

The Effectiveness of “Knowledge Management System” in Research Mentoring Using Knowledge Engineering

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Abstract

Currently, many old universities in Thailand have been facing the occurrence of lecturer massive retirement. This leads to the large amount of newly Ph. D. graduate recruitment for taking immediate responsibilities to teach and conduct research without mentoring by senior staff as well as in new universities. Therefore, this paper aims to propose the “Knowledge Management System Based Mentoring” which could be used to share and disseminate research experiences of the senior staff to enhance the abilities of newly Ph.D. graduate staff in the universities to supervise Ph.D. students to get the qualified research outputs. Knowledge engineering is employed to capture the effective mentoring practices particularly on Lateral Thinking in higher education. The Knowledge Management System had been implemented in department of Knowledge Management, The College of Arts, media and Technology, Chiang Mai University to mentor five newly Ph.D. graduate staff. The study explored the effectiveness of KMS in the case study of Ph.D. program in Knowledge Management is elicited from three senior professors (in social science, mathematics, as well as computer science and knowledge management) and modeled in CommonKADS. The Knowledge Management department is utilizing this mentoring knowledge for improving the research performance. The major output of the study is the effectiveness of “Knowledge Management System” KMS that helps to enhance abilities of newly Ph.D. graduate staff to supervise Ph.D. students productively.

Keywords: knowledge management system, mentoring, CommonKADS, newly Ph.D. graduate staff

1. Introduction

Quality of a nation’s higher education has the significant social and economic impacts on the country (OHEC, 2007), and has continued expansion as one of the largest economies in the ASEAN (Association of South East Asian Nations) region, Thailand is seeking to improve the global competitiveness of its universities. As Thailand’s economy develops to become increasingly based on knowledge and innovation (Chareonwongsak, 2012; OHEC, 2009; Bhatiasavi, 2010) the quality and competitiveness of its higher education system will become ever more important. Challenges and opportunities such as the forthcoming 2015 ASEAN Economic Community (AEC) have made the development of higher education a priority focus for Thailand (OHEC, 2010; Chareonwongsak, 2012; Witte, 2000).

Conducting a scientific and social research in the universities, which serves with the community, social and national development contexts, is the main aspect in achieving national development as well as Thai education system. Therefore, various organizations working related to conducting research have put more emphasis on the importance of research including develop the qualified researches in the university level, especially postgraduates and Ph.D. graduates. However, the skill level of academic staff remains one of the most significant barriers to improvement (OHEC, 2009; Stess et al., 2010).

While Thailand is mainly emphasizing on research development in the higher education, one main issue which has started after economic crisis since 1997 is massive retirement of professors. These are the professional with great experiences in conducting doctorate degree as well as they also are the mentors for all Ph.D. graduates. Because of this issue, it leads to insufficient academic professors. Significantly, several universities have to

extend the working contract for this group.

Since 2003 the number of the retirees in public and private universities is steadily high. Obviously, the increased number started significantly in 2007 and also has highly continual number. In the next 10 years, the approximated number is going to be 800 retirees annually (Chareonwongsak, 2009). Thamrongthanyawong states that the new Thai Ph.D. graduates are inadequate in replacing the professors who are retiring within the next five years (as cited in Pimpa, 2005). While the attempt to develop new graduate staff is on the process, it reveals that this rush development cannot serve the needs. As a result, it enhances higher educational organizations realizing heavily on that particular crisis and develops newly PhD graduate staff in conduction researches and supervision.

This study thereby aims at the process in accelerating the new graduate staff to conduct research and supervise doctoral students. This process is namely as “KMS based Mentoring”.

2. KMS Based Mentoring

Presently, the retirement of senior academic staff in old universities, increase of new universities' numbers have resulted in an overall increase in new academic staff. Although the universities are able to recruit academic staff, they still lack of academic proficiency. The number of academic staff with Doctorate degree and expertise is not growing (APS, 2012). This serves to highlight the imbalance of staff skills and experiences in Thai higher education and to collaborate the need for the KMS based mentoring proposed in this paper.

2.1 A KMS to Enhance Thailand's Academic Staff Research Skills

A knowledge management system (KMS) has a variety of definitions and meanings, but it can be generalized as an IT-based system for managing knowledge within organizations and for supporting the creation, capture, storage, as well as dissemination of information (KMT, 2010; Zhang et al., 2009; Alavi & Leidner, 2001). In further defining of a KMS, Oyefolahan and Ishaq (2011) suggest a KMS being as a class of information systems or technologies dedicated to the management of knowledge activities. Knowledge management systems are already utilized by global organizations (Chun et al., 2008; Yoo & Ginzberg, 2003), and particularly in Thailand, where the Public Sector Management Quality Award (PMQA) is used to assess all government agencies, and where the deployment of a KMS constitutes a significant key performance indicator. Thus, the development of an effective KMS to develop and mentor Thailand's academic staff not only raises the research skills of these knowledge workers, but also contributes to the successful achievement of the PMQA.

There are many techniques to construct a KMS. CommonKADS is an approach in Knowledge engineering for a modeling activity (Schreiber et al., 1994). This technique is used for knowledge-based system development and for knowledge analysis as well as structuring in general knowledge management (Sureephong et al., 2007). CommonKADS is one technique of knowledge engineering used for modeling knowledge intensive (Schreiber et al., 2000). This modeling relates to not only expert knowledge, but also the various characteristics of how that knowledge is embedded and used in organizational environment. The different model of CommonKADS methodology is called 'model suite' that means capturing the different sources and types of requirements. It plays a role in realistic application (Schreiber et al., 1994).

In this research, the term KMS is taken to mean a software application to manage explicit or tacit knowledge, acting as an information repository and communication platform. Additionally, it enables staff to be ready access to universities' documented facts, information sources and solutions. Being as knowledge workers, academic staff within Thailand's universities fit within the domain of a KMS, and thus a KMS is developed and deployed specifically to mentor academic staff enhancing their research skills potent effectiveness.

2.2 Mentoring Concept

Further technique used in the study to support development of the staff is mentoring. Mentoring is acknowledged as an important tool in achieving personal and professional success. Generally, it presents opportunities as academic staff training, career development, performance management and academic development (Bierema & Merriam, 2002; Higgins & Kram, 2001). Traditionally, mentoring is a process involving a relationship matching between who has explicit knowledge and experience, called mentor, and who tend to advance from mentor's directions, called “mentee”. In mentoring relationship, it does not only train people to do their job but also share their experiences, wisdom, and political ability to others (Megginson et al., 2007). Therefore, many organizations have promoted mentoring relationship by invested in their resources and identified the relationship as a part of human resource management (Florence, 2007).

In recent years, researches on mentoring are interested in using information and communication technology (ICT) to support traditional mentoring process and relationship (Hasselbring & Glaser, 2000). This is known as

e-mentoring, online mentoring, telementoring, virtual mentoring, and cyber-mentoring. E-mentoring has been increasingly discussed as a possible solution to logistical limitations such as staff expertise (Bierema & Merriam, 2002, Ensher, Heun, & Blanchard, 2003). It can be defined as a relationship that is established between a more senior and/or experienced individual (mentor) and a lesser skilled or experienced individual (mentee). The primary uses of e-mentoring are electronic communications, skill growth and development, knowledge, confidence, and cultural understanding of mentee's success.

The issues describing so far indicate that Thailand must rapidly develop the quality and professional skills of academic staff within its higher education institutions. According to the OHEC (2007), the development should be done especially through mentoring and real experiences. The KMS proposed in this paper could deliver cost-effective, efficient, and targeted mentoring to staff in order to increase their research skills. Importantly, development must be done by learning and practicing through the sharing of knowledge and collaborative working with senior supervisors.

Therefore, integration of knowledge management system principles and mentoring techniques could be the possible alternative solution to accelerate the new Ph.D. graduate staff development. The benefits of this solution are to support knowledge transfer process, promote communication, provide flexible connection, and allow academic staff to create innovative knowledge and experiences, and restrict limitations of time and distance (Sriwichai et al., 2011).

This study focuses on requirement specification for a Knowledge Management based mentoring system to support learning of newly Ph.D. graduate staff, called "mentees" by helping senior supervisors "mentors". The scope of this study reasonably emphasizes on the field of research capability and Ph.D. thesis supervisor.

3. Methodology

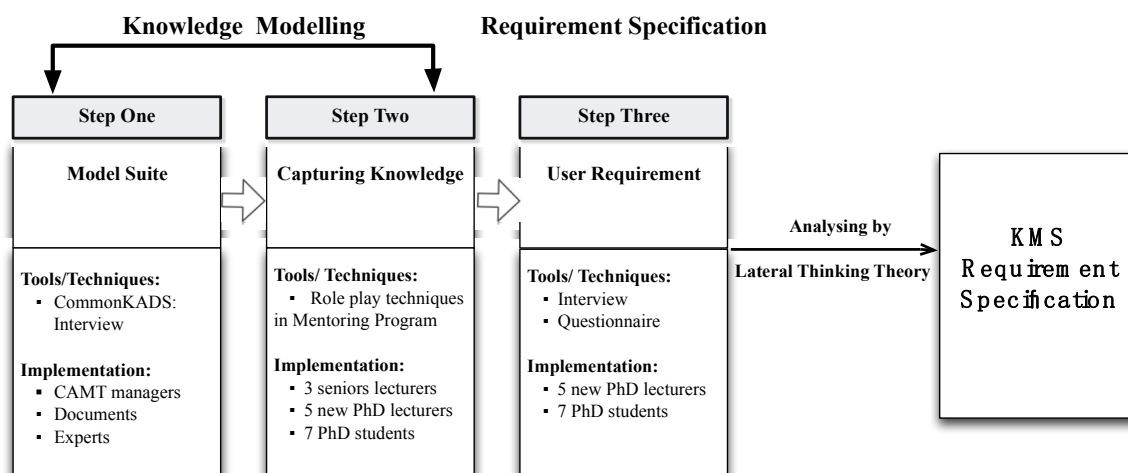


Figure 1. Research methodology

3.1 Sample and Data Collection

The Collage of Arts, Media and Technology (CAMT) of Chiang Mai University was selected being as the case study of this research. The samples are three faculty administrators, five Ph.D. instructors majoring in Knowledge Management Department, who have worked less than five years as well as three senior academic staff (experts).

In this study, to clearly identify intensive knowledge and communication functions is needed to develop KMS for newly graduate staff being as a research supervisor in Ph.D. program. Then, to specify KMS specification involves with Knowledge Modelling and Requirement Specification having three steps. It is illustrated in figure. First step, knowledge model suite is used to specify the knowledge and reasoning requirements of the perspective system. Second step, the roles play technique is applied to capture the mentors' intensive knowledge research, and indirectly used to give advice to Ph.D. candidates as well. Third step, integrating interview with questionnaire for newly Ph.D. graduate staff group and Ph.D. candidates in order to gather user requirement is occurred. This leads to the designing of interface, communication activities and functions of the system.

Knowledge Modelling specifies the needs and desires relating to the interfaces with other agents. As this process needs to analyze the task-related knowledge and agent into input in order to identify, specify as well as refine knowledge. The outcome of the stage contains three knowledge categories-domain knowledge, inference knowledge, and task knowledge in gathering data for analysis which will be illustrated by context level diagram. To collect data for analysis in knowledge modeling, it is performed by using two techniques are the interview from the group's faculty administrators and the capturing knowledge from a group of expert. It can be described as following Figure 2.

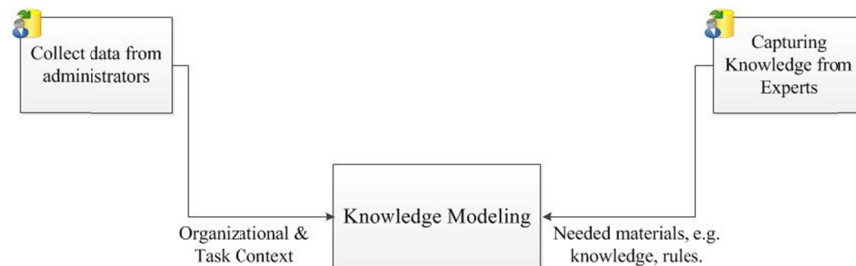


Figure 2. Primary methodology of knowledge modeling

The data collection will be done by structured interview aiming at the administrators and experts of College of Arts, Media and Technology (CAMT), Chiang Mai University. The administrators are four who are a dean, a deputy dean of research, two KM committees, and one expert in knowledge management field. They are all the key persons in providing the important data; business requirement. This data can widen the problems and solutions. Then, the documents are checked for accuracy based on the curriculum such as handbook, educational plan, etc. in order to collect the data of Ph.D. research procedure in graduate and faculty. Finally, all the data will be analyzed for setting task and agent, and knowledge intensive task.

In addition, Capturing tacit knowledge of experts is occurred. Typically, capturing knowledge is difficult and complex even though it is both formal and informal such as interviewing, face-to-face communication, observation, concept mapping, etc. (Bednar, 1999) for acquisition which is knowledge insight of experts within organizations and transfer knowledge to learners. The research instrument is employed with role play technique of CommonKADS in gathering needed data for knowledge modeling in capturing knowledge and observing experts' behavior. This needs to rely on the following process; build up a face-to-face mentoring program for 3 associating groups as senior academic staff, newly Ph.D. graduate staff, and Ph.D. students. After that the learning environment needs to be managed as the sub seminar group among three related people. These seminars are held weekly 10 times following the number of research topics of KM Ph.D. students. Significantly, these topics are the conclusion from CommonKADS. This program is described in the next topic and it consists of roles and the relations among three groups of key persons as the following Figure 3.

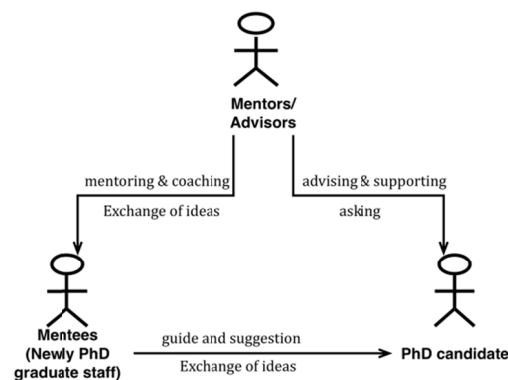


Figure 3. Participants of the role play technique

The illustration is consisted of,

- 1) Three senior supervisors are the organizations' experts. They also hold the academic position like professor, assistant professor, and doctorate. All of three experts have the different specialization and experiences; are knowledge management, mathematics and statistics, and social science research. They have to act in two roles; 1-being advisor to give advice and guide to the practical process in conducting Ph.D. research for each Ph.D. students and 2-being as mentor to offer knowledge and advise to newly Ph.D. graduate staff.
- 2) Seven Ph.D. candidates who are in the process of conducting Ph.D. research and have the role as students asking advice from the advisor in doing research.
- 3) Three newly Ph.D. graduate staff act as mentees and are responsible for being learners. They gain tacit knowledge of mentors as well as observe the mentors' behavior in advising the students. In addition, the mentee group is assigned by the mentor to act as informal advisor to guide and give advice to Ph.D. candidates after regular time in each week to measure whether they can apply the learning from mentoring or not.

In conclusion, knowledge and rules are the outcome of CommonKADS process, which educates "How to do" as the process in conducting research and education in Ph.D. level. Moreover, the emphasis of this research is to experience newly Ph.D. graduate staff to know "How to teach" in order to develop themselves to be as supervisors, who are capable of mentoring Ph.D. students. Additionally, these Ph.D. students need to be as supervisors who can supervise and also produce the research relating to the context of organization. Therefore, all gathered data are analyzed on the concept of Lateral Thinking for setting KMS specification requirement relevant to the context of learning development through mentoring techniques.

4. Results

This research reports the qualitative data in making understanding and link to the relationship of organization context, intensive knowledge, task or process, agents, and communication which support the learning of the newly Ph.D. graduate staff.

4.1 Organizational and Task Context

Primarily, the interview of the organizational administrators found that the faculty has the crisis on insufficient producing researches, the numbers in publishing internationally, as well as the numbers of staff who are able to supervise Ph.D. students. Therefore, the administrators paid attention urgently on the tools in developing and facilitating academic staff in graduate level within the short period and minimal expense. It can be concluded that the development of KMS based on mentoring is an alternative which the administrators can apply to the problems occurring in the organization.

Then, the analysis of relating tasks and the necessity of the education of Ph.D. with the curriculum of KM revealed that the most important task and had a lot of problems was conducting research design and methodology especially, the activities relating to constructing research framework and crafting research methods. It is that task having an agent relating directly to advisor and Ph.D. students in planning research procedure. Moreover, KM committees who have the roles in controlling and monitoring themes need to plan the direction of research to be relevant to the context of faculty curriculum.

After getting the proposed outcome, the procedure in identifying knowledge relating to tasks by experts' interview was done. Then, it had to prove the document relating sub-tasks of constructing research design and methodology based on graduate and Ph.D. in Knowledge Management Program. Consequently, the conclusion is presented as the diagram in Figure 4. After the synthesis of all tasks, the procedure in conducting researches is guided. One task consists of 10 sub-tasks, which explains the relationship between task and sub-tasks as following;

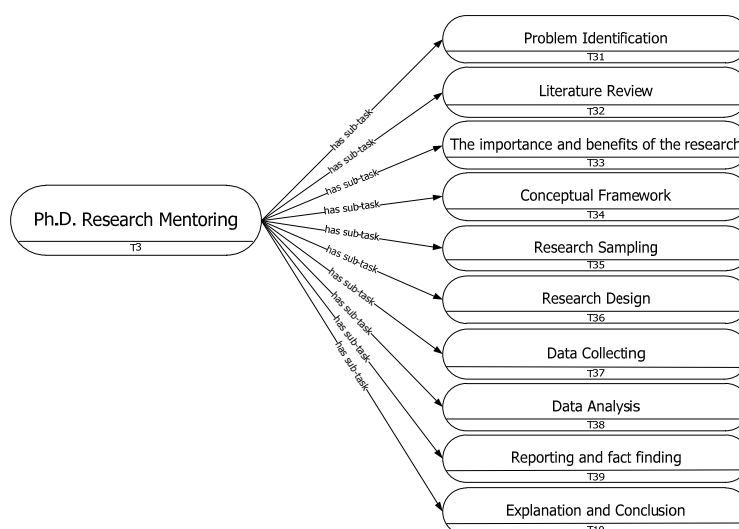


Figure 4. The relationship between task and sub-task of Ph.D. research in KM program department

The Figure 4 describes that Ph.D. research task consists of 10 important sub-task; problem identification, review literature, identification of importance and benefits of the research, designing conceptual framework, decision of research sampling, constructing research design, collecting data, analyzing data, reporting and fact finding, and explanation and conclusion. This process is the responsibility of supervisor as the conductor to Ph.D. students, is necessary for knowledge and in-depth expertise of theories and practice to adjust the crafting methods to be compatible with limited period. Thus, the test of expert is necessary in acquiring the intensive knowledge. This can be described in the next section.

4.2 Knowledge Rules Captured from Mentors

This section shows the results elicited from senior professors in social science, mathematics, as well as knowledge management and computer science. The results involve with tacit knowledge of these professors in Ph.D. research tasks, are presented each task by three knowledge categories of knowledge modelling. First category is “task knowledge” which expresses as knowledge goal to success in the Ph.D. research. It consists of ten sub-tasks as above. Second one is “inference knowledge” which explains steps of reasoning to achieve each task and to apply the domain knowledge. Third one is “domain knowledge” which includes specific knowledge or conceptualization of solutions for accomplishment in the inference. These categories in the study represent the tacit knowledge of each mentor and some of them are explained as Figure 5.

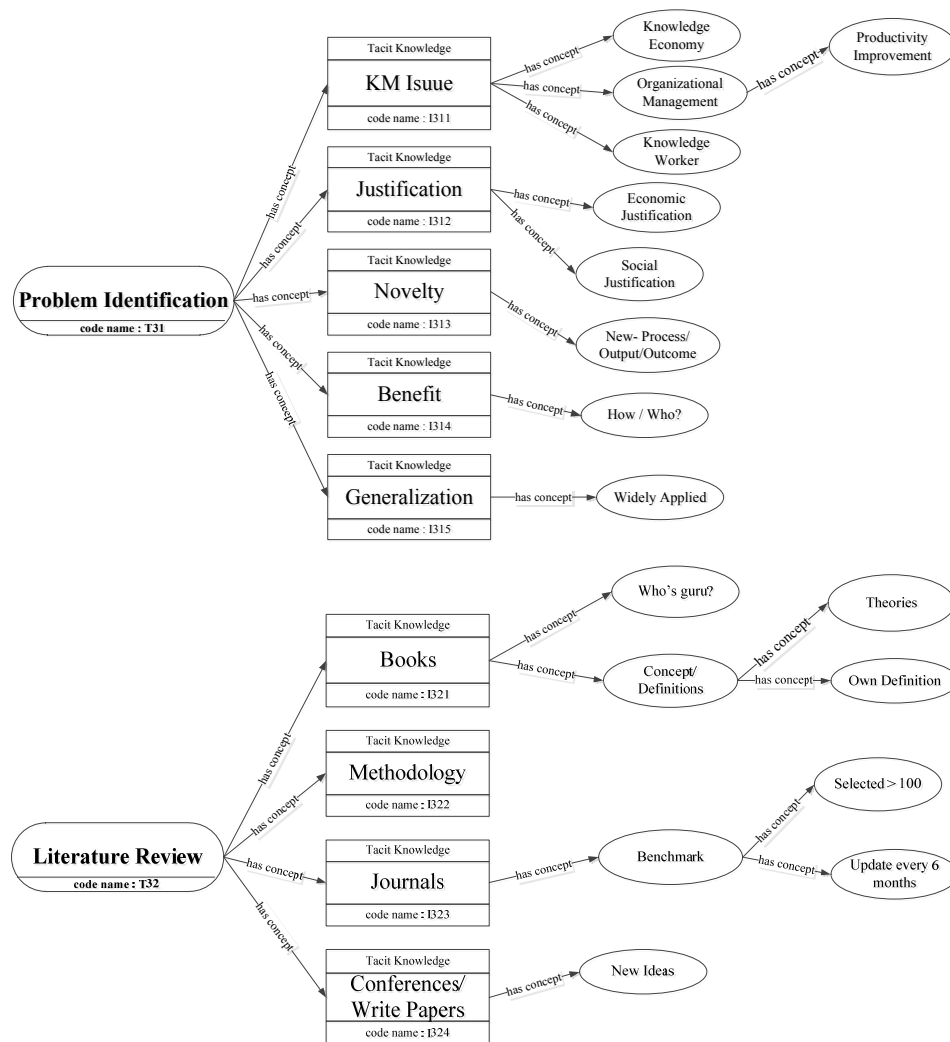


Figure 5. Knowledge modeling suite of Ph.D. research in KM program department

4.3 Analyzing the Knowledge/Rules to Specify Research Mentoring by Lateral Thinking

After capturing knowledge, the data would be analyzed for specifying the mentoring techniques and activities by using typological analysis based on theory. Lateral thinking theory is selected to apply as a tool in managing learning activities by KMS based mentoring so that the learners can further their knowledge and their expertise rapidly.

Edward de Bono, who is the key person, invented Lateral Thinking theory. This method is processed as identifying new solutions to problems. Also, it provides the information in restructuring the thinking patterns, preparing the way for new ideas to evolve (De Bono, 1969, 1990). These ideas might be challenged in the future. Four main principles of the theory employed with recognition of domain ideas, searching for different ideas as well as things, elimination the sequential vertical thinking, and utilizing provocative methods to present discontinuity (Lindell, 2010; Hernandez & Varkey, 2008; Fisher, 2000).

Based on the theory, classifying mentoring techniques and activities are processed by categorizing on the principle as shown in table 1.

Table 1. Analyzing the mentoring techniques and activities by Lateral Thinking theory

Techniques and Activities on Mentoring	Relation	Principle of Lateral Thinking Theory
(1) A range of conversations.	(1) is related to (A)	
(2) Creative method of working together.	(2) is related to (B)	(A) The recognition of domain ideas
(3) A double-task technique.	(3) is related to (B) and (C)	(B) The search for different ideas of looking at things
(4) Transferring intensive research knowledge.	(4) is related to (A) and (B)	(C) The exclusion of the sequential vertical thinking
(5) An eliciting values techniques.	(5) is related to (C)	(D) The use of provocative methods to introduce discontinuity
(6) Collaborative activities.	(6) is related to (D)	
(7) Assessment the mentoring program by 360-degree feedback.	(7) is related to (D)	

Table 1 is the result derived from the application of Lateral Thinking Theory. It emphasizes on exploring the solutions that differ from the conventional solutions. For instance, the problems come out with the various solutions of innovative ideas for each concept or problem. Learning from conducting and supervision on Ph.D. research which originates from the knowledge of modeling knowledge is complicated. Therefore, the techniques or methods mentioned in the table are specified in order to set activities or functions of the system. This can serve the needs of mentor the newly staff to stimulate the thinking process, practicality, and capability of learning on Ph.D. research.

The mentioned techniques based on the concepts explored by Megginson and Clutterbuck (2005) propose the various ways for coaching and mentoring in various organizations. Some techniques were chosen for this research which is compatible with the development of learning curriculum by Lateral Thinking Theory. In addition, these techniques need to be served the context of process on computer network of the department. They consist of:

- 1) A range of conversations to build relationship and understand situation.
- 2) Creative method of working together to encourage a more expansive mode of thinking.
- 3) A double-task technique to develop the learning, thinking, and practicing.
- 4) Transferring intensive research knowledge of mentors to support learning and experience of mentees.
- 5) An Eliciting values techniques to support the building of self-knowledge.
- 6) Collaborative activities to support mutual engagement of participants.
- 7) Assessment the mentoring program by 360-degree feedback to stimulate the motivation in exploring and developing themselves continuously. This assessment also develops the system of mentoring serving with the user requirement and organizational context.

4.4 KMS Requirement Specification

According to the primary finding, KMS requirement specification is applied from IEEE standard 29148-2011, which is designed to specify scope of the system involving users, functions, and design specification for KMS based mentoring. Firstly, to understand the system perspective, users of the system are demonstrated by studying use-case diagram as shown in Figure 6.

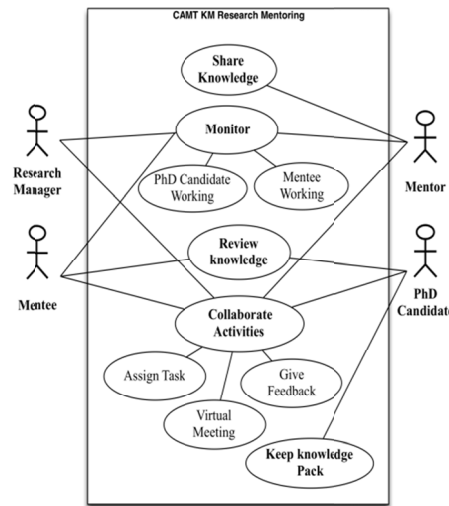


Figure 6. Use-case diagram of the KMS based mentoring

This diagram comprises of the users who are authorized differently to process in the system. Research managers are able to monitor both mentees' working and Ph.D. students' progression and conduct collaborate activities with all others users. Mentors being the most important of the system are able to share and explicit knowledge collaborated activities with their mentees, and monitor mentee's work. Mentees who play as the mentee and pre-supervisor role can review the sharing knowledge, monitor Ph.D. students, and do collaborative activities with mentors and the students. Ph.D. students can also review the sharing knowledge, work on collaborative activities, and keep their knowledge pack.

On the other hand, KMS requirement specification originates from all the collected data above. It consists of business specification, user specification, requirement specification, system specification, function specification, and design specification as shows in Tables 2(a) and 2(b).

Theoretically, the first and the second specifications are "business specification and user specification". They are used to identify organizational and individual requirements that are a basis of the KMS development. The third specification is "system specification". It is to determine the needs of the tasks, functions and services of the system in descriptive level. The specification, then, is recognized as two main systems, mentoring system and PhD student system, responding to develop the mentees and PhD students. Both systems process collaboratively with information, intensive-knowledge, and learning activities. 'Requirement specification', the fourth one, identifies principle of the system processes and tools used to build the system. The fifth one is 'functional specification' which identifies the main functions of the system software as scoped in requirement specification. This part is designed by applying techniques of mentoring. A range of conversations is used to build mentoring relationship and to understand situations. It is also the creative method of working together to encourage a more expansive mode of mentees thinking. Additionally, a double task technique is used to develop mentee's learning and practicing. Lastly, an eliciting values technique supports mentee building self-knowledge. The last specification is "design specification" which demonstrates external and internal design of the system. A Web application platform supporting these designs is Microsoft SharePoint which has features and functions to serve as a secure place to organize, share, access, and store the knowledge and information from almost any devices. Therefore, theses specifications are the blueprint of the KMS's software to be developed.

Table 2(a). KMS requirement specification of KMS based mentoring

Business Specification	User Specification	System Specification	Requirement Specification
BS 1: Dean's opinion - Newly graduate staff have to practice more researches and can supervise PhD students.	US 1: Managers - Monitoring PhD. Students. - View all report of mentee's performance and PhD. Student's progression.		RS 1: The KMS must be able to work as follow: 1.1 Represent tacit and explicit knowledge as well as techniques of senior staff (mentors) involving conducting research in knowledge management field. 1.2 Encourage newly graduate staff to learn and practice the research. 1.3 Support newly graduate staff to supervise PhD students to do research. 1.4 Provide collaborative system for participants' learning. 1.5 Support PhD students to do research. 1.6 Support research managers to track the students' progression.
BS 2: Deputy Dean's opinion - Graduate staff have to produce more research and can publish research papers in international journal.	US 2: Mentors - Sharing tacit & explicit knowledge. - Provide mentoring assistance for mentees. - Collaborate with mentees.	S 1: Mentoring system - Research Proposal Development. - Research Experiment. - Academic Writing up	
BS 2: KM committees' opinion - KM major require amount of supervisors who can supervise PhD students working on thesis research, based on graduate school's regulations, to graduate on time period.	US 3: Mentees - Review mentors' knowledge. - Monitor PhD students' progression. - Collaborate with mentor via VDO conference and/or email.	S 2: PhD Student Thesis	RS 2: Tools and Techniques to build the KMS: 2.1. To design the KMS by using CommonKADS. 2.2. To develop the KMS by MS SharePoint. 2.3. Training tool in the KMS based Mentoring Approaches.
	US 4: PhD students - Report progress of conducting research. - Collaborate research activities with mentees. - Keep own knowledge pack.		

Table 2(b). KMS requirement specification of KMS based mentoring (Cont.)

Requirement Specification	Functional Specification	Design Specification
RS 1: The KMS must be able to work as follow: 1.1 Represent tacit and explicit knowledge as well as techniques of senior staff (mentors) involving conducting research in knowledge management field. 1.2 Encourage newly graduate staff to learn and practice the research. 1.3 Support newly graduate staff to supervise PhD students to do research. 1.4 Provide collaborative system for participants' learning. 1.5 Support PhD students to do research. 1.6 Support research managers to track the students' progression.	FS 1: Provide a range of conversations to build mentoring relationship and to understand situations. - Seven layers of dialogue in mentoring (to build relationship between mentor and mentee). - Role environment mapping: REM (to help mentee progress from the known to unknown-mind mapping). FS 2: Provide creative method of working together to encourage a more expansive mode of mentees thinking. - Auditory creative techniques: Using metaphor or stories. (Encourage mentees to create their story or picture) FS 3: Provide a double task technique to develop mentee's learning and practicing. - Addressing task and emotion. - Learning and practicing through current work situations. FS 4: Transferring intensive research knowledge of mentors to support mentee's learning and practice research. - Using document, stories, and knowledge map. - Lessons learn & Best practice.	DS 1: External - Web based mentoring, CoP, document, photo, video, tag and notes, portal, directory (Knowledge engineering) DS 2: Internal 1. Mentor and mentee module - Knowledge Map (based on ten research activities knowledge). - Personal development plan (PDP) of mentee. - Libraries for Sharing Documents and VDO clips. - Room for forum discussion, storytelling, lessons learn, and best practice. - Working together as Task Assignment - Contact directory of Mentors and Mentees. - Virtual communication as VDO conference - Hot Issues, Information Links - Checking success of the mentee PDP zone. 2. Ph. D. Student Module - Knowledge Map (First year project, Critical review, Conference paper, Sampling, Research design, Data collection, Data analysis, Finding, Discussion and conclusion) - Libraries (Shared Documents) - Lists (Experts, Information Links) - Discussion (Forum discussions) 3. Manager Module - CAMT KM Research (Research task assignment, Research issue function, Suggestion to research manager, announcements, CAMT publications) - Libraries (Shared Documents) - Cite (Experts, Information Links) - Discussion (Forum discussions)
RS 2: Tools and Techniques to build the KMS: 2.1 To design the KMS by using CommonKADS. 2.2 To develop the KMS by MS SharePoint. 2.3 Training tool in the KMS based Mentoring Approaches.	FS 5: Provide an eliciting values technique to support mentee building self-knowledge. FS 6: Provide Collaborative Activities Function to support mutual engagement of participant. - Peer Interaction - Groups' working- virtual meeting. - Facilitation of knowledge sharing and distribution such as VDO Clips, and issues. FS 7: Using 360-degree feedback in mentoring. FS 8: Provide research information and regulation based on graduate school and CAMT collage to support PhD Student for conducting PhD thesis - Sharing techniques and methods to conduct PhD thesis- Document, Picture, VDO, and Knowledge Map. - Sharing all PhD Students' progression in picture or sign. - Sharing information and condition of timeline of PhD process FS 9: Provide report to support research managers for tracking research progress. - PhD Students' progress. - Research Publications	

5. Discussion and Conclusion

Knowledge Management System Based Mentoring, in the study, is proposed to be a tool in developing research supervision expertise of newly Ph.D. graduate staff. By applying this tool, it has to share and disseminate tacit knowledge and qualified experiences of the senior professors in research field. Therefore, these expectations will be achieved if it has the clear specification through being relevant to organizational needs and users. Significantly, the specifications of the system are not only processed by a suite model of CommonKADS, but analyzed to set mentoring activities by Lateral Thinking Theory. In this study, the suite provides the modeling of the organization, the performed tasks, and the agents who are responsible for the tasks, the knowledge itself, and the communication ways. All of these are the basic disciplines of knowledge engineering and knowledge management which are implemented to prove the effectiveness of the system for the mentors and mentees. While Lateral Thinking concept is a condition in setting mentoring activities in the system, the lateral thinking is also selected. Due to being one of the learning theories furthering from the schema, the Lateral Thinking can create the way and new knowledge in solving a problem which serves the characteristics of newly Ph.D. graduate staff group. This group consists of the knowledgeable people who are necessary in furthering their knowledge and the way of thinking. Consequently, this system environment has the uniqueness in supporting collaborative learning of participants. The collaborative system has characterized not only to facilitate of knowledge sharing and distribution, but also to enhance interaction and working together (Fesakis, Petrou, & Dimitracopoulou, 2004; Hassandoust & Kazerouni, 2013).

The KMS based mentoring is an important tool, which is not only effective in communication and relationship, but also supports knowledge transferring from mentors to mentees. This new system is worked by the combination of two techniques as KMS and online mentoring. This system shares the same features; being repository, providing the specific and professional knowledge, and being the system focusing personnel development. Therefore, the system requirement specification is going to use as a guideline in creating the system that the organizations are able to utilize knowledge for improving and to enhance the abilities of newly Ph.D. graduate staff to supervise Ph.D. students productively in their future research work.

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