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Syllabus Management System for Academics Practicing Knowledge Management

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Abstract

Knowledge management, a very popular term which describes a range of practices used by organizations to identify, create, represent, and distribute knowledge for reuse, awareness and learning across the organization. This paper will discuss a practice used by academics in Centre for Diploma Programme (CDP) in Multimedia University via syllabus management system. Every two to five years, CDP's academic and management staff will prepare the updated syllabi for MQA accreditation. The system will assist both the administrator and the lecturers in organizing, updating and retrieving their syllabi information for the entire Diploma in Information Technology (DIT) programme. There are basically a few factors that encourage academics to practice knowledge management. First of all, we will identify the contributing factors that encourage the academics in CDP, MMU for practicing knowledge management i.e. MQA's requirement, academics' commitment and the university's requirement and then the practice of knowledge management is shared through the Syllabus Management System. The requirement models have been represented using the Unified Modeling Language (UML) and the development stage uses the ontology development methodology. The ontology methodology is then used as a guideline for creating ontologies based on a declarative knowledge representation system. The system is deployed on the Protégé ontology editor tool.

Keywords: Knowledge Management, Outcome Based Education, Protégé , Ontology

Introduction

Knowledge is neither equal to data nor information. In fact, knowledge can be described as something that makes both data and information manageable. For example, if you want to travel by train from Rawang to Ipoh, you will need some data, some information and above all, knowledge. You have the data through tables with train times at the Rawang station. From this data, you can extract meaningful and useable information from the large amount of data that are relevant for the trip. The thing that makes this all possible is knowledge. This is because, you have knowledge of train tables and you must consult the tables if you need to know what time your train leaves. You can also read and you found the station. All these things have something to do with knowledge.

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Knowledge is characterized by information, a capacity and an attitude. Knowledge management needs to take into consideration the system-bound side of knowledge or also known as information and people-bound side of knowledge or also known as capacity and attitude. The system-bound side of knowledge is called explicit knowledge and the people-bound side knowledge is known as implicit or tacit knowledge.

Knowledge Management (KM) has managed to become the main source and continued key factor in developing and implementing competitive and successful systems that represents the organization memory in various fields including education. This competitive advantage is achieved through the process of creating, collecting, organizing, diffusing and implementing of both creative and timely business solutions that are able to pursuit the organizational objectives.

Multimedia University (MMU) is currently having more than ten faculties and departments offering different education programmes which are accredited by Malaysian Qualification Assurance (MQA) previously known as Lembaga Akreditasi Negara (LAN). To maintain the quality of programmes taught, MQA has provides some guidelines and procedures on syllabus format and materials that need to be collected, prepared and updated. These are to ensure that all programmes offered are always met with its quality assurance.

A Document Management System allows users to track and manage documents across work groups which include handling critical information assets such as lecturer's teaching background, subject learning outcomes and programme outcomes. In order to manage the syllabus, a simple prototype is developed to enable authorized user groups to locate, update, store and retrieve data in the most efficient manner. The system is developed using the Protégé 2000, an ontology editor tool that will assist in defining and providing an extensible architecture of creating and customizing knowledge based application, in this study the knowledge of syllabi.

Research Objective

The overall goal of this study is to identify the contributing factors that encourage knowledge management practice among academics via the syllabus management system in Centre for Diploma Programme, Multimedia University Melaka. Moreover, we need to identify if MQA requirement, academics' commitment and university requirement are the contributing factors that encourage knowledge management practice among academic in CDP, MMU. Based on the above research objectives, a syllabus management system is introduced to encourage knowledge management practice among the academics. A simple prototype has been developed and introduced to the academics by using an ontology tool in identifying the knowledge base and representing the organization memory by emphasizing on the knowledge of programmes. A simple prototype is developed based on the models, structure and the defined knowledge base repository of the Syllabus Management System.

Scope and Limitations of Study

The scope of this research is as follows: (1); The contributing factors for knowledge management practice among academic is only limited to three factors that is MQA's requirement, academics' commitment and university's requirement, (2) The Document Management System only caters for the Diploma in Information Technology syllabi, (3); The system is able to store, update, search and retrieve syllabus. (4); The use of ontology tools to module the Syllabus Management System

Literature Review

Knowledge Management (KM)

KM has managed to become the main success factor for organizations in building and

representing their organization memory (OM) in various fields such as education, engineering, management and environment. Information Technology (IT) has proven to continuously support KM throughout the development of OM. In addition, the integration of informal, semiformal, and formal knowledge helps to facilitate its access, sharing and reused by the members of their organization(s) for solving their individual or collective tasks (Thorsten & Sure, 2002). A common approach to tackle the knowledge management problem in an organization consists of designing an organizational memory (Abel et al., 2004).

There have been many researches done on knowledge management itself. Data can be transferred, information can be shared but knowledge is an attribute of people or communities or societies. According to Dougherty (1999), knowledge only exists because of people. Knowledge comes as a person uses information and combines it with their personal experience. Much of the knowledge one acquires and gathers in one's head has its own value, and it is that which makes each of us unique and valuable to the society as a whole and to organizations. Tobias (2000) and Trepper (2000) have also suggested that the two greatest assets that companies have are the people that work with and knowledge in their workers' heads.

Drucker (1993) describes knowledge as the only meaningful resource in a knowledge society. He further stresses that knowledge is not impersonal like money. Knowledge does not reside in a book, data bank, a software programme. They contain only information. Knowledge is always embroiled in a person, taught and learned by a person, used or misused by a person.

McAdam and O'Dell (2000) have undertaken a study on the perception and the use of knowledge management in both public and private sector. They have used Demarest's socially constructed models as their model, as they assume a wide definition of knowledge and represent knowledge as being intrinsically linked to the social and learning processes within the organization.

Al-Athari and Zairi (2001) have carried out another research project on knowledge management in both private and public sector organizations. Their study examined the actual situation on the availability of knowledge management systems in 77 Kuwait Organizations.

According to Civi (2000), many companies are beginning to understand that the knowledge of their employees is the most valuable asset. Knowledge management has thus far been addressed at either philosophical or technological level, with little pragmatic discussion on how knowledge can be managed and used more effectively on a daily basis.

Liebowitz and Chen (2003) have also conducted another study on knowledge management issues in public sector organizations. They investigated on how knowledge management could build and nurture a knowledge sharing culture in an organization.

Bender and Fish (2000) recognize that knowledge originates in the head of an individual and builds on information that is transformed and enriched by personal experience, beliefs and values with decision and action-relevant meaning. It is information interpreted by the individual and applied to the purpose for which it is needed. The knowledge formed by an individual will differ from another person receiving the same information. Therefore, Bender and Fish (2000) conclude that knowledge is the mental state of ideas, facts, concepts, data and techniques, recorded in an individual's memory. It involves the processing, creation or use of information in the mind of the individual (Kirchner, 1997). Unlike traditional raw material, knowledge usually is not coded, edited, inventoried and stacked in a warehouse for employees to use as needed. It is scattered, messy and easy to lose (Galagan, 1997).

According to several researchers, explicit knowledge is characterized by its ability to be expressed as a word or number, in the form of hard data, scientific formulas, manuals, computer files, documents, patents and standardized procedures or universal starting points that can be easily transferred and spread. On the other hand, implicit knowledge is difficult to formalize and therefore difficult to transfer and spread. It is mainly located in people's hearts and heads. Implicit knowledge is what is in our heads and explicit knowledge is what we have codified.

Nonaka and Takeuchi (1995) have argued that a successful knowledge management programme needs to convert tacit knowledge into explicit knowledge in order to share it and for individuals and groups to internalize and make personally meaningful codified knowledge once it is retrieved from the knowledge management system.

According to Civi (2000), Knowledge originates in human being; a computer cannot create it. The only sustainable advantage of organization is what people know and what they do with it. It is the most important resource a company has that is worth more than land, labour and capital and unlike those traditional assets, knowledge does not diminish in value. It actually represents 75 percent of a company's worth, but does not get a place in the company's balance sheet.

Organization Memory

Organizational Memory defines a comprehensive computer system which captures a company's accumulated know-how and other forms of knowledge assets and makes them available to enhance the efficiency and effectiveness of knowledge-intensive work processes (Vasconcelos, 2000). Furthermore, OM without fail supports the continuous storage manipulation of an organization knowledge (Vasconcelos et al 2002).

Ontology Modelling

Ontology is a model that is populated by concepts and it is organized in a particular hierarchy that represents the theories about real world objects of interest, the relations between them in a certain domain and properties of objects (Vasconcelos, 2000). Protégé 2000 is one of the available ontology which is an open source tool that helps users on the construction of large electronic knowledge bases. This tool enables developers to create and edit domain ontologies.

Among the advantages of Ontology are (1) The ability to share common understanding of the structure of information among people; (2) The ability to reuse domain knowledge and (3) The ability to make the domain explicit.

Outcome Base Education (OBE)

Outcome Based Education (OBE) is an educational process in achieving specified outcomes concerning the students' learning abilities. Both the curricula and education structure are designed in such a way to achieve the capabilities and the qualities that a student should have.

MMU Syllabus contents are modeled and structured from both MMU and MQA guidelines. This structured format will refer as their lecture plan and syllabus. The OBE has since been introduced and implemented by all faculties and departments of Multimedia University (MMU) in the late 2005.

Theoretical Framework

Since knowledge management is an emerging field, there has been no single set of widely recognized and empirically validated criteria for evaluating the successful contributing factors for knowledge management practice. Therefore, in line with the trend toward examining more fully integrated models of

the knowledge management contributing factors, a set of variables, taken solely from one perspective, may explain only a small proportion of the variance in how well the factors contribute to knowledge management practice. Moreover, there is little statistical evidence that the proposed factors affect the knowledge management practice, these factors need to be tested especially in the Malaysian context.

The framework is divided into two parts: independent variables and dependent variables. The theoretical framework of this research study consists of a dependent variables (Knowledge management practice among academic in CDP, MMU), and three independent variables (MQA requirements, academic's commitment and University's requirement). Refer to Figure 1.

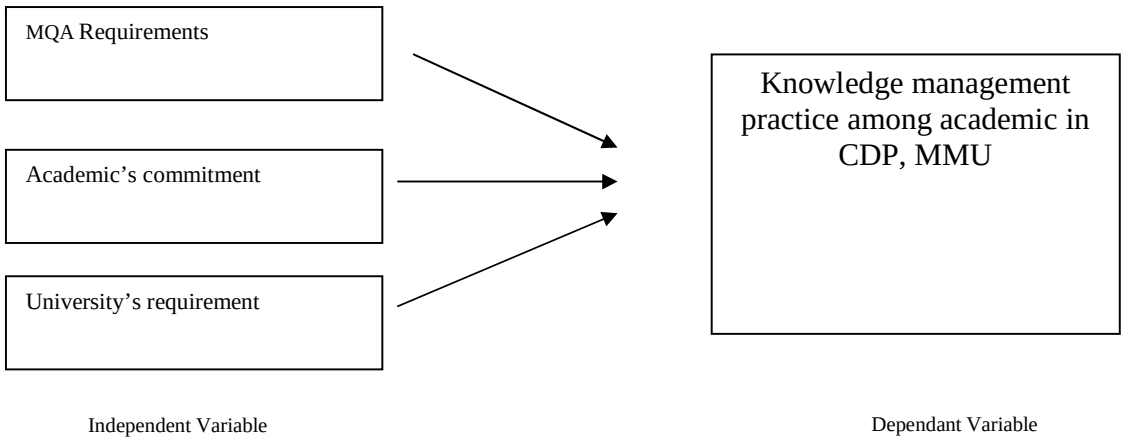

Fig. 1. Theoretical Framework

Dependable variable

Knowledge management practice among academic in CDP, MMU.

Independent variable

a) MQA's requirement

b) Academic's commitment

c) University's requirement

Hypotheses

- **HA1**: MQA's requirement is a contributing factor that encourages knowledge management practice among academics in CDP, MMU.
- **HA2**: Academics' commitment is a contributing factor that encourages knowledge management practice among academics in CDP, MMU.
- **HA3**: University's requirement is a contributing factor that encourages knowledge management practice among academics in CDP, MMU.

Methodology

The population of interest comprises of the academic from CDP, MMU. Simple random sampling technique will be used to select sample. It is an unrestricted probability sampling design whereby every element in the population has known an equal chance of being selected as a subject. A target of 40

academics from CDP, MMU will be randomly selected to be sample for this study.

The time dimension of research would be cross-sectional due to the fact that this study can be carried out in which data are gathered just once in order to meet the research objective.

The data collection for this research will be done through a quantitative nature that is based on survey technique. The survey will be carried out through a self administered and e-mailed questionnaire which is meant to be answered by the academics in CDP, MMU.

The questionnaire consists of five sections in which the academics will be asked to fill up. Section A consists of the individual respondents's demographic characteristics and a nominal scale is used to measure the answers.

Section B is asking the respondents to state their agreement/disagreement on the current issues of knowledge management as adopted from Choi's (2000) study. Each section is cored using a five-point Likert scale. One of the questions in this section is negatively worded because according to Sekaran (2003), instead of phrasing all questions positively, it is advisable to include some negatively worded questions so that the tendency in respondents to mechanically circle the points toward one end of the scale is minimized, especially when the questions are gauging on the respondents subjective feelings such as perception.

Section C is designed to draw information on respondents' perceived importance and the degree of implementation of the practices of knowledge management in their organization. Ernst & Young, Delphi Group and Choi's (2000) study on important factors affecting the implementation of knowledge management in organization, is included in this section. Once again, interval scale is used using a five-point Likert scale.

Section D uses Chois (2000) measurement scales on how knowledge management in general, contributes to organizational competitiveness in Malaysian firms using the five-point Likert scale to seek respondents' opinions.

Finally, Section E describes the potential benefits from implementing knowledge management practices in organization. These items were adopted from Bixley's (2000) study. Interval scale is used where the items in the survey uses five-point Likert scale.

Once the above three hypotheses have been proven, the syllabus management system will be introduced to the academics in CDP, MMU to practice knowledge management.

Syllabus Management System

CDP, Syllabus flow

Currently, CDP is offering 7 different diploma programmes with the duration course of 7 trimesters for each programme. The components of the course structure are divided into 4 parts, which are Mathematics, Core/Major, Electives and University or LAN subjects. Diploma in Information Technology is one of the pioneer courses offered in CDP, offering 28 subjects. Every two trimesters, coordinators are responsible to update the syllabi. The syllabus information is divided into two section; static and variable information. Static information consists of attributes that are fixed and can only be changed upon the approval of MQA. Example of static attributes are subject name and subject code. Variable information consists of attributes that need to be updated from time to time such as reading materials, learning outcomes of the subject, and details of the subject. Besides that, the coordinator needs to update the version and rename the file based on the current version - current month and year. Unfortunately, there are no records of who updates the syllabus. All archived syllabi are then kept by the Manager.

System Flow

Interviews were conducted to 6 people, 4 programme coordinators, one Manager and one Deputy Director of CDP. Requirements and the functionalities of the system are identified and the data collected will represent the information that needs to be captured and represented. UML is used to reflect the system flow. Figure 1 shows the basic flow of the Syllabus Management System, CD.

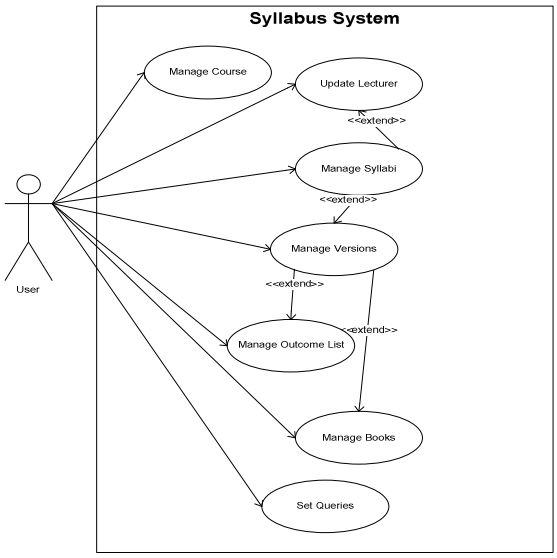

Fig 2. Use Case Diagram of the Syllabus Management System.

Analysis

Step 1. Domain and scope of the ontology

In the syllabus domain, the following are some of the possible competency questions that need to be fulfilled:

- What is/are the subject(s) offered for that trimester?
- What is/are the requisite(s) for the subject?
- What is/are the pre-requisite(s) for the subject?
- Who is/are the lecturer(s) teaching this particular subject?

Judging from the above list of questions, the ontology will include the information on various syllabus characteristics, pre-requisites, requisites, versions, lecturer's information, subject listing, and text/reference books' information.

Step 2. Consider Reusing Existing Ontology

Currently, there is no existing syllabus ontology found or made available through the internet.

Step 3. Enumerate Important Terms in The Ontology

With the help of the guidelines given, some important syllabus terms have been identified. Among the terms are versions, prerequisites, requisites, lecturers, text book, assessment, and many more.

Design

Step 1: Defining the Class Hierarch

In the next stage, classes are created and are arranged in a taxonomical manner as shown in figure 2. Figure 3, represents the object-relationship diagram representing the Syllabus Management System.

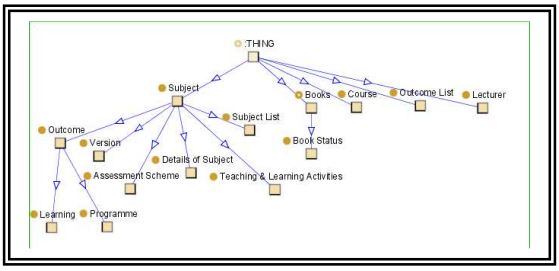

Fig 3. Taxonomy Classes for the Syllabus Management System.

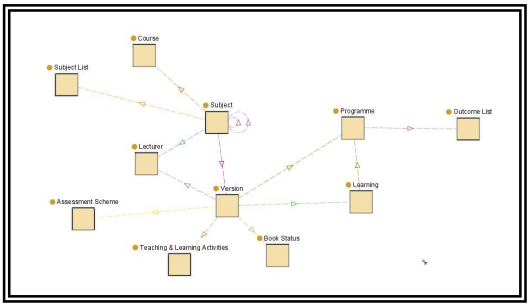

Fig 4. An Object-Relationship Diagram for the Syllabus Management System, CDP

Step 2: Defining Facets and Properties of Slots

The slots are created, identified and are made available in each class. These terms cover the information needed to be captured in the classes defined earlier which includes, a subject code, subject name, version id, credit hours, lecturer, and many more. There are slots that carry different facets describing the values it describes, the type, allowed values, cardinality and other features that it can support. These slots consist of intrinsic properties, extrinsic properties, parts of the object structured and as a relationship to other instances and slots.

Implementation

In the implementation stage, prototypes are designed and instances are created by filling in all the information. Once all this is done, queries are generated to determine the results that enable to answer the competency questions that have been set in the analysis phase.

Step 1: Prototype and Instances.

Layout of the subject is constructed by using the default Protégé 2000 graphical user interface (GUI).

Step 2: Creating Instances and Filling in Information.

Once the prototypes have been developed, instances are created and filled in desired input information.

Testing

The system prototype and the system functionalities are presented to the six committees who determine whether the system is working accordingly. Queries are created to show the results produced. The results showed that all the basic requirements have been fulfilled.

System Limitation

The limitation of the Syllabus Management System are as follows: (1) The system does not focus on the security expect as this is the starting phase of the project development; (2) The system only caters for the syllabi offered in Diploma of Information of Technology (DIT). Therefore, the course offered is based on the DIT course structure; (3) The buttons of add, edit, delete and view button are provided by the Protégé GUI, therefore, it is difficult for the users to understand the icon functionalities; (4) the system does not include the details of topics taught in lectures, tutorial and laboratories, and the hours spend on the defined topics; (5) The system could not display the whole course structure of DIT and (6) There are no access level implemented in this system.

Future Enhancement

The system can be improved if the following is implemented: (1) The system should capture more information of the syllabus such as the details of the topics taught and the hours spend; (2) The system should be able to show the whole course structure; (3) The system should implement the access level and (5) The system should be able to expand the domain so that it will be able to support more competency questions.

Significance/Contributions

The implication of this study is significant because it focuses directly towards the contributing factors that encourage knowledge management practice among academics in CDP, MMU. Hence, it allows knowledge management researchers to gauge the current state of knowledge management research in a systematic and practical manner. In addition, the results of this study will be able to provide an insight into what are the overall perception of knowledge management and how various factors affect the successful implementation of knowledge management practice and organizational performance among academics in CDP, MMU.

More importantly, knowledge management makes the transition from concept to practice; attention must turn to the ways in which academic practitioners can implement the growing body of theory. The findings of this study contribute to the practice of knowledge management among the academics in CDP, MMU, whereby this research provides an opportunity to the practitioners to undergo a self-check for the various important knowledge management areas that this research intend to study. Moreover, once the hypothesis has been proven through the research, a syllabus management system is used to practice knowledge sharing and this system is a significant tool which will iteratively and gradually improve and support for the entire programmes offered in CDP, MMU, Malacca. Changes are easily made to suit both the CDP and MQA requirements.

Among the objective of this project is to use the ontology in structuring the Syllabus Management System for CDP. Nevertheless, ontology allows the flexibility and reusability of domain knowledge that makes it possible to change the assumptions if the domain changes. There is no one correct way or a static method in modeling a domain. There are several alternatives to choose from but

the best solutions have been reflected in the system requirements.

The model created is flexible, allowing the integration between ontology and application and the ability to extend the class hierarchy without restricting its depth or breadth (A.Abu-Hanna et al, 2005). The syllabus management system is flexible and adaptable and it can be easily suited and integrated to the proven hypothesis for knowledge management practice and sharing of knowledge among academics in CDP, MMU.

Conclusion

Overall, the main objective of this study is to identify and prove that MQA's requirements, Academics' commitment and University's requirement are among the main contributing factors for knowledge management practice among academic in CDP, MMU. A Syllabus management system helps in creating and managing the knowledge management practice and sharing knowledge among the academics. The Syllabus management System is developed using Protégé 2000. However, the system only caters for the Diploma Information Technology programme and only certain information is captured to represent the system requirements. Ontology development is one iterative process that permits knowledge reusability and is the better engineering of knowledge based system with respect to acquisition, verification and maintenance.

This research will be the beginning for the development of the Syllabus Management System for the CDP, MMU, Malacca. Using ontology as guidance in structuring the system, allows the opportunities to expand and reuse the system for other programmes offered in CDP. Besides that, with the assistance of ontology tools, it helps the system to manage, distribute, capture and represent the knowledge base of the syllabi and the future Outcome Based Learning activities.

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