensibility. Each component, for example, website theme or features, are plug-ins and are programmed

using PHP.

### 3.2 Components of K-Comm

#### 3.2.1 Profile Gathering and Personalization

K-Comm captures user profiles and allows users to personalize their pages based on their interest. Specifically, the system can capture user profiles explicitly and implicitly.

User profile is captured explicitly during the registration process. The instantiation of K-Comm in National University of Singapore (NUS) consists of a three-step registration process. In the first step, we ask basic information like their name, email address and password. In the next step, users can fill in their general interests, specify whether they are students, staff or alumni, and indicate the faculty they are member of. Finally in the third step which is an optional step, users can select the list of NUS modules they have taken or are taking with the option to be automatically added to the groups created for those modules. This is to create groups with current students and seniors who have taken that module so that they can help one another.

The system allows administrator to customize the list of fields to display on the registration page, and indicate whether each field is mandatory or optional so different instantiation of K-Comm can be customized to the varying needs. The administrator can also select the list of possible fields a user can specify on their profile page.

User profile can also be captured implicitly through users' activities. For example, by asking a question in the area of Computers/IT, the system will be able to deduce that the user might be interested in the category of Computers/IT. By capturing user profile, the system will be able to personalize each user's screen. For example, looking at the list of interest of the user, we are able to generate a list of relevant questions to show on the Q&A page.

#### 3.2.2 Groups

Groups can also be created in K-Comm. They allow members to participate in discussion forums, post messages or share files. This helps connect members who are interested in a particular topic. Group owner can prevent accessibility of group discussion forums and files to non-group member.

Thus, it allows members to create private groups for project discussion among their project mates.

As mentioned in the previous section, we have

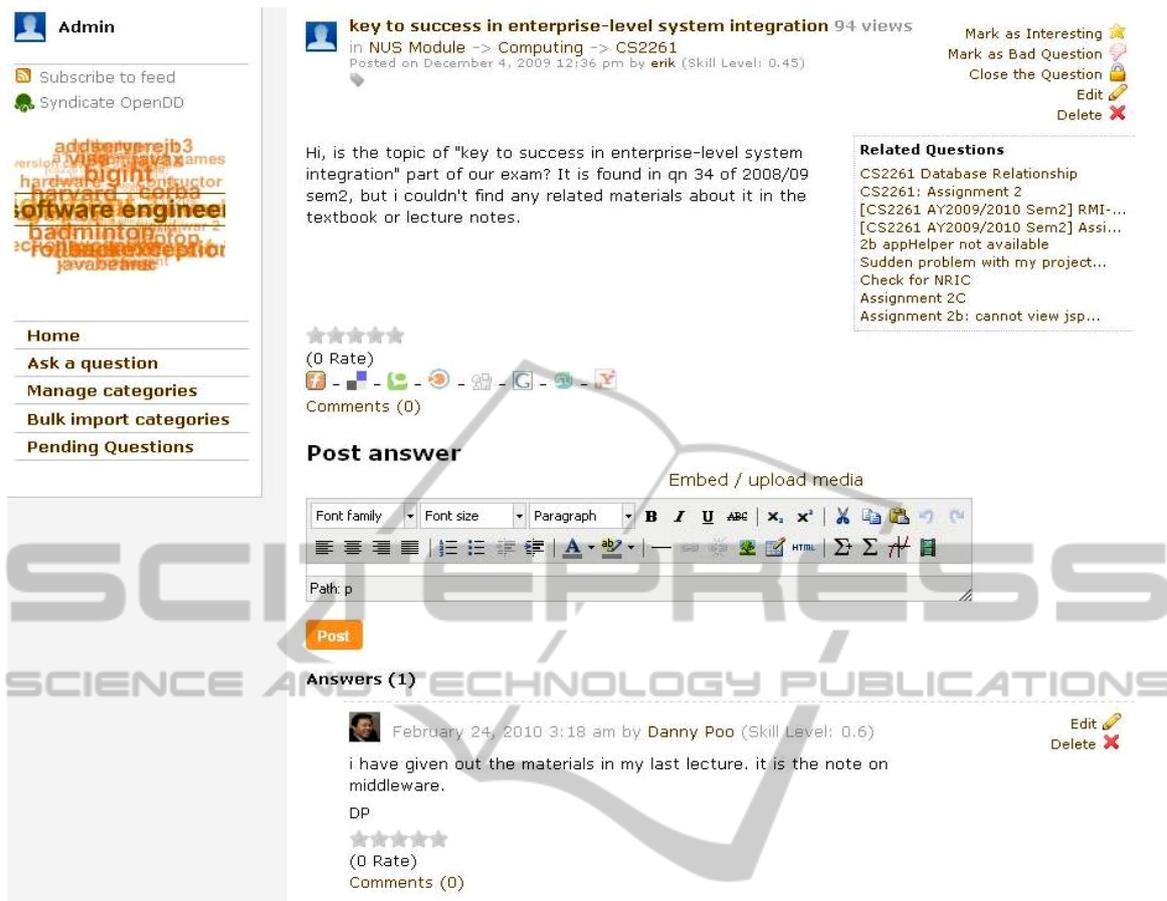


Figure 1: Question and Answer.

created a group for each NUS module and the system will, by default, add users into the corresponding groups of the modules they have taken. Groups are useful for students to discuss matters concerning a module and to help one another since the lecturers may not be available all the time. Groups may also provide feedbacks for lecturers to fine-tune their teaching.

### 3.2.3 Question and Answer (Q&A)

The key feature of K-Comm is the question and answer (Q&A) component. This component allows users to ask and answer questions.

Each question is organized under a category. As K-Comm adopts a hierarchical category structure, there could be many sub-categories for each category. Depending on the nature of the question, question asker will select the category which best fits the question. However, there could be cases where the pre-defined categories do not fit the question. In such cases, users can suggest a category and associate the question to the newly suggested

category. The administrator will review the question and the category suggestion and allocate the question to the right category accordingly or create the new category. Other than category, tags can also be associated with a question. Tagging provides additional and important keywords for a question. A tag cloud is formed on the top left section of the web page (see Figure 1) using the list of tags. It allows users to view questions associated to a tag. Tagging also helps in searching for relevant questions. To encourage users to tag and to ease user from the trouble of tagging, the system automatically suggests possible tags. This is achieved by analyzing the questions using natural language processing techniques.

Each question and answer can be rated by other members. Users can also mark a question as a bad question if it contains inappropriate content, or mark it as interesting. The question asker is also allowed to choose the best answer to the question. This ability to rate/mark questions/answer helps in a few ways. Firstly, it helps to verify the credibility and

correctness of questions and answers. Secondly, it demonstrates that content moderation is part of the community effort and not one audited by the administrators/moderators. Thirdly, the rating can help measure the value of a question/answer. This can be used to assess student's level of participation.

We are also researching into automatic question answering techniques where we hope to automatically answer questions posted by users by sourcing for answers from the World Wide Web. Specifically, we aim to mine a database for specific domains so that it can be used to answer questions relating to that domain.

### 3.2.4 Other Components

K-Comm also provides other components which might be useful for students. They include blogging, instant messaging, and webpage creation facilities. Furthermore, K-Comm also allows users to add widgets to their personalized dashboard which can integrate with existing technologies like twitter, windows live messenger, etc.

### 3.2.5 Point System and Student Assessment

There is also a point system in K-Comm where points are given to users for their participation like inviting friends, posting questions/answers and contributing answers. The ratings of questions/answers also help calculate the "skill level" of members for a particular area. This skill level forms a rough gauge of the expertise of a member in that particular area. Briefly, the system calculates the skill level using a function consisting of the following variables:

1. The rating of questions/answers in a particular category
2. The total number of questions/answers from the user in a particular category
3. The number of answers from the user in a particular category which have been selected as the best answer

A point system helps to encourage participation and also allows lecturers to assess students' performance based on the quality of their discussion rather than the quantity of postings. Apart from point system, the instructors/mentors can also monitor students' activity rate.

### 3.2.6 Privacy Issues

Like any other online communities, privacy issue is a major concern. Users want to be able to restrict access to their private information. This issue has

been considered in K-Comm. Users can assign different access rights for each piece of data. For example, they can assign different access rights to each field in their user profile. Access rights can be private, public, for friends, for logged in users or for specific groups. Apart from privacy settings for user profiles, they can also set similar access rights for other content like their uploaded files, blog entries and webpages.

## 4 DISCUSSIONS

### 4.1 How K-Comm was Applied

An instance of K-Comm was created for the NUS community. A pilot experiment was carried out on two faculties of students in NUS, namely School of Computing and School of Business. Other than mass advertisements, we also asked students from two computing modules: Enterprise Systems Development (CS2261) and Fundamentals of Information Systems (CS2250) to use this portal to discuss course materials, and manage their projects through the Group feature.

For the case of CS2261, students are taught principles of enterprise systems development and are required to design and build enterprise systems as part of their assignments. During the course, students made use of the Q&A feature of K-Comm to ask questions concerning problems they encounter and clear doubts in the understanding of the concepts discussed in the module. When there is a question, fellow classmates would help answer the questions. Unlike a forum, the Q&A feature allows rating and the system keeps track of the number of views for each question. Questions that were highly rated and popular were arranged at more prominent places relatively to other questions. Member's skill level for a particular category is increased each time he/she participates in answering questions. The higher rating given to members for their effort further boosted the morale of the members and encourages their subsequent participation. K-Comm, being a social network, allows students to add other fellow students or teaching staff as friends. This adds a personal touch to an online portal.

The students and teaching staff in CS2250 used K-Comm in a slightly different manner. Students are pre-registered with the system and the accounts are sent to all the students. They are divided in teams of five to work on assignments together. The students are required to create videos to describe the concepts they have learnt in the module. Private groups are

Table 1: Comparison.

	LMS	QA sites	SocialNWSites	K-Comm
<b>Communication Architecture</b>	Communication is usually single-directional where lecturers post the learning material.	Question and Answer approach where someone asks a question and people try to answer.	Users can post messages to their friend's page or talk using the instant messaging service provided in the site.	Users can ask questions and answer questions, or they can use the instant messaging service on K-Comm to talk to their friends.
	Communication is less interactive.	Communication can be interactive but lacks personal touch.	Communication is usually more interactive.	Communication is interactive and members of the community are usually fellow classmates and lecturers, so there is more personal touch.
<b>Organization</b>	Modules/Courses	Categories	Communities	Tags, Categories, Communities
<b>Focus</b>	Administration of modules/courses	Question and answering	Human relationship	Knowledge Sharing and contribution

generated for each team, and students used K-Comm to share their videos files. Students used the file sharing feature as a version control service for their video files. The lecturers who form part of the groups also used the file sharing facility to monitor the students' progress and to assess the quality of the students' works.

#### 4.2 Feedbacks and Lessons Learnt

During our pilot experiments, we have gotten some feedbacks as to how K-Comm could better serve the needs of students and lecturers.

Lecturers in particular noted that they are unsure how to do certain thing on K-Comm, so we came up with a FAQ section with step-by-step instructions and YouTube screen casts of the different processes.

Students generally like the idea of K-Comm but one of the issues was that there are relatively little posting when there are no assignment deadlines. However, we note that there is always reply to each posting. As such, instructors can ask probing and pertinent questions to excite discussion and to encourage participation.

Apart from participation, some students also noted that there should be a good notification mechanism in place for question answerers to monitor comments.

#### 4.3 Comparisons

K-Comm utilizes the wisdom of the crowds and creates an environment where any individuals can be an expert based on his/her experience, interest or passion. Table 1 provides a comparison of K-Comm with other technologies. In particular we can see that unlike LMS where the communication is usually uni-directional and less interactive, K-Comm allows more interaction like that of social networking sites. It has a much different focus compared to LMS where the focus is to create an online portal for managing modules/courses. Instead, K-Comm aims to promote knowledge sharing and contribution and achieve collective intelligence.

Unlike other online community-based systems like iCamp (Kieslinger et al., 2006) and TenCompetence (Koper & Specht, 2008), it is also important to note that our system relied heavily on natural language processing which can help in automating certain tasks, for example, automatic tagging of content based on the linguistic properties of the content. It also has the potential of massively retrieve and process information available on the WWW to supplement existing knowledge.

## 5 CONCLUSIONS

LMS has served as a means to enable e-learning and administration of classroom events. However, it fails to harness the full potential of what an online portal could possibly provide.

In this paper, we described K-Comm, a platform that can allow for more interactivity among its users. It is able to identify the expertise of individuals and maximizes their knowledge potential, allowing them to contribute based on their experience, passion and interest. Being a social network in nature, the line between educator and students are less obvious and students are more willing to participate, thus achieving active learning. Currently, we have instantiated K-Comm for our institution. Other colleges have expressed interests to use K-Comm in promoting active interaction in their learning environment.

Future works will look into ways and means for better organization and retrieval of contents. We are also considering allowing different communities to communicate with one another which is similar to Simple Query Interface (Simon et al., 2005). This will involve having an interface layer that allows one K-Comm system to talk to another K-Comm system or to another system like Facebook or Yahoo! Answers. We are also trying to incorporate automatic question answering features into the system which would attempt to automatically answer a question by retrieving answers from the web.

## ACKNOWLEDGEMENTS

This work is supported by the Singapore Ministry of Education Academic Research Fund (AcRF) Tier 1 Grant R-253-000-049-112.

## REFERENCES

- Agarwal, N. K., Poo, D. C. C., & Tan, K. H. (2007). Impediments to sharing knowledge outside the school: Lessons learnt from the development of a taxonomic e-learning portal. *In International Conference on Information Systems (ICIS)*. Montreal, Canada.
- Agarwal, N. K., & Poo, D. C. C. (2008). Capturing tacit knowledge across different domains: Knowledge Community (K-Comm). *Int. J. Bus. Inf. Syst.*, 3(6), 668-685.
- Blackboard. (n.d.). Retrieved September 25, 2010, from <http://www.blackboard.com/>
- Elgg - Open Source Social Networking Platform. (n.d.). Retrieved September 22, 2010, from <http://www.elgg.org/>
- Kieslinger, B., Wild, F., & Arsun, O. (2006). iCamp – The Educational Web for Higher Education. *In Innovative Approaches for Learning and Knowledge Sharing, Lecture Notes in Computer Science* (Vol. 4227, pp. 640-645). Springer Berlin / Heidelberg. Retrieved from [http://dx.doi.org/10.1007/11876663\\_66](http://dx.doi.org/10.1007/11876663_66)
- Koper, R., & Specht, M. (2008). Ten-Competence: Life-Long Competence Development and Learning. In M-A. Cicilia (Ed.), *Competencies in Organizational e-learning: concepts and tools* (pp. 234-252). Hershey: IGI-Global.
- Lek, H. H., Poo, C. C., & Agarwal, N. K. (2009). Knowledge Community (K - Comm): Towards a Digital Ecosystem with Collective Intelligence. In *Proceedings of IEEE International Conference on Digital Ecosystems and Technologies (IEEE - DEST 2009)* (pp. 211-216). Istanbul, Turkey.
- Romero, C., Ventura, S., & Garcia, E. (2008). Data mining in course management systems: Moodle case study and tutorial. *Comput. Educ.*, 51(1), 368–384. doi:10.1016/j.compedu.2007.05.016
- Scalater, N. (2008). Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems (No. *EDUCAUSE Center for Applied Research, Volume 2008, Issue 13*). Retrieved from <http://www.educause.edu/ecar>
- Simon, B., Massart, D., Assche, F. V., Ternier, S., Duval, E., Brantner, S., Olmedilla, D., et al. (2005). A simple query interface for interoperable learning repositories. *In Proceedings of the 1st Workshop on interoperability of web-based educational systems* (pp. 11–18).