Process Knowledge Maps for Academic Excellence

Pratosh Bansal Manohar Chandwani***

Abstract

This paper addresses a problem of requirement of managing the knowledge in an academic set up. The focus is on development of process knowledge maps. The academic infrastructure is passive and does require intellectual inputs of the stakeholders for speedy outcome and consistent supply chain. The process knowledge maps deal with the passive models and attempt to make them active and dynamic. The role of process knowledge maps is analogous to the role of dynamic information structure in the software. In addition, these maps add value to the system for better communication and consistent functioning. We present an intrinsic model of process knowledge maps, a multilevel hierarchy and B-C model of k-map development.

Keywords: *Knowledge, Knowledge Management, Knowledge Map, Process Knowledge Map, B-C Model.*

1. Introduction

The knowledge era has begun. Knowledge is now the most critical yet important business resource. Information overload is the major problem today and Knowledge Management (KM) is the solution. KM has received a considerable attention, not only of business people, but also of academicians and research workers [1].

The Universities have started becoming business centers in addition to being the traditional educational centers wherein knowledge is the focal point. There is an important role to capture, create, store and disseminate knowledge to be played vitally by every stakeholder of the University. Every process of the University system involves the use of knowledge that needs to be managed properly so that every stakeholder is benefited rationally and proportionately.

Increased globalization is posing new challenges to the traditional Indian Universities. Apart from decreased funds, resource crunch, shortage of man- power, there is also great competition with private and foreign universities. Today's economical, social and technological factors are changing the way with which the Universities are working. It is very well known fact that Universities lack in adopting new ideas as compared to the business organizations in the Indian context [1, 2].

It has been observed that Universities have been unable to fully utilize their infrastructure and resources. At times, there have been observations that some of the infrastructure and resources are available redundantly leading to unnecessary duplication of efforts. Resource optimization is a serious problem, yet is unattended.

The Information and Communication Technologies (ICTs) together with KM are very powerful tools in resolving this problem while

*, ***Institute of Engineering & Technology Devi Ahilya University, Khandwa Road, Indore. MP India .*

getting strategic advantages. With the increased use of ICTs, KM has received considerable attention in the educational sector and especially in the Universities. People have justified that ideas which were originally developed for managing the knowledge in business enterprises are also amicable to the Universities. KM shall help the Universities to reform a internal resources, in better administration, and improved teaching and research [1].

Individual knowledge is the resource to any organization. KM plays a prominent role in capitalizing the individual knowledge into organizational knowledge. Knowledge maps can be used as a methodology for managing the organizational knowledge in academics such as University Teaching Departments. There are only few studies available in the literature showing the application of this idea in education sector. There is great deal of possibility of effective KM for better productivity and economy. One of the major pragmatic ways is to deploy process knowledge maps.

Knowledge mapping techniques and tools reduce the complexity and provide transparency in the system. Knowledge map's graphical and visual feature facilitates easy and fast access to the organizational knowledge. Knowledge Maps increase the transparency by navigating the users to the knowledge resource [2] and it also provides a platform for sharing and generating knowledge. The key idea of this paper is to show the capability of the knowledge maps to reuse the organizational knowledge for solving problems; which have already been solved before within the organization by some other person (s) and for performing the certain tasks in the defined flow. Knowledge stored in the processes should be managed systematically and strategically for excellent outcomes [3].

2. Knowledge and Knowledge Management Defined in the Context

Information is termed as processed data, and actionable information is knowledge. Knowledge is neither data nor information [4]. Data is raw material, information is data with context and knowledge is information with experience. Fred Nickolas [5] elaborated meaning of word knowledge. In the perspective of KM, knowledge is "know about" and "know how". Further, knowledge can be categorized in two ways i.e. tacit and explicit. Informal, un-codified knowledge that a person has is called tacit knowledge. It is difficult to articulate and formalize tacit knowledge [4]. Explicit knowledge is systematic and easy to formalize [5]. Explicit knowledge represents technical knowledge effectively or "know how" [6].

Davenport and Prusak [7] have nicely differentiated Data, Information and Knowledge and have defined knowledge. According to them - *Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, **processes**, practices, and norms.* This definition serves the basis of defining knowledge and knowledge maps for this paper. We emphasize on the process part in academic set ups.

Abell and Oxbrow [8] defined: "*KM is the creation and subsequent management of an environment which encourages knowledge to be created, **shared**, learnt, enhanced, organized for the benefit of the organizations and its customers*". Organizations can get strategic advantage by managing the knowledge in products, people and processes [9]. A study shows that there are two best practices adopted by organizations internationally – the first is sharing of the knowledge that is within the organization and the second is creation of new knowledge [9]. The second aspect of our work is focused on the first one. Generally, people in organizations waste time and efforts on reinventing the wheel. Our idea is to indicate the managing of the organization's process knowledge by capturing and sharing it through

knowledge maps.

Figure 1 shows an intrinsic model of how KM methods can be used for managing the knowledge. Data is vague and not useful without context. Meaning, purpose and context makes data useful by converting it to the information. With use/application information becomes knowledge. Knowledge, not managed i.e. in tacit form is represented in grey shade. This knowledge can be made explicit with the help of KM methods like knowledge map. A knowledge map (k-map hereafter) is an interface from un-managed knowledge to the managed one.

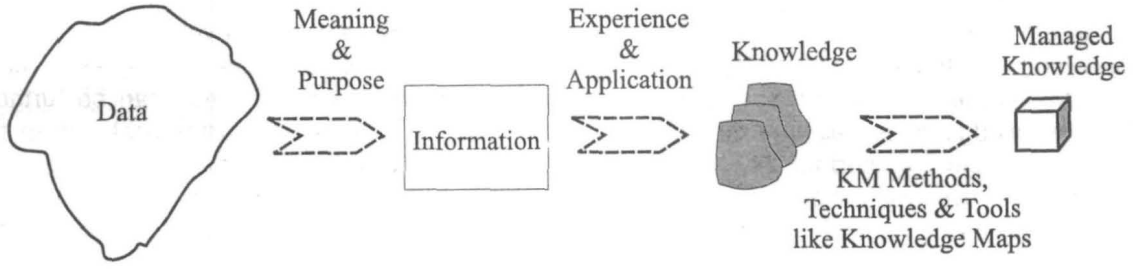

Figure –1: Data, Information, Knowledge and KM (An intrinsic model)

3. Knowledge Maps andKnowledge Mapping

It is a difficult task to know, what you know. This challenge increases with organizations like universities where profit is not the objective. However to secure strategic advantage and maximize opportunities by exploiting existing knowledge, ICTs based knowledge map can help the organizations. This system can assist the organizations to know the location of knowledge items, expertise of individual or groups and learning during the execution of some work [10].

Knowledge mapping can make easy for an organization to map: explicit knowledge (*the what*) available to the organization, the specific expertise (*the who*) or the location of best practices, narratives or anecdotes for understanding the situation/circumstances behind past decisions (*the how, the when and why*) [10].

According to Davenport and Prusak [7] "*A knowledge map – whether it is an actual map, knowledge "yellow pages" or a cleverly constructed database – points to knowledge but it does not contain it. It is a guide not a repository*". Knowledge maps are simple and efficient ways to capture and share explicit knowledge. Complex knowledge structures, in domain like universities, can be simplified, coordinated and navigated efficiently with the help of knowledge maps. According to Wexler [11], *knowledge mapping serves as the continuously evolving organizational memory, capturing and integrating strategic explicit knowledge within an organization and between an organization and its external environment.*

Knowledge maps are problem oriented [11] and represent transformation of tacit or explicit knowledge artifacts into a graphical form such that it can be easy to understand to the users. Performance indicators, highlighted by knowledge maps, can be used to improve business processes [12].

Folkes [10] cited the comprehensive and widely acceptable definition of knowledge maps given by Edmond Vail III: *A knowledge map is the visual display of captured information and relationships which enables the efficient communication and learning of knowledge by*

observers with differing backgrounds at multiple levels of detail. The individual items of knowledge included in such a map can be text, stories, graphics, models or numbers. Maps can also serve as links to more detailed knowledge sources ranging from text-based GroupWare documents to database schemas as well as pointers to implicit knowledge (such as experts).

There are two ways to classify knowledge maps. First is on the basis of their form and the second is on the basis of purpose. Literature shows knowledge maps may have theoretically any form and can be used for any number of purposes. However, without purpose there is no use of knowledge map, hence purpose imposes some constraints upon the form of knowledge maps and corresponding purpose [10]. Process knowledge maps are suitable for knowledge gap analysis in an organization [10].

Operational processes which are carried out in the organizations on day to day basis need relevant information and knowledge, which can be easily mapped through process knowledge maps. Figure 2 suggests levels of k-map based on organizational structure. The highest level is organizational k-map, which can be further divided from inter-departmental k-map to department level k-map.

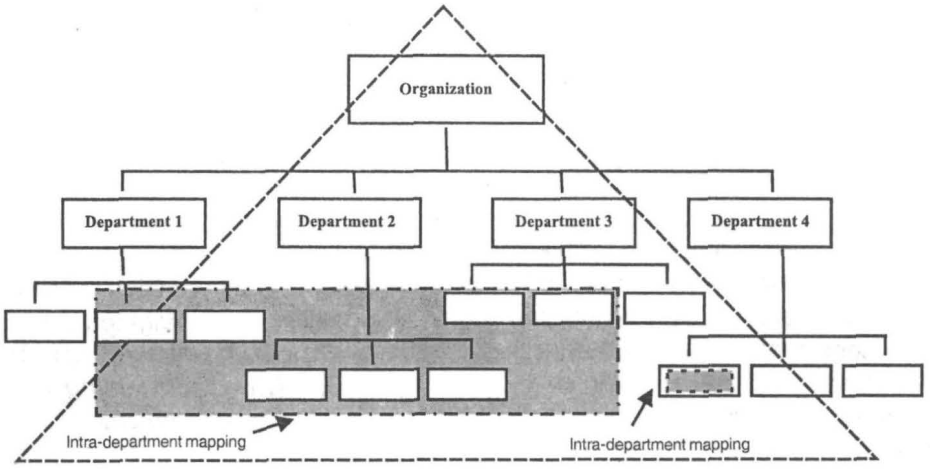

Figure - 2: Levels of k-map

Every live system and environment is dynamic in nature. In creation of knowledge maps dynamic nature of organization, environment and also dynamic character of knowledge is challenge. Some knowledge becomes obsolete, superior knowledge replaces old knowledge and some knowledge may become irrelevant [2]. Folkes [10] and Wexler [11] discussed the challenges due to dynamism of knowledge and suggested some approaches to capture the dynamic character of the knowledge. Competence maps, concepts maps, strategy maps, chronological series of static maps etc. can be the solution. However, this paper primarily deals only with static knowledge and suggests application of process knowledge maps in Universities by taking a case of a department of a university.

Most of the universities in India are facing severe problem of qualified manpower. Upper layer of senior and experienced professors and executives is depleting. Teachers are overburdened with administrative tasks. Due to absence of any significant and integrated knowledge management measures they are

wasting time and efforts in repeating tasks. Authors believe that use of process knowledge maps in the organizations like Universities shall lead to reduction in knowledge gaps and hence saving in efforts, resources and time. This shall help universities to excel in academics as automated system of knowledge map will help teachers in doing routine process efficiently and timely with optimum use of resources.

4. Development of Process Knowledge Map

In this section we propose a schema of developing process knowledge maps. We call it B-C model (Fig 3) of k-map development life cycle. This model has following phases for developing k-map: articulating the requirement, analytical study, decision making module, filtering of knowledge to template and contemplating the template.

4.1 Articulating the Requirement

Unmanaged knowledge, within the organization, resides in diversified locations that include manuals, written documents, human brain, database and organizational memory.

Organization works through some predefined series of steps, confined by some set of rules/ procedures, called process. Some processes are cross functional and some are intra-department or unit. Order, supply are the example of cross functional generic processes which are almost common to most of the organizations. However, some domain specific processes like thread cutting, clearing of cheque etc. needs domain specific knowledge.

This phase starts with articulating the knowledge requirements. Focus should be on the processes where the knowledge gap is large. This helps in deciding the scope of k-map. It may be noted that this decision is also based on some previous experience/knowledge, represented as knowledge artifact in Fig. 3.

This phase ends with the identification of process for which k-map is to create.

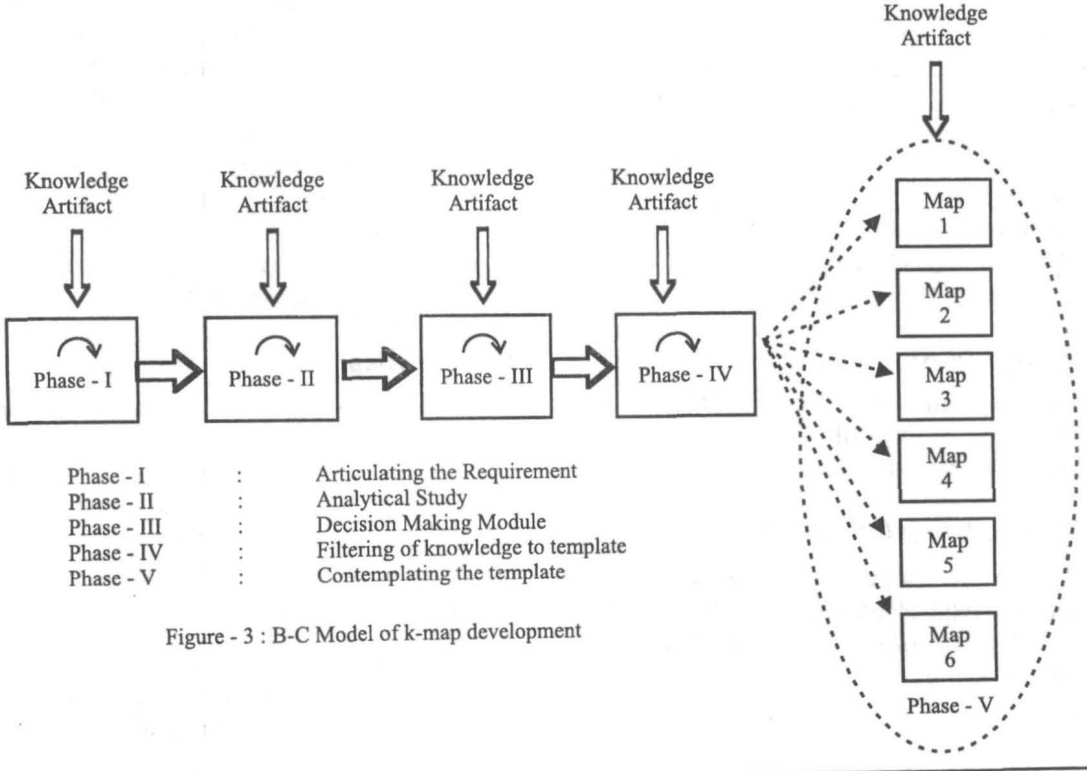

Figure - 3 : B-C Model of k-map development

4.2 Analytical Study

Analysis phase decides the level of detail. Process identified in the first phase are further decomposed into its component steps, then analysis of each component step is carried out, and following information is collected:

- *Who* is the user of this step, who has the required competency/knowledge/ *experience /qualification to execute this* step like store keeper, cashier, HOD etc.
- Inputs needed i.e. pre-conditions to execute the step like filled application form, LOI etc.
- Desired output of the step like scrutinized application form etc.
- Tools/systems used to perform the steps.

Complete information collected for all component steps of the process will be the input to third phase of the model.

4.3 Decision Making Module

Third phase emphasizes the importance of academic alliances, procedures, best practices i.e. organizational knowledge (*how*) required to execute the process.

As second phase gives the knowledge about users, inputs etc. this phase provides knowledge for doing the things in an organization. Domain specific knowledge is also gathered here.

4.4 Filtering of Knowledge to Template

This phase maps the knowledge gathered in decision making module over information collected in phase two for each component step.

4.5 Contemplating the Template

This phase provides organizational knowledge in explicit form for the requirements as stated in phase one. Various k-map templates are the outcome of this phase. K-maps may be diagrammatic representation of the process with knowledge required/used during the execution, documents in suitable format, html page or knowledge matrix. In the next section we present a case study.

5. Process Knowledge Map : A Case Study

5.1 Overview

We take a case of a department of a university in India. It is one of the oldest universities of Central India. Around 35 university teaching departments (UTDs) are in the university in addition to more than 150 affiliated colleges. Some UTDs are self-financed and do not get any grant/aid from the government.

We have selected one of the self-financed UTD for our study, which is imparting higher education in engineering & technology. We exemplify the development of process k-map based on model, for this UTD.

5.2 Articulating the Requirement

We have identified one small intra-department process, i.e. "preparing the panel of practical examiners", of examination department to discuss in this case study. It is worth mentioning that for every exam there is a new team of board of studies (BOS) to prepare the panel. This team is normally a mix of experienced and un-experienced teachers. This can be very useful for the newcomers before taking the responsibility.

5.3 Analytical Study

There must be some initial knowledge to help in deciding, when one has to trigger the process. If this is not documented, and unfortunately this is the case in most of the organizations, then problem becomes more complicated. However, in this case, this is assumed that, users know that when to start preparation of panel.

Following are the component steps and relevant information for the process of "preparing the panel of practical examiners":

Component Step 1: List of Subjects

- User (who performs?):
  * Members of BOS/HOD
- Input:
  * Scheme of the subjects
- Output:
  * List of subjects for which practical exam will be conducted

Component Step 2: Listing of Examiners

- User (who performs?) :
  * Member of BOS/HOD
- Input :
  * List of subjects for which practical exam will be conducted, database of examiners
- Output :
  * List of examiners who can be called for the examination

Component Step 3: Allocate Examiners

- User (who performs?) :
  * HOD/Dean
- Input :
  * List of examiners who can be called for the examination
- Output :
  * Proposed Panel for the examination

5.4 Decision Making Module

Following knowledge artifacts can be useful for executing the above process:

Component Step 1: List of Subjects

Specific knowledge requirements:

- Which is the current scheme?
- What are the old schemes?
- How to identify the subjects for which practical examination will be conducted but not being taught in the current semester?

Component Step 2: Listing of Examiners

Specific knowledge requirements:

- Who can be the examiner? What is the qualification? Rules.
- Old experiences with particular examiner, Non availability of the examiner in a particular subject.
- Old panel (s)

Component Step 3: Allocate the examiners

Specific knowledge requirements:

- Format of preparing the list
- Allocate three examiners, based on priority, for each subject
- What to do if an examiner is not available

In addition to this, following are the knowledge requirements specific to the whole process:

- Rules to form BOS.
- Who can be the member of board of studies? Role and responsibilities.
- Examination related ordinances and statues.
- How to change scheme?
- Latest decision by BOS like inclusion or deletion of subject (s)

The format of these knowledge artifacts is the issue of concern while making automated system.

5.5 Filtering of Knowledge to Template

Component Steps	User (s)	Input (s)	Output (s)	Step Specific Knowledge	Process Specific Knowledge
List of Subects	Member ofBOS/ HOD	Scheme	List of subject for which practical exam will be conducted	Current Scheme	Rules to form BOS. Who can be the member of board of studies? Role and responsibilities. Examination related ordinances and statues. How to change schme? Latest decision by BOS like inclusion or deletion of subject (s).
List of examiners	Member ofBOS/ HOD	List of subjects for which practical exam will be conducted, database of examiners	List of examiners who can be called for the examination	Rules	
Allocate the examiners	HOD / Director	List of examiners who can be called for the examination	Proposed Panel for the examination	Format	

Table 1: Knowledge Map Matrix

This phase does the processing on the knowledge collected in phase one and phase two (5.3 and 5.4 here). Depending on the requirement of the user this phase prepares the map by selecting the template available. It is actionable from the rule-base.

5.6 Contemplating the Template

This phase represents the knowledge artifacts in the form that is suitable to the user. Table 1 is the knowledge map matrix of a process "preparing the panel of practical examiners".

6. Conclusion

In this paper, we have given a framework for developing process knowledge maps for academic setups. The proposed model is modest one and has analogy with the artifacts and information structures in the software developments process. We have presented a stepwise development cycle with illustrative schematic of producing k-maps of different requirements. For the fully developed system there will be interlinked maps for all the processes within an organization. Presently, the model is at conceptual stage and is subject to undergo formal design, architectural design and implementation towards automating the system.

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