Knowledge Management in Academia
A Case Study - IIT Delhi

Mayank Kumar[1], Anuraag Gupta[2]

[1]*Department of Electrical Engineering*
Indian Institute of Technology, Delhi
Hauz Khas, New Delhi, INDIA
mayank.grd@gmail.com

[2]*Department of Electrical Engineering*
Indian Institute of Technology, Delhi
Hauz Khas, New Delhi, INDIA
anuraag.gupta.in@gmail.com

ABSTRACT

Academia generates a lot of knowledge during teaching and research which needs to be managed. Our proposed Knowledge Management model is student centric and caters to these needs of institutes of higher education. It explores the constituents of transferable knowledge in academia and psychological mindset of the students and faculty. Special incentive models have been built into the system for its acceptance and sustainability. Further, untapped knowledge repositories and pathways have been identified and incorporated. The system has been implemented on a pilot basis using web 2.0 technologies for increased level of collaboration and ease of use.

Keywords
Knowledge Management, Academia, Web 2.0, Transferable Knowledge, Incentive Models

1.0 INTRODUCTION

Knowledge management is defined as a process through which organizations create, store and utilize their collective knowledge. Henceforth, Knowledge Management would be referred to as KM in this paper. KM gives a greater focus on management of knowledge as a strategic asset and encourages sharing of knowledge. KM efforts can help individuals and groups to share valuable organizational insights, to reduce redundant work, to avoid reinventing the wheel per se, to reduce training time for new employees, to retain intellectual capital as employees move out, and to adapt to changing environments and markets. (McAdam & McCreedy, 2000; Thompson & Walsham, 2004).

While the concepts of organizational learning and knowledge management are essential in industry, relatively little attention has been devoted to how these same concepts can be applied to higher education. Despite the ready availability of the Internet and the World Wide Web, and the increasing familiarity of faculty and students with these tools, many universities seem reluctant to release their firm hold on learning paradigms that predate the information revolution by decades. The necessary infrastructure is largely in place to begin to fundamentally reengineer knowledge creation, sharing and delivery based on principles of knowledge management, organizational learning and web 2.0.

Harnessing on the capabilities and opportunities provided by Web 2.0, our model for Knowledge management in academia is a loosely connected information paradigm where students and faculty act as both knowledge creators and knowledge consumer. Our model develops a clearly articulated link between knowledge management and academic goals. This resulted in a KM model which is tailored to the needs of technology institutions like ours, and is designed keeping in mind the feasibility and sustainability of the model.

Section 2 discusses the needs and implications of KM and the concept of transferable knowledge in academia. Section 3 touches upon the psychological and social aspects and builds upon the incentive models that should be incorporated. Section 4 is a case study of the KM implementation at IIT Delhi. A student survey has been conducted to identify problems and a model is proposed as a solution. Pilot system implementation is also discussed. Section 5 discusses the conclusion and future work.

2.0 NEED AND SCOPE

Academic institutions generate an immense amount of knowledge during research and teaching processes. With the advent of knowledge economy, knowledge is becoming the prime driver of society and an invaluable resource, management of which is

crucial for educational institutions for them to lead the society.

A learning organization is able to harness the collective intelligence of its members to its objectives and commits itself to organization-wide knowledge sharing (Piccoli, Ahmad & Ives, 2000). Currently, the flow of knowledge is unidirectional and the institutions rarely solicit student contributions to organizational memory and thus do not qualify to be called as learning organizations. Unfortunately, such learning environments are increasingly proving to be a poor fit with the needs of emerging education paradigms. The need of the hour is to make learning knowledge-centric rather than teacher -centric where the flow of knowledge is multi-directional and all the stake-holders are knowledge providers and seekers.

The faculty do recognize the value of knowledge and expertise gained during a project but only a handful have devised local systems to motivate the creation, archiving and sharing of their group's generated knowledge. These too only have a lifetime of a single major project, where management of knowledge is indispensable. Furthermore the gained knowledge / experience from this research is restricted to few, which eventually is kept isolated and accurate only to the collective experience of the isolated group.

2.1 Transferable Knowledge

It may be argued at this point that the purpose of academia as a "teaching institution" is to motivate students to learn and "repetition of work" is not a concern. In contrast, this is a major concern in industry and this difference stems from the fact that industry's prime motive is "getting things done quick with minimum effort" whereas academia's motive is "teach everyone how things are done the right way". Thus, it is essential to understand what constitutes "Transferable knowledge" from academia's point of view.

Transferable knowledge constitutes "Generic knowledge" gained during a project which could easily be shared as it is common for many contexts/projects. It doesn't include any specific details of how the particular project is completed and the intricacies involved as they are unique to projects and should be learnt by experience. Among other things transferable knowledge constitutes-

- Methodology used in solving sub-problems which can be a part of other projects.
- Knowledge about hardware, software, development kits and machinery which facilitate research work.
- Knowledge that reduces time to implement the innovation
- Knowledge regarding "How to innovate and how to do research".

Thus, the role of knowledge management should be best restricted as a guide who instructs and shows the correct way things are done and a facilitator to reach to prospective people who have the desired knowledge and experience to share. This shall help the research community overcome communication barriers, and query as well as derive from a wider research community.

All this knowledge must be stored in a form such that it is reusable by next generation or even peers and should ideally be explicitly attached with the possible applications areas of the knowledge. The students should not reinvent the learning path and should be able to leverage the benefits from the KM initiative. This would help them acquire the same sets of skills and knowledge much faster and more efficiently, and would help them reach their true potentials.

2.2 Implications of KM

The benefits of using Knowledge management in Academia can be summarized as follows-

• KM would help institutes capture the tacit (hidden) knowledge and experience of faculty and student, pertaining to projects and courses usable by a larger community over a longer period of time.

• KM would increase the pace and efficiency of research by a) decreasing the time spent in doing mundane activities b) finding the right guidance to derive help from c) facilitating inter-disciplinary collaboration. This would make optimum use of resources both tangible and human.

• KM would enable the creation of an auxiliary mentor system making the learning curve less steep for students as it will solicit relatable and practical student contributions to organizational knowledge. It enables guided exploration in one's stream of interest and the scope of work possible within immediate environment.

• For the knowledge creator, his/her knowledge reaches a wider section of the community, attributing importance to his/her work and secondly, collect critical opinions on any topic/idea/method leading to the betterment of his/her own project.

3.0 PYSCHOLOGICAL AND SOCIAL ASPECT

Knowledge management is lesser of a technology problem and more of an organizational and social problem. KM implementation can be thought of as

an organizational change to be initiated which involves bringing a new culture of knowledge sharing and thus changing how individuals work, manage and share related knowledge. However, assigning a person knowledge requirements and tasks pertaining to its management requires disruption of usual role within the organization and thus needs to be studied and compensated for.

3.1 Dilution of Power

Knowledge provides a sense of power and importance, and the cases when it offers a competitive advantage, knowledge sharing is less embraced. The implementation of a Knowledge Management System (KMS) can be seen as a public good social dilemma (Cabrera & Cabrera, 2002) why would I contribute to the public good wasting my time and not getting anything in return? For tackling this, the outflow of knowledge needs to be balanced by an inflow which can be in the form of a) knowledge gained from the collective knowledge pool, b) motivation and assistance shown by interested individuals, c) incentives inbuilt in the knowledge sharing model itself. Awareness needs to be imparted that this activity in fact would lead to a wider spread of power, status or role of an individual in the community.

3.2 Technological Ignorance and Sheer Inertia

Any knowledge management implementation thrives on the contributions of a community. People fear the lack of competence which can be attributed to technological ignorance and sheer inertia. For the former, it is essential to use the right technology so that it is usable and teachable. Web 2.0 provides the perfect ingredients for creating such a collaborative platform. The solution for the latter shall dwell on developing a perceived sense of ease and perceived sense of usefulness in the mind of the user.

3.3 Organizational Change & ADKAR model

Inculcating KM as a process is a change and people resist to a change because it is perceived as an overload and additional burden cast by the system. This disinterest and negative publicity can kill any change effort. The ADKAR model (Hiatt, Jeffrey M. 2006) is a goal-oriented change management model. The required building blocks for change management as suggested by the ADKAR model are a) Creating Awareness of why the change is needed. b) Inculcating Desire to support and participate in the change. c) Imparting Knowledge of how to change d) Imparting Ability to implement new skills and behaviors. e) Reinforcement to sustain the change.

We will see in the next section how the approaches identified above and ADKAR model have been combined to form a knowledge management roadmap right from bootstrapping the plan till ensuring sustainability of the developed model.

4.0 IIT DELHI – A CASE STUDY

In the following section we will illustrate how KM principles have been put to practice in the area of research and classroom teaching in the Indian Institute of Technology, Delhi. Officially established as College of Engineering in 1961, it has been declared as institution of national importance under the "Institute of Technology (Amendment) act, 1963".

IIT Delhi comprises of 13 engineering departments and 11 research centres. As of August, 2006, IIT Delhi has 421 faculties and 4931 students. This constitutes 45 % undergraduates, 34 % postgraduates, 19 % Ph.D. and 2% M.B.A students. IIT Delhi has 240 patents, and on an average files 20-25 patents annually. Research as well as quality higher education are equally important for I.I.T. Delhi as is reflected by its mission statement.

Our KM implementation is tailored to the needs and aspirations of the student community which shows great potential for true research and innovation. The illustrations and findings are based on a student questionnaire survey and focus group discussions with faculty in 2009.

Though there emerges an explicit hierarchy in the organizational structure, our KM model considers all the stakeholders as equal contributors and benefactor and that our approach should be considered as a loosely connected information paradigm. But, the model also inculcates the idea of moderation based on seniority of knowledge and responsible behavior to keep a check on malicious activities by a few.

4.1 Knowledge Repositories and Pathways

Knowledge pathways are institutional processes and practices which result in transfer of knowledge from source to sink. An analysis of existent (already in place) and potential (untapped) knowledge pathways in an academic setup would help us identify potentially new sources of knowledge which had hitherto been unrecognized. We will analyze knowledge pathways in three different academic setups – (i) Academic Courses and labs (ii) Research projects and (iii) Tacit Knowledge.

The knowledge transfer in academic courses and labs has traditionally been unidirectional – from faculty to students. But, with easy availability of internet and other information media, students

themselves are a potential source of knowledge which could be shared among fellow learners. This might include useful links, videos, and course material, knowledge and experience gained while working with lab equipments and past industrial experiences of students. Sharing of this knowledge will make the courses and labs more interesting, practical and contemporary in nature. Creation of these knowledge pathways will definitely motivate students to acquire more knowledge if a proper incentive model is also attached with it.

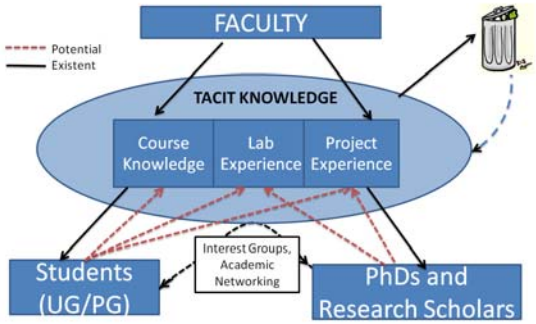

Figure 1: Knowledge Pathways

Currently, Project knowledge is confined to project groups which comprises of few faculty and student members. Moreover, knowledge acquired by students is lost as students keep on changing. Any project constitutes two kinds of knowledge which are indispensible – (i) generic tasks to configure and build research setups, (ii) actual innovation and research findings in addition to experimental procedures. Innovation and research findings get duly credited through international journals and conference proceedings. But, the efforts and expertise devoted to former are neither shared nor get due recognition. Also, this knowledge is sharable across multiple projects because of their generic nature. Thus, KM could be used to help reduce the time, effort, and money put into these generic tasks.

A major portion of institutional knowledge lies in the form of tacit or hidden knowledge and experience inside the minds of faculty and students. For a successful KM model, special care should be taken to convert this into explicit knowledge usable by the whole community and a proper incentive model built over it for its acceptance and sustenance.

4.2 Results

A survey was done to evaluate the need for knowledge-sharing in IIT-Delhi, the findings of which will be discussed here. The sample space consisted of 84 students (55% undergraduate, 45% Postgraduate and PhD). The instrument used was an online survey with questions relating to current state and scope of KM in IIT-Delhi. All objective questions had a Yes/No/Can't answer response.

4.2.1 Current Scenario

Table 1: Student opinion over current situation

Opinion/Argument	Yes (%)	No (%)	Can't Answer (%)
Knowledge generated during a project is confined to faculties and student groups.	85	10	5
One often experiences the inability to find the right guidance at the right time.	94	4	2
Any project can be divided into generic sharable tasks and one's own innovation	77	22	1

Table 2: Time spent in research v/s generic tasks

Percentage of time devoted to actual research	Favorable Responses (%)
Less than 10%	23
10-30%	35
30-50%	25
50-70%	8
More than 70%	9

4.2.2 Perceived usefulness of KM

Table 3: Scope and willingness for KM

Opinion/Argument	Yes (%)	No (%)	Can't Answer (%)
If the community shares knowledge about courses, labs & projects it would be more beneficial and generate more interest.	92	0	8
The time one devotes to innovation can be increased if proper KM is done for generic tasks.	90	0	10
Student community can contribute to knowledge creation and sharing.	100	0	0
Student community will write wiki articles and document your work.	89	11	0

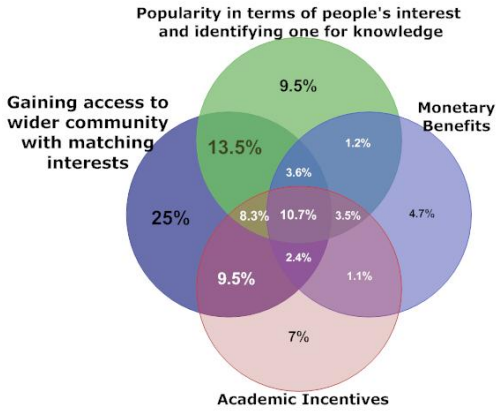

Figure 2: Incentives for knowledge sharing

4.3 Proposed KM models

Our model constitutes four components that address key issues identified above and are interlinked with each other to give a holistic solution to the Knowledge Management problem faced by the student and faculty.

4.3.1 Knowledge Centric Project Database

For the purpose of managing information pertaining to projects and research being done, a central project database have been created. This database stores subtasks-methodologies pertaining to the generic tasks associated with a project. Each project also supports its own discussion which simulates interest, leads to betterment of project and identifies interest convergence leading to '**social networking for projects'.**

4.3.2 Technopedia

This initiative aims at converting the tacit knowledge related to courses, labs and experiences to explicit tangible knowledge snippets stored in a wiki. This will encourage multiple channels of information flow than just from faculty to students. The moderators will be the faculty/faculty nominated students.

4.3.3 Interest Groups

Information regarding a particular task is often required on a need-to-know basis. This problem is addressed by formation of interest groups. An interest group would bring together like-minded people on a common discussion forum where the right person/guidance can be sought. Each interest group would be supported by a notice board representing a summary of the group's activities. An additional module for expertise tracking contains information on expertise level in the interest group and is used to find the right people to approach for guidance pertaining to a particular problem. A more implicit form of expertise tracking is possible by analyzing the contributions made by individuals on all KM platforms.

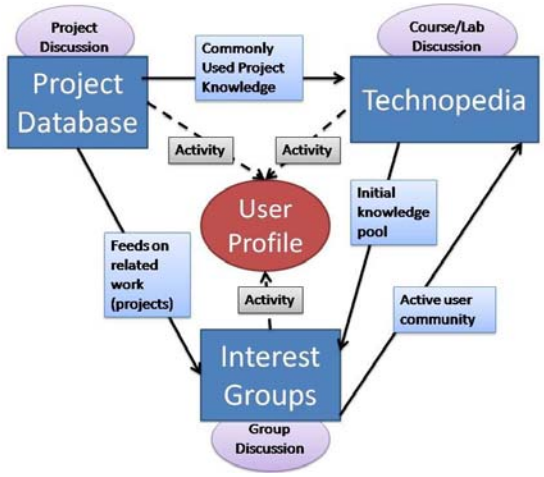

Figure 3: KM Model

4.3.4 Workshops

Workshops are a tool of managed knowledge transfer. Workshops can help impart hands-on knowledge and acts as a good forum for identifying interest groups. Additionally, they help capture the experience and tacit knowledge of the outgoing batches by imparting it to newer batches and hence retain the same in institutional memory. Interest groups can play a major role in improving the workshops by identifying needs to be addressed in that area and also assist in generating good quality content for workshops through collaboration.

4.4 Acceptance and Sustenance of the KM model

For the purpose of guiding knowledge creators on how to use the KM model to represent knowledge in its most usable form, a team spanning all departments and centers has been deployed. Such a team will also help understand and capture the diversity needed to represent knowledge effectively across all departments, thus contributing to the evolution of the model to better align with the specific needs of all.

Based on the results of the survey, we have devised the incentive model for the project database on popularity gained and perceived usefulness of the knowledge content. The following categorizations on projects have been made to motivate inflow of good quality content a) Most Highly Rated b) Most Viewed Projects c) Most followed (in terms of notification) d) Featured Projects. The content quality is also maintained by ensuring faculty

approval. Project discussion forum helps generate interest and foster support and assistance in one's work by others.

Techno champions, the ones with the maximum quality contribution get recognition by the community. The ability to follow contents by email and RSS feeds ensures that regular updates can be received directly thus addressing the issue of inertia.

We have developed an intuitive web interface for the whole system so that it could be used by different departments. Video tutorials have been put up to explain the usage and functionality of the system. Workshops and seminars are regularly conducted for faculties and students to educate on how they can use the system to their best advantage. We have combined our KM initiatve with other existent institutional processes like Openhouse (Year-end project display events) and major and doctoral thesis submission to gain wider influence and acceptance.

4.5 Implementation

We have developed IT support for Knowledge Centric Project Database and Interest Groups using Drupal which is a free and Open Source Content Management Framework. This choice is based on various factors such as a) Reduced implementation cost as the software is distributed under the GNU General Public License, b) Inbuilt support for collaborative content creation, c) Intuitive web based interface for knowledge creators, d) Support for multi-tagging for better contextual search, discussion forum, email notification, granular access control and RSS feeds e) Modular design and easy customizability e.g. Social Networking support for interest group was added using Organic Group (OG) module.

Technopedia uses TWiki which is an open-source web based collaborative wiki solution, and has been successfully implemented in Hong Kong University to facilitate students' co-construction of knowledge in group work (Chu, 2008). Some of the features provided by Twiki which are best suited for us includes, a) Easy and intuitive Microsoft Word like editing interface, b) Inbuilt hierarchy support (called webs) to implement department and centres, c) Strict access control, d) inbuilt versioning

4.6 Proposed Model and Web 2.0

Leveraging on the benefits of Web 2.0 development paradigm, our KM infrastructure provides new and intuitive ways of information sharing and collaboration among students and faculties to provide free-flowing, vital information in a way that is adaptive and user-driven. Discussion forum and wikis have been implemented to increase community participation. Discussion forum serves as a question – answer type knowledge base and wikis serves as an organized knowledgebase created as manuals and user guides. Interest specific chat rooms have been implemented to connect people directly. To make students feel connected with the system certain design principles of Social Networking sites like Facebook, MySpace etc have been incorporated into the system e.g. user profiles. Friend Followings, Groups, email-notification etc

5.0 CONCLUSION AND FUTURE WORK

In this paper, we proposed a student-centric KM implementation. The model is generic and could easily be extended to other institutes of higher education. The model has been implemented at IIT-Delhi as a three-fold solution comprising of a central project database, Technopedia and Interest groups which retains transferable and tacit knowledge in the institutional memory. It incorporates incentive models derived from psychological study and survey carried out among the student community to ensure sustenance and active participation.

As future work, the solution developed needs to be validated and evolved using operational statistics into a final implementation tailored specifically to meet the diverse needs of different departments.

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