

THE DESIGN OF KNOWLEDGE MANAGEMENT SYSTEM OF THE INFRASTRUCTURE AND INFORMATION TECHNOLOGY SECURITY OF UNIVERSITAS GADJAH MADA

Fajar Ibnu Tufeil, Azhari, Singgih Hawibowo

Higher Education Management Universitas Gadjah Mada

A B S T R A C T

The Desing of a knowledge management system suitable to support the process of knowledge distribution in the security and infrastructure of information technology in Universitas Gadjah Mada is essential. Knowledge, documents, SOP, regulations and experience are yet to be well-documented, and this causes difficulties for staff members in performing their tasks should there be a staff rotation. Staff members' knowledge and experience will disappear as they are retired, transferred, or at the end of their terms of office. The frequent staff turnover in this field demands a faster learning process to ensure that the organization goals are fulfilled. The research problem discussed in this paper is the search for an appropriate KMS model. This research was conducted using Fernandez's method. The results showed that the main priority of the development of knowledge management system are knowledge discovery, combination, direction, and socialization for knowledge sharing. The priority of this KM process would be supported by other KM processes, namely routines, exchange, internalization and externalization. The features supporting KM process are document management, knowledge management, discussion forums, the search for knowledge and documents.

KEYWORDS : knowledge management, knowledge management system

I N T R O D U C T I O N

Mulyanto [1] stated in his paper that knowledge has become something important. Therefore, the acquisition and utilization of knowledge should be well-managed. Within the context of keeping the existence of an organization, knowledge management is a necessity for an organization. Knowledge

management itself can be defined as a systematic act to identify, document, and distribute relevant knowledge to each member of the organization, in order to increase its competitiveness. In relevance with a statement from Laal, M. [2] that knowledge management (KM) is a systematic process and a detailed action so that the knowledge required for the organization can be created, preserved, and utilized collectively. Explicitly, KM is a goal and relation of knowledge expressed through formal and systematic language with words, numbers, patterns, and other forms. To maximize the development and dissemination of the knowledge, a Knowledge Management System (KMS) is required. Simply put, Hult [3] explained that KMS is a strategy in organizing circulation of information in particular knowledge thus it will be easier to digest, explore, and used for a development of particular disciplines so they could evolve. Bassi [4] also said that KMS will improve institution's performance due to the capability to manage their developing knowledge. The management is not only beneficial to the relevant institution, but it should also be useful for the society and other knowledge development. In the main planning draft of technology information and communication (*Teknologi Informasi dan Komunikasi*, TIK) development of Universitas Gadjah Mada, the Directorate of System and Information Resources (*Direktorat Sistem dan Sumber Daya Informasi*, DSSDI UGM) [5] stated that TIK is a strategic component to obtain the vision, mission, and objective of Universitas Gadjah Mada. Application of TIK in university's education, research, service, and governance aims to be the catalyst of realizing the objectives in the future. Along with UGM's status change to Legal Entity State University (*Perguruan Tinggi Negeri Badan Hukum*, PTNBH) and also the crucial necessity of technology information and communication support, Directorate of System and Information Resources (*Direktorat Sistem dan Sumber Daya Informasi*, DSDI) was established based on UGM's Board of Trustees (*Majelis Wali Amanat*, MWA) regulation Number 4/SK/MWA/2014. One of DSDI's task and authority is to reconcile System and Technology Information with business process in the university's environment. DSDI, which is a management unit in UGM TIK, possesses three fields of work: infrastructure and security, application and multimedia communication, and integration and system information governance. The number of human resources handling UGM TIK is by far 44 staff di DSDI, and 63 staff spread in the whole unit/faculty¹. However from this human resources composition, the process of sharing and transfer knowledge between UGM TIK's staff are rather infrequent. In result, stagnation occurred and the staff had to face any huge problems on their own. The documentation of routine daily activities is not well-integrated. Each division has its own way to document, such as keeping them in a CD format, papers, or simply memorize them.

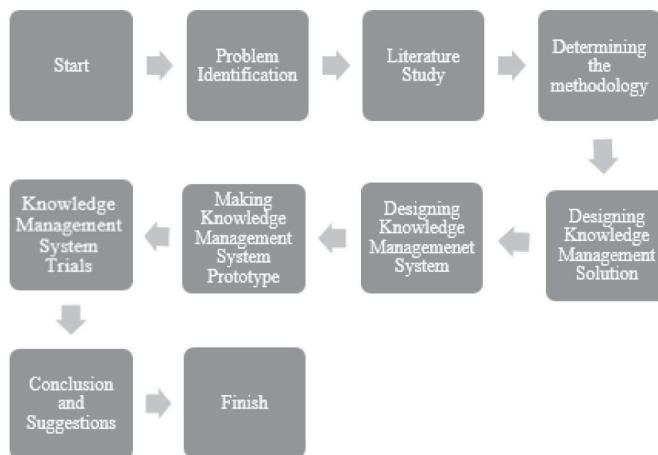
¹ <http://dsdi.ugm.ac.id/alamat-kontak-tenaga-it-ugm/>

Such conditions reflect that the human resources knowledge management in UGM TIK is not well-constructed, as the positive advantages for the staff are not yet seen. With a good management, there are many advantages which can be taken, such as management in learning, administration, skills, career development, and so on. To obtain this, the practice of writing and publishing the writing should be cultivated. Additionally, the posted writings of certain topics should be supported a system of knowledge management to accommodate discussions between members. Providing KMS in infrastructure and information technology security in a university will simplify the transfer knowledge and process of giving solutions in the fields of infrastructure and information technology security of Universitas Gadjah Mada.

In order to be understood easily, the structure of this paper is divided into five. The first part explains about the rationalization of problems and the urgency of KMS design in the field of infrastructure and technology information security of Universitas Gadjah Mada. The second part contains the stages of activities in designing KMS. Literature review of researches that are relevant to KMS is explained in the third part. The fourth part takes on the proposed KMS design. The fifth part is about the analysis and discussion on the proposed KMS design. The sixth part concludes the result of the conducted analysis and discussion.

M E T H O D O L O G Y

This research is conducted under the methodology of Fernandez [6] to determine the KMS solution. This is depicted in the first to seventh stage in the research design (Picture 1).



Picture 1: Diagram of Research Methods

The stages of designing the knowledge management solution are conducted through the Fernandez methodology as follows:

1. **Determining the contingency factor**
This stage aims to choose contingency factor which suits the organization's circumstances. Methods applied to determine task characteristics, organizational knowledge, and environmental knowledge are questionnaire, observation, and interview.
2. **Conducting KM identification based on every chosen contingency factor**
This stage aims to resolve the KM process based on the chosen contingency factor. The method used is the contingency analysis with contingency factor table.
3. **Listing KM priorities**
The objective of this stage is to list the priorities for KM required for the organization based on the contingency factor table made in the previous stage.
4. **Identifying current KM process**
This stage aims to choose the contingency factor which corresponds with the organizational circumstance. The methods applied to determine task characteristics, organizational knowledge, and environmental knowledge are questionnaire, observation, and interview.
5. **Identifying additional requirements in KM process**
This stage is conducted to get the prototype of KM development based on the necessities within the process. Methods used to determine the additional process are questionnaire, observation, and interview.
6. **Assessing KM infrastructure**
This stage aims to get a picture of the current KM infrastructure conditions based on the organizational structure, organizational culture, technology information infrastructure, and specialized knowledge. Methods applied to obtain this picture are questionnaire, observation, and interview.
7. **Developing KM system, mechanism, and technology**
This stage's objective is to get the KM solution model and the necessary KM system based on the KM developing process prototype and infrastructural circumstances. The methods used are the KM mechanism and technology methods as well as KM solution method.

The making of KM system prototype aims to obtain prototype from the KM system developed based on the KM process necessity. The steps conducted in this stage are:

- Creating KM system use case diagram
This step is conducted to get KM system use case diagram based on KM system's necessities.
- Creating activity diagram
This step aims to obtain activity diagram from all use-cases based on the KM system use case.
- Creating prototype and user interface
This step aims to get system prototype and KM system user interface based on use case diagram and activity diagram.

R E L A T E D R E S E A R C H

Oktavia [6] stated in her publication that knowledge management has more important role in business of many organizations, because they realize that competitiveness depends on the effective intellectual resources management. In line with Oktavia's research, Palacios et. al. [7] comprehends knowledge management as a management system which absorbs the advanced model of organization and expands it to provide practical methodology. They define the contents of knowledge management which consists of two dimensions: principal and practical. Their specified concept of knowledge management is as a managerial tool signed with a set of collective principals with a set of practices and techniques through the introduced principles in order to create, change, spread, and utilize the knowledge.

In a research conducted by Sentinuwo, Steven Ray. [8] said that university has massive opportunity to utilize its resources and knowledge to increase productivity and competitiveness. Knowledge Management System is a helpful tool to collect, manage, and distribute the knowledge. This is in line with Universitas Gadjah Mada's main planning draft of technology information and communication (TIK) development, which stated that the application of TIK have strategic role in improving the learning process in UGM. The applied technology information could transform the learning process into richer, more interactive, attractive, and efficient process.

Before applying Knowledge Management, the readiness of the organization/ university should be observed. This was conducted by Suharti, Leili and Hartanto, Irwin. [9] which stated that the application of Knowledge Management should be having rather informal organizational structure to stimulate the creation of knowledge, because knowledge is not found within stiff, static, and procedural conditions. This was also asserted by Henderi and Mustofa, Khabib. [10] in which the implementation of Knowledge

Management proposed in the real world could support universities in managing their possessed knowledge efficient and effectively, as well as supporting its primary function in establishing quality education through knowledge creation, knowledge discovery, management, and knowledge sharing.

Utilization of technology information has given opportunities so Knowledge Management program in organizations may operate effective and efficiently, until Knowledge Management could accomplish its mission, according to Assegaff, Setiawan. [11] in their research. In relevance with the knowledge asset within an organization/ university or company, Lim Bui Ho et. al. [12] stated in their research that knowledge as one of the company's assets is an aspect which could advance the competitive advantage value of the company. Knowledge becomes important when inter-company competition and staff exchange happen rapidly. Therefore, a Knowledge Management System is required in the company.

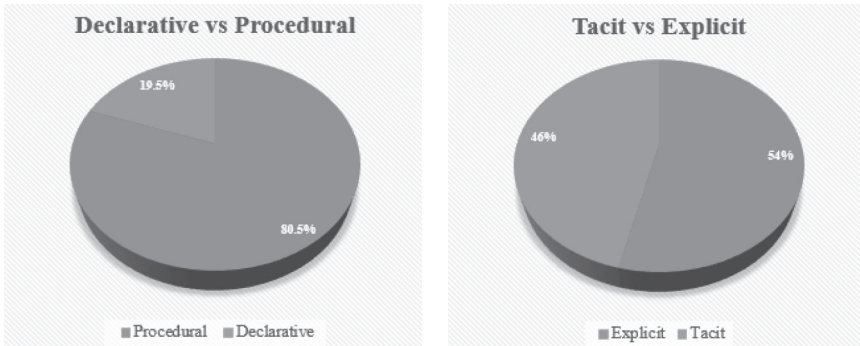
Santoso, M. Bayu. [13] who applied Fernandez methodology, stated in their research conclusion that the application of knowledge management solution considers aspect of assessment, which is the priority of knowledge management necessity process, priority of knowledge management process usage tendency, and priority of knowledge management process usage expectation. Using the same methodology, Amini, Safrina. [14] stated that the suitable knowledge management system model could assist the staff in sharing and learning knowledge easily. The development process then conducted with an expectation to manage existing knowledge to be permeated to the whole staff.

According to the statements above, the knowledge resources potential as intangible asset can be optimized and explored well. A method or application to manage capital asset is required so that it can be communicated and used. Knowledge in its capacity as policy and decision making support should be preserved in a structured repository. The establishment of knowledge management system (KMS) should facilitate the transfer knowledge process and simplify the problem solution process.

R E S U L T

This chapter explicates the analysis result data from the questionnaire until the knowledge management solution model, knowledge management system design, and test case based on the Fernandez methodology are obtained. Data used by the researcher are primary and secondary data. Primary data are acquired from questionnaire, interview, and observation. Secondary data are retrieved from documents, books, rulings, articles, and existing data in the working unit which supports this research.

A. Identification of Contingency Factor



Picture 2: Knowledge Characteristics

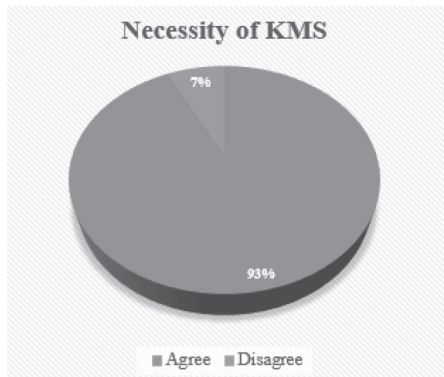
The tabulation result of procedural or declarative tendency based on the respondent questionnaires shows that 19.5% of them answer according to patterns and data formulation (declarative) and 80.5% of them answer procedural. From this result, it can be concluded that the staff of infrastructure and information technology security of Universitas Gadjah Mada do more procedural works.

The tabulation result from the respondents' survey data informs that the task uncertainty is high, as shown from the frequent occurrence of such uncertainty for 53,7%. Meanwhile, the tabulation result of task interdependence states that 56,1% respondents answered "high", and it can be concluded that task interdependence for the fields of infrastructure and information technology security of Universitas Gadjah Mada is high. The tendency of tacit or explicit knowledge tabulation shows that 46,3% of respondents answer direct or tacit and 53,7% respondents say media or explicit. The whole result concludes that the staff in the fields of infrastructure and information technology security of Universitas Gadjah Mada conduct various activities to share knowledge explicitly through the media (for example: document, e-mail, social media).

B. Knowledge Management Infrastructure Analysis

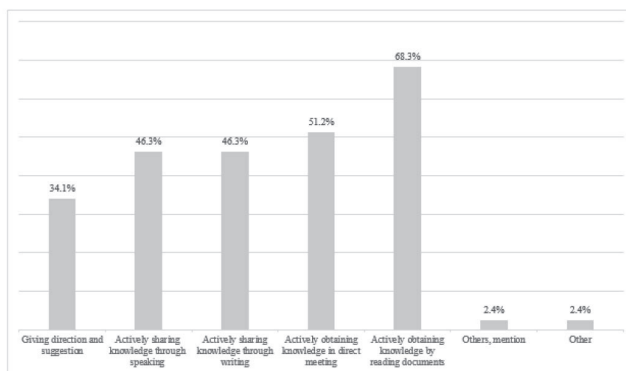
This analysis refers to five aspects of organizational culture, structure, technology information infrastructure, general knowledge, and physical environment.

The tabulation result for the knowledge management (KMS) necessity is 92.7%, which says that the staff needs KMS, while 7.3% staff does not need KMS. This questionnaire concludes that in the infrastructure and technology information security of Universitas Gadjah Mada, a knowledge management system is needed.



Picture 3: Necessity of KMS

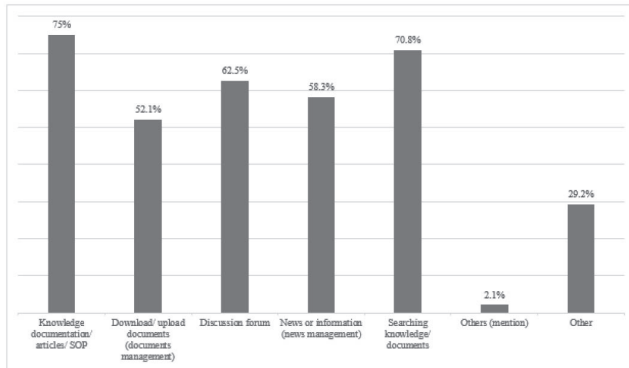
According to the questionnaire and observation, all respondents are willing to actively participate if a communication forum is established based on their task and function. The active roles can be seen in the following diagram:



Picture 4: Staff activity percentage in communication forum

C. System Development, KM Mechanism, and Required Technology

This stage arranges the design of knowledge management solution which is suitable based on the KM necessity analysis and infrastructure analysis. The desired features in infrastructure and information technology security of Universitas Gadjah Mada are as follows:



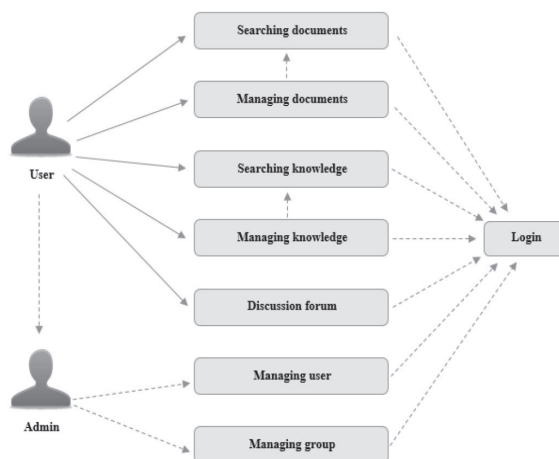
Picture 5: Percentage and diagram of Desired Features in KMS

D. Knowledge Management Design

This stage explains about the knowledge management system (KMS) design for infrastructure and information technology security of Universitas Gadjah Mada. The components discussed in this stage include use case diagram, activity diagram, KMS architectural design, KMS infrastructural design, KMS display prototype, KMS prototype trial, and the research implication.

1) Use Case Diagram KMS

Retrieving from the functional necessities in infrastructure and information technology security of Universitas Gadjah Mada explained in the previous phase, the concluded necessities then modeled by using use case diagram which can be seen in Picture 6.



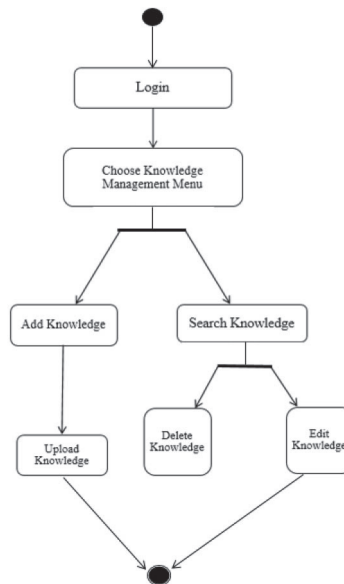
Picture 6: Use Case Diagram

Picture 6 shows the needs of KMS in infrastructure and information technology security of Universitas Gadjah Mada, which later will become KMS modules for infrastructure and information technology security of Universitas Gadjah Mada. There are 6 functional use case and 2 user managerial use case for administrator.

2) Activity Diagram

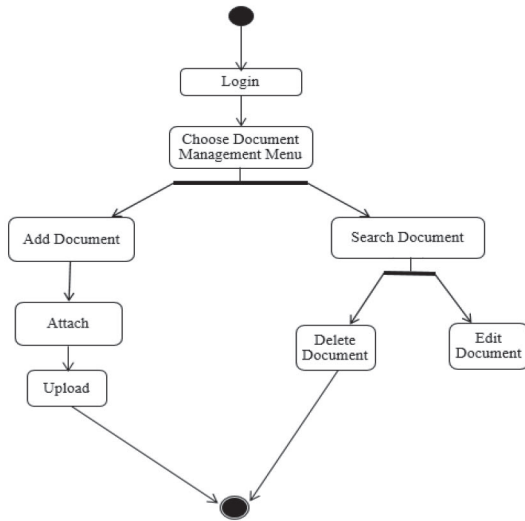
Activities that can be done in each use case are explained in this stage. The use case in this KMS is to manage knowledge, documents, and discussion forum.

- **Managing Knowledge**
User may input best practice, article, or other possessed knowledge. User can also edit or delete the documented knowledge.



Picture 7: Knowledge Management Activity Diagram

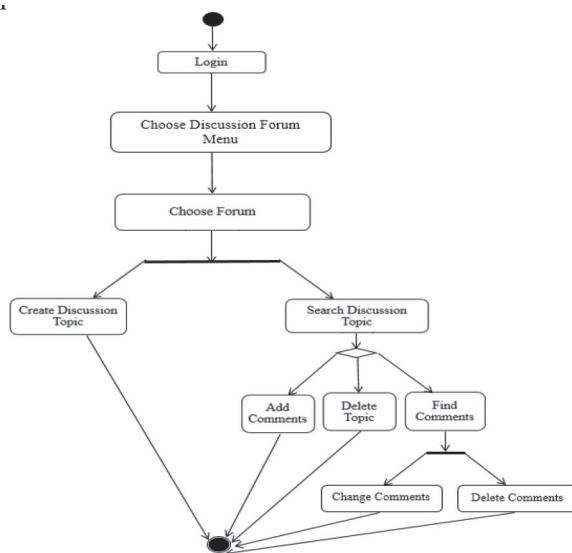
- **Document Management**
User may upload and download documents that are relevant with their works, such as manuals, procedures, or other types of documents. User can also add relevant information about the document, delete, as well as edit the document. Documents that are eligible to upload are Standard Operational Procedure (SOP), Ministerial Regulations, Decrees, etc.



Picture 8: Document Management Activity Diagram

- Discussion Forum

User is able to join discussion forum, add category, delete category, give comments, edit comments, and delete comments. User may enter the discussion forum after logging. The steps to do in searching documents are login, choose forum, choose from existing topic or create new topic, find comments to delete or edit comments, delete topic and add comment.



Picture 9: Discussion Forum Activity Diagram

This page contains topic or theme for the field of network infrastructure. In this menu, user may obtain documents, as well as member of discussion forum with relevant theme. It is also possible to add new required topic in this page.

C O N C L U S I O N

Knowledge management system model that is suitable for infrastructure and information technology security of Universitas Gadjah Mada is a comprehensive integrated system which could fulfill the needs of knowledge management process. Knowledge management process that is required to be developed includes knowledge discovery, combination, direction, and socialization for knowledge sharing.

The results of knowledge management system features to support the knowledge management process consist of document management, knowledge management, discussion forum, knowledge search, and document search.

Usage trials of knowledge management system prototype to test out the features have been receiving positive responses, thus the design proposed by researcher is accepted by the users. In implementing knowledge management system, it is required supports through commitment from the leadership boards as well as specified regulations about application and usage of knowledge management system.

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