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Knowledge Mapping Methodology for Developing a Knowledge Management System: A Case Study in Universiti Teknologi MARA Kelantan

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ABSTRACT

Knowledge map approach represents tacit and explicit knowledge in an organization. Knowledge is created and reused during the execution of a business processes going through the business process and dealing with specific relevant knowledge for a particular task of process. A knowledge map is the visual representation of captured information and relationship, which enables the efficient communication and learning of knowledge by observers with different backgrounds at multiple levels of detail. The map consists of text, graphics, stories, models or numbers. Knowledge mapping serves as the continuously evolving corporate memory, capturing and integrating the key knowledge of an organization. It enables people learning through navigation and interrogation of the information in the map and also through the creation of new knowledge through the discovery of new relationships. This paper suggests the methodology for capturing and representing organizational knowledge. The methodology is comprised of a six-step procedure from defining an organizational knowledge step to a knowledge map validation step. A case study of UiTM Kelantan campus is also provided at the end of the discussion to verify the proposed methodology focusing only on the process of the verification of subject offered as a part for the subject registration process and finally discusses the lesson learned from which the knowledge mapping methodology is implemented.

Keywords: Knowledge mapping, knowledge management, corporate memory

Introduction

Knowledge Management (KM) has become an important topic in a world of management. KM is a process that deals with the creation and utilization of high-level information within an organization to improve its business performance (Gupta 2000). Information technology-based knowledge management involves many disciplines. It overlaps with information system development (Sage and Rouse 1999), Information Resource Management (Nissen 2000), Decision Support System (Ramesh and Tiwana 1999), artificial intelligence (Knowledge and Information System, An International Journal 2001), human resource management (Rastogi 2000) and others.

There are 2 types of knowledge: tacit and explicit. The former resides within people as mental models, experience and skills and is difficult to communicate externally. The later can be captured and communicated in the forms of rules and procedures. Capturing and representing knowledge buried in human's mind are fundamental for knowledge management implementation. This paper suggests the methodology for capturing and representing organizational knowledge. The methodology is comprised of a six-step procedure from defining an organizational knowledge step to a knowledge map validation step (Kim, Suh and Hwang 2003). A case study of UiTM is also provided at the end of the discussion to verify the proposed methodology and finally the paper also discusses the lesson learned.

Knowledge Management Framework

Knowledge map was firstly introduced in to KM by Michael Zack (Tiwana 2000) who also describes the process as knowledge based SWOT analysis. Knowledge map approach represents tacit and explicit knowledge in an organization. Knowledge is created and reused during the execution of a business processes going through the business process and dealing with specific relevant knowledge for a particular task of process. Figure 1 shows the overall framework of a workflow-based knowledge map.

The figure shows that a knowledge map consists of two steps: first are knowledge collection and the knowledge representation. The knowledge collection is based on users' knowledge and related task knowledge. The relevant knowledge is given to the user's knowledge of a specific task. The users' information and the task attributes are important in order to achieve the relevancy of user and task. The information can be obtained by defining a process. The knowledge collection takes the relationship of user-task and task-knowledge into account.

The second step is knowledge representation. The knowledge is represented in the hierarchical organization. This is called the vertical relationship. The horizontal relationship means the knowledge is represented in the form of input-output relationship of knowledge. A knowledge item may need other knowledge item, which produced by the

previous process.

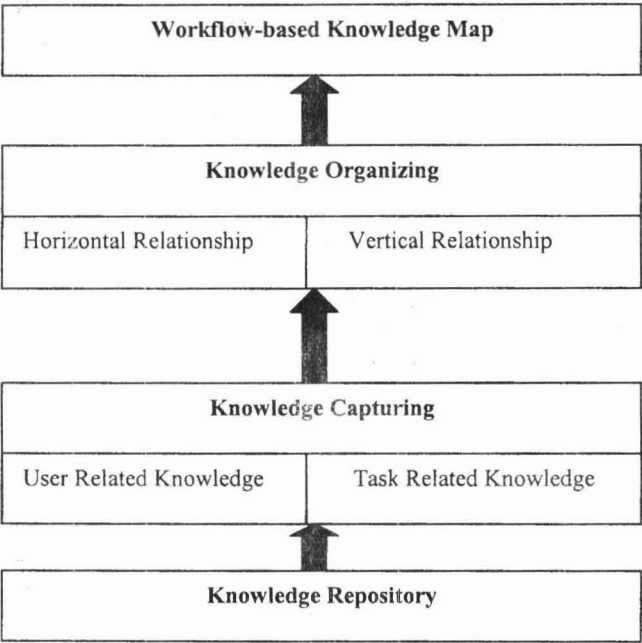


Fig. 1 : The Knowledge Management Framework

Knowledge Map Definition

Knowledge maps problem-centered (Wexler 2001). It is the systematic system that enables users to find the answer they look for. Different knowledge map focuses on different problem. The problems addressed by map makers and map users explain the contents of the knowledge map. The contents of the knowledge map are problem focused and alter through use, reuse and experimentation. A knowledge map is the visual representation of captured information and relationship, which enables the efficient communication and learning of knowledge by observers with different backgrounds at multiple levels of detail. The map consists of text, graphics, stories; models or number. The mapping process often creates intellectual capital value through the creation of new knowledge from discovering previously unknown relationships.

Knowledge map enables all stakeholders in an organization to capture, organize, share and evolve the knowledge. Capturing is a collecting relevant information process in which it evolves in the forms of text, pictures, stories, data and models. Organizing is a process of symbols and knowledge architecture into an organization's knowledge, which serve as visual directories of sources of knowledge. Sharing is a process of being visible and accessible to everyone at every level of an organization in the form of display regardless of his or her levels of computer literacy. Evolving is a process of sustaining in which they do not need to recreate from scratched rather they are enhanced with new knowledge relationships.

Knowledge mapping serves as the continuously evolving corporate memory, capturing and integrating the key knowledge of an organization. It enables people learning through navigation and interrogation of the information in the map and also through the creation of new knowledge through the discovery of new relationships.

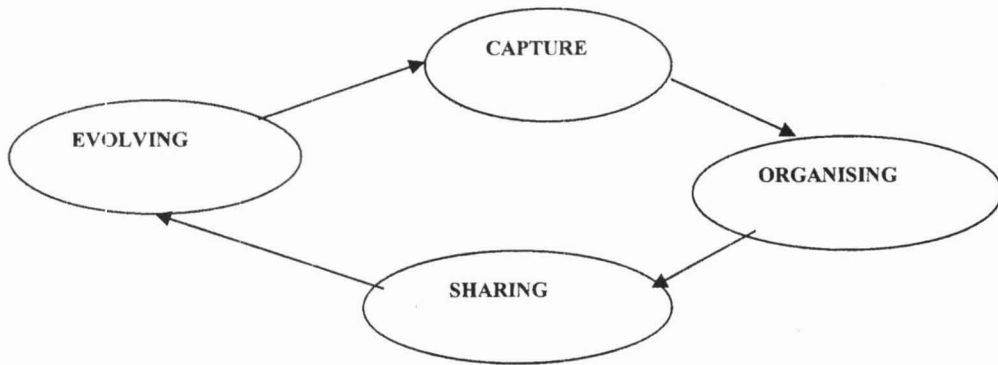


Fig. 2: Knowledge Management Process

Knowledge Mapping Procedures

We proposed six procedures for building knowledge management system (Kim, Suh and Hwang 2003). Those six procedures are defining organizational knowledge, process map analysis, knowledge extraction, knowledge profiling, knowledge linking and knowledge map validation.

Defining Organizational Knowledge

This procedure deals with the usage of vocabulary in specifying knowledge. This procedure is to provide a uniform, text-based intermediate representation of the knowledge in which can be understood by humans and machines. Those uniformed terms will be used in the retrieval process in accessing knowledge by users. The users can access a knowledge-based system without being expert in the specific process because those uniformed terms can be understood by humans and machines. It makes the process of accessing and retrieving easier and quicker.

Process Map Analysis

This process we extract organized knowledge from the business process supported by IT infrastructure as well as organizational culture. Solutions can be found from knowledge involved in the business process.

Business process is analyzed using a process map technique. Process is the work or actions performed on data so that they are transformed, stored or distributed to customers or next processes (Hoffer, George and Valacich 2002). A process map is composed of process, flow (dependency), event and external entity. An arrow represents the relationship between pre and post process.

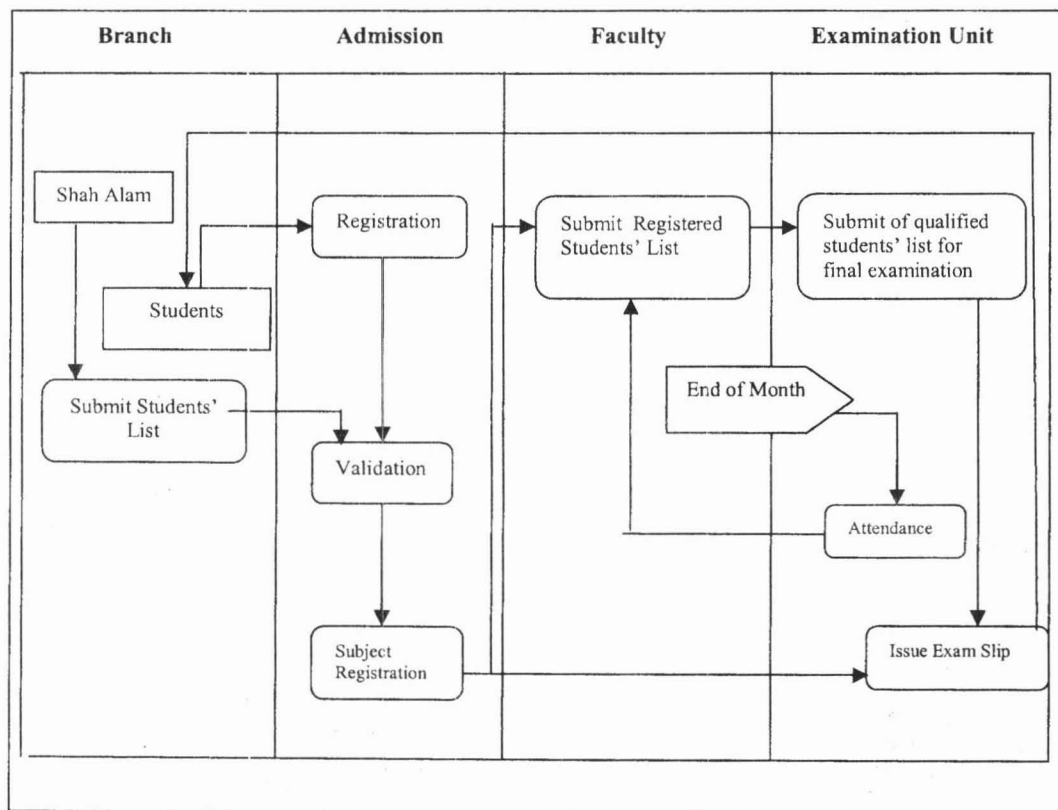


Fig.3: An Example of Process Map

Knowledge Extraction

In this step, knowledge is extracted through a process map. There are several techniques of extracting knowledge from a process map.

- Interview: using a questionnaire;
- Document analysis: such as manual, procedures, organizational chart, training materials and external document;
- System analysis: it is based on information and database;
- Knowledge workshop: capture and analyze knowledge in specified knowledge area.

There are other techniques such as brainstorming, focus group, qualitative text analysis and so on.

Knowledge Profiling

We describe knowledge with pre-defined items (attributes) and create relationships with process. The knowledge profiling provides information attributes such as keywords, description, importance and people-finder attributes such as an expert or author.

Table 1: Sample attributes of knowledge profile

Category	Item
General	Knowledge ID Title Type (tacit/explicit) Creating Date Last Modified Expired date
Storage	Format Location
Ownership	Author Organization Access right Department/Unit
Contents	Keyword Description
Evaluation	Importance Rating
Link	Prerequisite Expert

Knowledge Linking

The step of knowledge link is identified after the knowledge profile. The knowledge link is identified when producing knowledge profile. We identify new links and examine and confirm existing links. Knowledge is represented in a form of arrow. The knowledge map shows a navigation path of knowledge. The knowledge map consists of nodes and links. Each node represents knowledge item and each link represent pre and post relationship between knowledge.

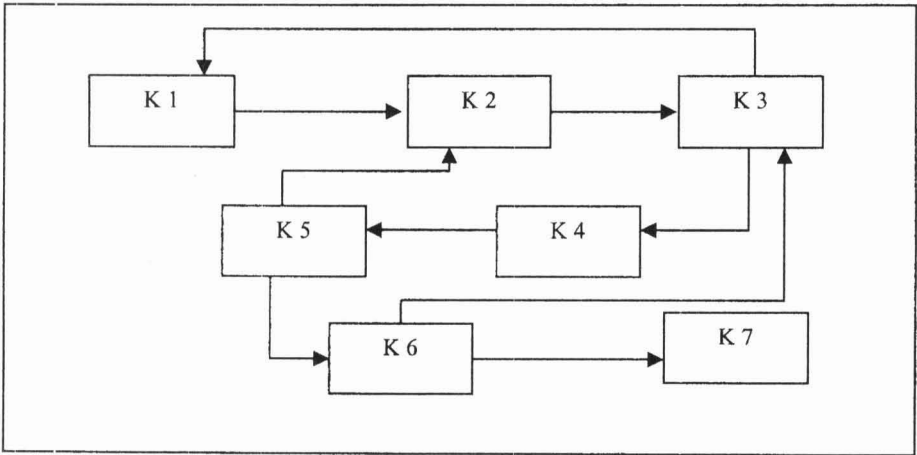


Fig. 4: An Example of a Knowledge Link

Knowledge Map Validation

User validation is performed by a structured walkthrough. A walkthrough is conducted with domain experts, business managers and knowledge map producer. These are questions should be asked as a guideline:

- a) Are all knowledge extracted?
- b) Is any knowledge redundant?
- c) Are profiles and links fully described for all knowledge?
- d) Are the 'knowledge profile and knowledge map consistent?

After completing knowledge mapping procedures we can acquire knowledge mapping deliverables, knowledge dissemination deliverables and people-oriented deliverables. Knowledge mapping deliverables are a standardized terminology, new knowledge creation, knowledge maps and knowledge gaps. Knowledge dissemination deliverables are final report, an electronic system containing the captured knowledge. Lastly, people-oriented deliverable is a network of experts.

Case Study: MARA University of Technology, Kelantan Campus

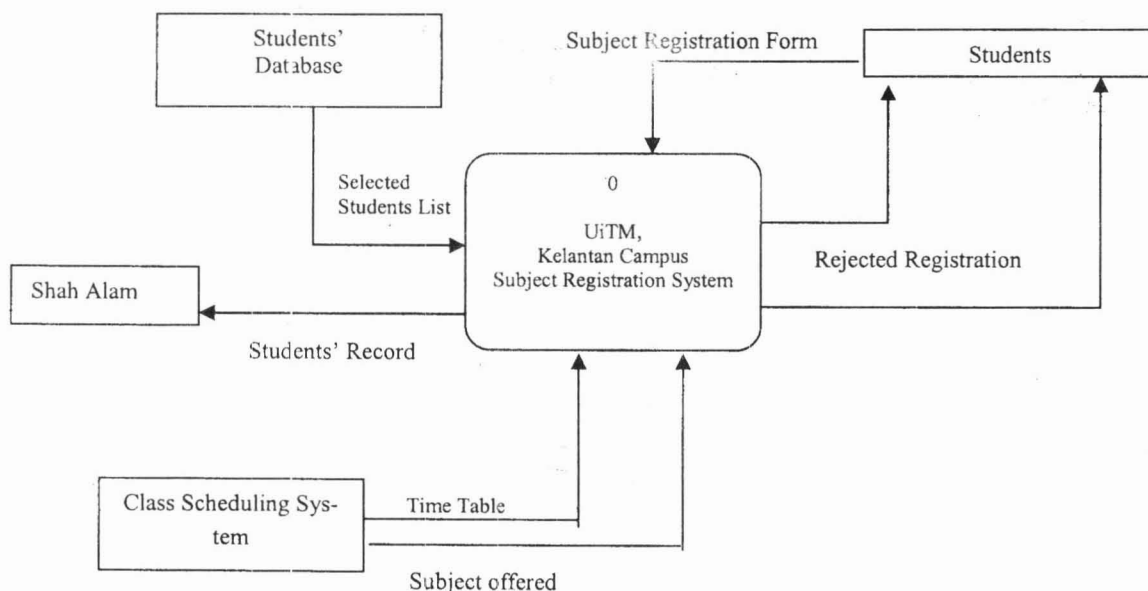


Fig. 5: Context Diagram of UiTM, Kelantan Campus Subject Registration System

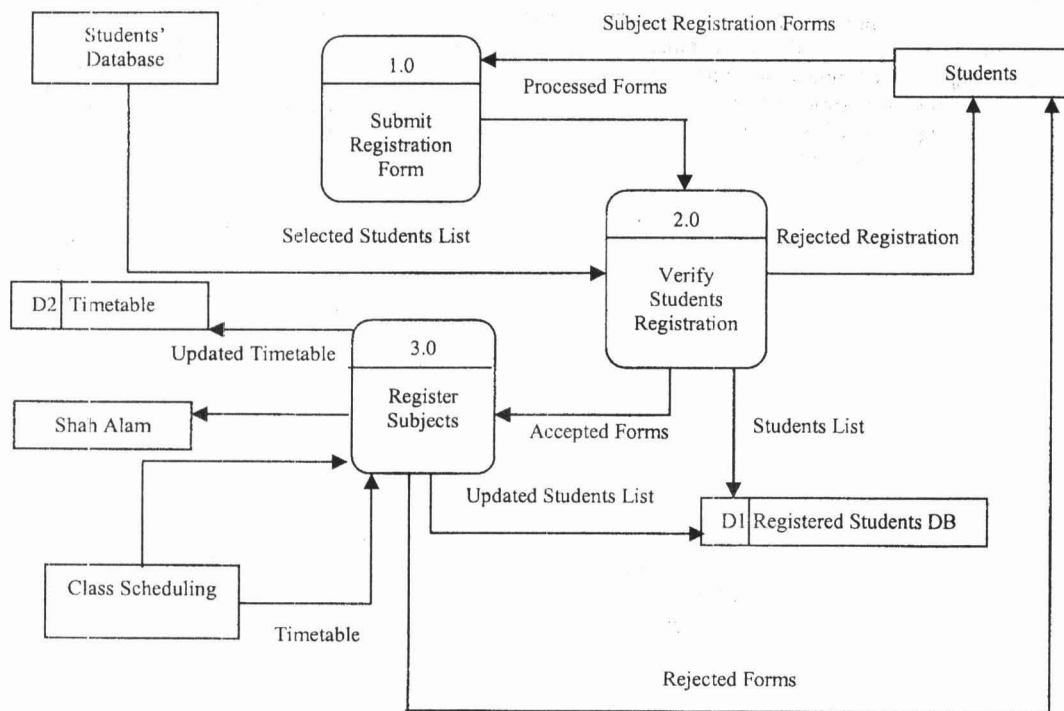


Fig. 6. Level-0 DFD of UiTM, Kelantan Campus Subject Registration System

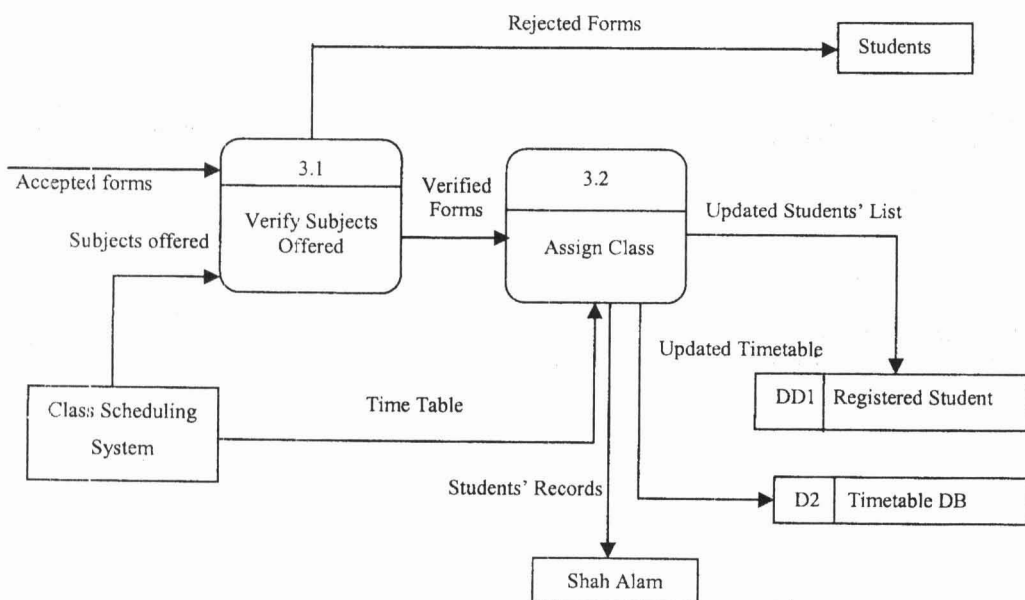


Fig. 7: Level-1 DFD of UiTM, Kelantan Campus Subject Registration System

Overview of the UiTM Subject Registration System (SRS)

Universiti Teknologi MARA (UiTM) is the largest university in Malaysia. She has branches in all states in the peninsular as well as in the east peninsular (Sabah and Sarawak). The systems implemented in the branches are not fully empowered. Some systems have to be dependent on the main campus in Shah Alam. One of the dependent systems is the Subject Registration System (SRS). We can see from the Data Flow Diagram (DFD) above that the Subject Registration System (SRS) is not completed its circle. The complete circle of subject registration begins with students' registration and ends with issuing the examination slip to the students.

The branches have to wait for the students' list sent by Shah Alam. The main campus in Shah Alam has an authority to make a selection of the qualified students. Another process is done by Shah Alam is the end process of subject registration is issuing the examination slip. This will make the period of the subject registration taken a long time or in other words the process of the subject registration takes a time of one semester. This is because the examination slip will be issued at the end of the semester.

As the largest university in Malaysia, UiTM will have to require the various kinds of technology and we select UiTM to apply the suggested methodology. We select only the process of the verification of subject offered (process 3.1) as one part of the subject registration process.

Defining Organizational Knowledge

We define the knowledge occurs in the Subject Registration System (SRS). The system will determine and delegate students according to their respective faculties, parts and subjects. The whole processing procedure occurs at the relative programs that they major in. The assets of the organizational knowledge are those who operate the system and the procedures or task related knowledge. In this case study the person is En. Shamsul Abdul Manan as one of the expert domain for IS student subject registration.

Process Map Analysis

We produce the process map based on task flow. Figure 5, 6 and 7 show the Data Flow diagram (DFD) from a subject registration form to be transformed into examination slip produced by the main campus in Shah Alam. The input has to go through several processes to the students or the next process and the next system.

Knowledge Extraction

Knowledge is extracted based on each process. Knowledge is organized according to the operation manual. Knowledge is extracted using observation, interview and questionnaire methods with experts. They also describe characteristics of knowledge and evaluate the knowledge. This procedure requires a prerequisite knowledge for the process execution uses the respective knowledge during the process execution and creates knowledge after the process execution.

Knowledge Profiling

We matched the knowledge with process map based on an interview results and reviewed to the knowledge list and domain expert. The knowledge profile is composed of title, creating date, author, expert, unit, faculty and a brief description. Table 2 shows the knowledge profile.

Table 2 : Knowledge Profile

Knowledge ID	UiTMCK-SRS-3.1	Title	Verify Subjects Offered
Author	Khalid Abd Wahid	Organization	UiTMCK
Creating Date	17/04/ 2005	Last Modified	-
Key Word	Verify Subjects	Expired Date	99/99/9999
Type	Explicit Knowledge	Rating	5
Prerequisite	UiTMCK-SRS-2.0	Access Right	Respective clerks
Unit	HEA	Expert	Shamsul/Imran
Description	Subjects registered by students will be verified by the respective clerk in order to make sure that the subjects registered are offered and provided by the faculty. The verification process will be based on data provided in the accepted forms. The output of this process will be sent to the next process, Assign Class. The rejected forms will be given back to the students.		

Knowledge Linking

The knowledge link is built in the form of navigation system. The users can click at any process in order to know the details of the particular process, its input and output as well as the knowledge profile. It is very helpful in identifying knowledge flow and association.

Knowledge Validation

After completing the production of the knowledge map, a structured walkthrough is conducted with domain experts to validate the knowledge map. In this case study the domain experts are En. Shamsul Abdul Manan and Sdr. Imran Mohamed @ Ismail, Asistant Registra of UiTM Kelantan.

Conclusion

We proposed the knowledge mapping methodology for capturing and representing organizational knowledge that comprised of the six procedures for building knowledge management system. Those six procedures will be defining the organizational knowledge, process map analysis, knowledge extraction, knowledge profiling, knowledge linking and knowledge map validation. This methodology enables the efficient communication and learning of knowledge by observers with different backgrounds at multiple levels of detail. Our approach was to verify the proposed methodology focusing on the process of verification of subject offered as a part for the subject registration process in UiTM Kelantan campus. It is hoping that the approach could be generalized and the study will contribute as the lesson learned to other campuses as it is implemented. We are encouraged to believe that the approach will play a key role to serve the continuous evolving corporate memory, capturing and integrating the key knowledge of the organization and becoming a solution to develop an effective and efficient knowledge management system.

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