

# COLLABORATIVE LEARNING IN A KNOWLEDGE COMMUNITY

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**Abstract:** In this paper, we recognize that every individual has something to share and contribute, whether it is factual knowledge or experiential knowledge and present a platform called Knowledge Community (K-Comm) which provides a higher level of engagement for student learning on the web. By having such a platform, we attempt to capture an individual's knowledge and tap onto the full potential of individuals. Since everyone has something to contribute, this community effort where users help one another formalizes collective intelligence. This Knowledge Community 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. 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. Unlike other social networks, K-Comm does not distract. It encourages knowledge sharing and contribution and promotes collaborative learning.

## 1 INTRODUCTION

No knowledge is mundane and every individual has something to contribute. Thus, what is obvious and trivial to one person may be highly useful to another. For example, there is a person X, who is 75 years old, has held a number of portfolios in major companies. He has traveled to different countries. X was born in Singapore in 1930. So X's knowledge areas would include (among others), family (experiences, views), jobs (experience in different areas/fields), countries (Singapore, Malaysia, other countries), etc. From these areas and experiences, X would have certain areas/issues (core knowledge areas) that he has been good at (expertise), knows a lot about or feels strongly about. These core areas are the ones that X would be able to contribute to (and would be most useful for) in the knowledge community. Similarly, another person Y would have

a different set of knowledge across different domains/hobbies/experiences. A teenager Z, 15 years old, would also have a lot to share (growing up, issues in school, between friends, etc.). So in essence, every person has knowledge to contribute to share and a different set of core areas – the difference may just be in the domain(s) and intensity. It is this amalgamation of core areas that will provide for a rich Knowledge Community – where you not only have access to information shared over time (repository), you also have access to a diverse and growing set of experts in core areas who people can consult and seek advices from.

It will provide for a feeling of self-worth in every individual, a feeling of usefulness to others/community/society and at the same time have a ready place (and access to experts) to seek whatever answers one might be looking for. The end product will be a growing community of experts in

different domains (core knowledge areas), an increasing knowledge-base across different domains, and people seeking answers to questions across different domains.

To study the approach, we have implemented a Knowledge Community (K-Comm) that aims to serve as a system capturing an individual's tacit knowledge across different domains. It also encourages collaborative learning in the education context.

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.

In section 2, we discuss the distinction between knowledge provider and knowledge seeker. In section 3, we discuss a knowledge sharing platform that could be used for collaborative learning known as K-Comm (short for Knowledge Community). In section 4, we discuss the K-Comm architecture. In section 5, we discuss on the use of K-Comm for collaborative learning in an education context. The paper concludes in section 6.

## 2 KNOWLEDGE PROVIDER VERSUS KNOWLEDGE SEEKER

Within a knowledge-sharing setting, there are usually two main parties involved – the *knowledge-provider* and the *knowledge-seeker*.

The knowledge-provider is one who has the clearer understanding of the knowledge at hand. However, the knowledge-provider usually does not understand the precise knowledge needs of the knowledge-seeker, as well as the context in which the knowledge will be applied. Moreover, the knowledge-provider does not have to know the identity of the knowledge-seeker.

Conversely, the knowledge-seeker understands the context in which the knowledge will be applied, but either does not understand the knowledge enough to use it or to actually know that the knowledge exists to search for it. The knowledge-seeker faces the problem on how to go about seeking the knowledge.

In short, the knowledge-provider knows the answer but not the question, and the answer is not necessarily structured to cater to the question of the

knowledge-seeker. The knowledge-seeker may know the question, but does not know whether an answer existed. Eventually, there is a situation of 'information overload but knowledge underload', when the information is abundant but no one is able to harness it. Therefore, it is imperative to ensure that a well-constructed system should be able to map the knowledge-seeker to the knowledge-provider.

## 3 KNOWLEDGE COMMUNITY (K-COMM)

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 accordingly to their areas of interest. For example, students taking a particular module could belong to a group. K-Comm has been designed to allow individuals to contribute knowledge through their experiences across various areas, and to provide a means to realize and capture tacit knowledge.

Unlike most conventional social networking sites where the main focus is for socializing and building relationships, the main focus of K-Comm is knowledge sharing. Knowledge sharing is mainly achieved through a question and answer (Q&A) approach where users can ask questions or answer questions posed by other users. Users can also leave comments and rate the questions or answers. We have also built into the platform a point system to encourage users to participate actively and to gauge their expertise in different areas.

K-Comm was built 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. By having such a platform, we attempt to capture an individual's knowledge and tap onto the full potential of individuals. Since everyone has something to contribute, this community effort where users help one another formalizes collective intelligence and encourages collaborative learning.

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. Sclater (2008) indicated that social networking sites, blogs, and wikis offer student unprecedented opportunities to enable knowledge sharing and enable interactions.

The platform was built not only to benefit the end-users but also allows researchers perform different kinds of research like information retrieval and information extraction.

## 4 K-COMM ARCHITECTURE

### 4.1 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. This allows us to port over existing components that have been written in PHP. When building the plug-ins, we have specifically designed the architecture such that most of the code can still run independently of Elgg.

### 4.2 Components of K-Comm

#### 4.2.1 Profile Gathering and Personalization

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

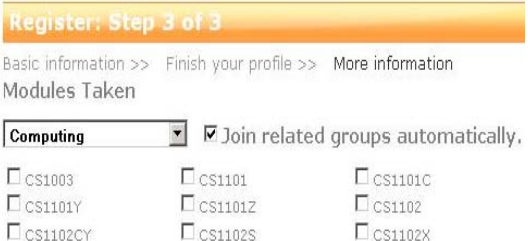
User profile is captured explicitly during the registration process. The instantiation of K-Comm in National University of Singapore (NUS) consists of a three-step registration process. In the first step, we ask basic information like their name, email address and password. In the next step, users can 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 (see Figure 1). This is to create groups with current students and seniors who have taken that module so that they can help one another. Current students can interact with their fellow classmates and discuss matters concerning that module, or they can find seniors who have already taken that module. Seniors, on the other hand, can share their experiences and what they know with juniors, resulting in a community effort in knowledge sharing. Note that we have made the

third step to be an optional step because even though we want to capture as much information about the user as possible, we recognize that most users are impatient to go through long registration forms.

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 without any program code change. 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. Conversely, if a user answers a question in the category of Computers/IT, the system will be able to deduce that the user might be an expert in the area of Computers/IT. The categories follow a hierarchical structure so there could be sub-categories. Answering question in the sub-category suggests the user has some expertise in the parent category.

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 the list of initial questions to show on the Q&A page. This is especially important for showing content which are relevant and interesting in user's perspective.



The screenshot shows a registration form titled "Register: Step 3 of 3". It has three navigation links: "Basic information >>", "Finish your profile >>" (which is highlighted), and "More information". Below the links is a section titled "Modules Taken" with a dropdown menu currently set to "Computing". To the right of the dropdown is a checked checkbox labeled "Join related groups automatically.". Below this are nine checkboxes arranged in a 3x3 grid, each followed by a module code: CS1003, CS1101, CS1101C, CS1101Y, CS1101Z, CS1102, CS1102CY, CS1102S, and CS1102X.

Figure 1: Profile gathering during registration.

#### 4.2.2 Groups

Groups can also be created in K-Comm. They allow members to participate in discussion, post messages or share files. This helps connect members who are interested in a particular topic. Group owner can define different permissions like group membership, group accessibility to non-group member, access to discussion forums and files. Thus, it allows members to create private groups for project discussion among their project mates.

The screenshot displays a web-based Q&A forum. On the left, there is a sidebar with an 'Admin' profile, a 'Subscribe to feed' button, and a 'Syndicate OpenDD' link. Below these are navigation links: 'Home', 'Ask a question', 'Manage categories', 'Bulk import categories', and 'Pending Questions'. A tag cloud is positioned above the navigation links, featuring various technical terms like 'addserverib3', 'games', 'digital', 'hardware', 'connector', 'software engineer', 'badminton', 'port', 'Fossil', 'receptor', and 'javabans'. The main content area shows a question titled 'key to success in enterprise-level system integration' with 9.4 views. The question is posted in the 'NUS Module -> Computing -> CS2261' category and was posted on December 4, 2009. The question text asks for the 'key to success in enterprise-level system integration' part of an exam. Below the question are five stars for rating, a '(0 Rate)' indicator, and social media sharing icons. A 'Post answer' section includes a rich text editor with a toolbar and a 'Post' button. Below the editor, there is one answer from 'Danny Poo' (Skill Level: 0.6) dated February 24, 2010. The answer states that the materials were given out in a lecture and are available as a note on middleware. The answer also has five stars for rating, a '(0 Rate)' indicator, and social media sharing icons. On the right side of the question, there are options to 'Mark as Interesting', 'Mark as Bad Question', 'Close the Question', 'Edit', and 'Delete'. A 'Related Questions' section lists several related questions, including 'CS2261: Database Relationship', 'CS2261: Assignment 2', and 'Assignment 2b: cannot view.jsp...'. The 'Embed / upload media' button is located above the rich text editor.

Figure 2: Question and Answer.

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.

#### 4.2.3 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 2) 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 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.

#### 4.2.4 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.

#### **4.2.5 Point System**

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.

As mentioned before, a point system helps to encourage participation which is essence of collaborative learning.

## **5 DISCUSSIONS**

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 generated for each team, and students used K-Comm to share their videos files. As we did not restrict any file size limits, 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.

## **6 CONCLUSION**

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 with collaborative learning as the main focus.

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