

# Designing the Knowledge Management System in an IT Consulting Company

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**Abstract** — Every organization needs Knowledge management system manage internal knowledge within the organization, also for IT companies. The purpose of this study is to describe the process of analysis and identification of the existing knowledge management in the IT consulting company and it propose the design of knowledge management system that can be developed by the company to overcome the existing knowledge problems. In this paper, the authors use the interview method to get the needs and problems of the current system at one of the IT consultant companies as the object of case study, then design the knowledge management system based on knowledge taxonomy and use case diagram. From this research we can conclude that the design of knowledge management system basically can be done easily and quickly, as long as the existing problem analysis has been presented clearly and in a detailed manner.

**Keywords** — knowledge, knowledge management, system, design, case study

## I. INTRODUCTION

Nowadays, knowledge is an important part in determining the strength of an organization's survival. Along with technology development in our life that appears in every innovation, the current level of personal, organizational or group dependency on information technologies is very high.

Knowledge Management (KM) consists of a set of practices used by organizations to identify, create, represent, distribute, and enable adoption and experiences and insights and also existing knowledge. KM also manage and organize organizational activities and resources. [1] Knowledge Management includes parts of business administration,

information systems, management and information science. Many large organizations have resources to dedicate to internal knowledge management efforts, such as business strategy, information technology, and human resource management. Some consulting organizations also offer strategies and suggestions related to knowledge management in an organization.

Knowledge is a value that comes from the experience, expertise and information of a person in a particular field. KM can merge or integrate the separate fields into one form that can then produce higher value. It also focuses on organizational goals such as improve organization's appearance, competitive advantage, innovation, sharing of what has been learned, and continuous development in the organization. The main goal of KM is to provide knowledge for the organization on a permanent basis and make it a practical attitude that serves the goals of the organization.[2] KM has potential role in contributing to the success of organizations in general and higher educational institutes in particular. [3]

To implement KM in a company, the Company must have mindset that knowledge is the first asset, and also very important for the Company. KM plays important rules in the Company to synergize ICT (Information, Communication, and Technology) and Company's business process. [4]

In this case, sometimes the company has its own reasons apart from the lack of knowledge and application of information technology field of knowledge management. Many positive things can be gained from the implementation of knowledge management, such as increasing company's value, and ease of sharing knowledge in the company. So, all people in a company

or organization can support each other in realizing corporate goals. It also can become a culture within the company. In simple way, Knowledge management system can increase the speed of work that can be the value of a company, and also enhance knowledge sharing among the users and the employees in the company or organization. [5]

Seeing the importance of a knowledge as a company's assets, knowledge management can go hand in hand with the business strategy of a company. The result of internal observations on XYZ Company which is an IT Consultant company is the company currently planning an innovation as a new breakthrough by looking at the existing system. This condition is in line with the focus of knowledge management within the organization, which is one of them to create innovations on things that have been studied, and the continuous development that exist in the organization.

Based on that condition, XYZ Company requires a system that can collect all the knowledge that exist. From the knowledge that has been collected and later processed, hopefully can bring up an innovation that support business processes on XYZ company.

From these results, the company wants an added value in the internal company that supports the service to the Customer. Because of the initiative and this desire, this research aims to build an application on XYZ company. This Knowledge Management application is expected to be a solution to assist in the collection of knowledge to support the goal to create an innovation in XYZ company.

The objectives from this research are (1) Creating analysis and design Knowledge Management Systems which stores all existing knowledge in each division and personnel on XYZ company to support in innovation of new product; (2) Knowledge Management System is expected as well as a place of group study and research on the company.

## II. BACKGROUND THEORY

### A. Knowledge Management (KM)

Knowledge is the fundamental source for the organization.[6] Knowledge is the most important resource for company to compete with competitors that can create competitive advantage for the company. [7] Knowledge Management (KM) was first conceptualized on 1990 which is the process of knowledge creation and acquisition that gain knowledge from internal and external organization. [8]. There are 2 types of knowledge, which are Tacit and Explicit. Tacit is the knowledge that difficult to articulate and difficult to put into words, text, or drawings, while Explicit Knowledge represents content that has been captured in same tangible form such as words, audio recordings, or images.[9]

### B. KM Cycle

There are several stage in KM implementation, which are Knowledge development, knowledge acquisition, knowledge refinement, knowledge distribution and deployment, and knowledge leveraging. [10] Here are several KM Cycle that described by the expert as follow:

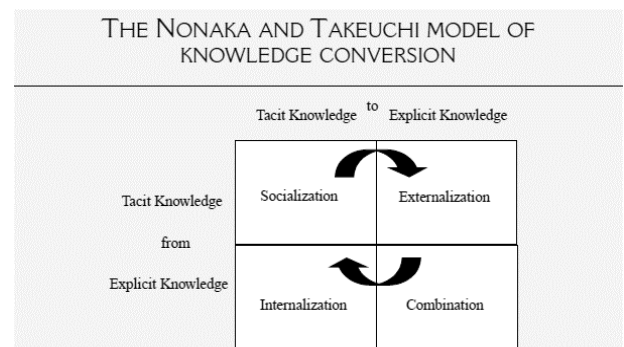
Meyer and Zack (1999)	Bukowitz and Williams (2000)	McElroy (1999)	Wiig (1993)
Acquisition	Get	Individual & group learning	Creation
Refinement	Use	Knowledge claim validation	Sourcing
Store/retrieve	Learn	Information acquisition	Compilation
Distribution	Contribute	Knowledge validation	Transformation
Presentation	Assess	Knowledge integration	Dissemination
	Build/sustain		Application
	Divest		Value realization

Fig. 1. Integrated KM Cycles [9]

Based on integrated KM cycles above, to create KM design, organization must gain the knowledge from any kind or resources, then use the knowledge, validate the knowledge with the Expert, and distribute the knowledge to other people in an organization. To make this process effective, organization can create KM portal that can be access by all people in the organization.

### C. Knowledge Management System Design

To design KM, we can use SECI Models, which are



Socialization, Externalization, Internalization, and combination. We use SECI Model to know the process of gain knowledge in the organization.

Fig. 2. The Nonaka and Takeuchi SECI Model

### D. Previous Research

There are a lot of KM research, which include systematic literature review that said Organizational learning has been conceptually absorbed by KM [8], KM integration with social media use in the company that can increase the way to share knowledge from the employees [11], KM sharing intention in the company that said commitments positively influence knowledge sharing intention [5], and also the application off Knowledge management to software evolution, which state that by using software maintenance task can enhance knowledge management in the company. [12]

### III. RESEARCH METHODOLOGY

Methods that have been used in this research are:

1. Method of Collecting Data
  - a. Literature Study  
Collection of references and literature to understand about Knowledge Management and the software to be used.
  - b. Field study with *Interview*  
Discuss and conduct discussions related to the needs of Knowledge management application design with Mr. RZ (IT Manager), as the responsible of this research.
2. Method of Knowledge Management Analysis  
Based on the problem statement, the company has not implemented knowledge management. So, with that condition, in the context of this research, we use SECI Model to analyze the process of knowledge management that exist in the organization.
3. Method of Design the Knowledge Management System  
After we analyze the existing Knowledge Management in the Company, we design the propose of Knowledge Management System by using Knowledge Taxonomy and use case diagram to describe system functionality in organization.

### IV. RESULT AND DISCUSSION

(XYZ company was established in 2001 In Indonesia). XYZ Company is an IT consulting company, which has approximately 200 employees (Knowledge Workers). The first step taken in this research is to identify the knowledge needed by the organization as well as related problems of the management of this knowledge. The following table lists the tacit knowledge and explicit knowledge of XYZ company:

TABLE I. KNOWLEDGE ANALYSIS

Tacit	Explicit
Problem Analysis	<i>Common Problem Solving</i>
Collect Hypothesis	<i>Report Making (SLA, monthly incident)</i>
Decision Making	<i>Reporting Issue</i>
System design expert	<i>Job Accomplishment (daily job, weekly job, monthly job)</i>
The expertise of data flow establishment in application design	<i>Scripting / coding skills</i>
Data Processing Expertise	<i>Airlines Business Process</i>
Suggestion Expertise	<i>Infrastructure Knowledge</i>
Technology development /improvement	

Here are the explanations related to the problems that occur in the knowledge management, especially tacit knowledge in the company.

- *Problem Analysis*: The ability of person's analysis is not all written down. This skill can be seen on troubleshooting the problem. If the person has no experience, he/she will check every part of the process. But if he/she is full of

- experience, he/she will analyze only the part where the problem occurred.
- *Collect Hypothesis*: This temporary conclusion also shows how a person is experienced or not. This result can only be done by knowledge, and not by procedure or written document. The existing system Tier are Application - Server - Database – Network. If one day the application is inaccessible, the person without experience will immediately take the decision that the damage occurred in the Application, while the Database, Server and Network also have the same possibility.
- *Decision Making*: Not everyone has this skill and this skill can't be practiced by only follow the written procedure. This skill requires someone who have a sensitive observation on the circumstances. No decision is decided by a definite order or step-step.
- *System Design Expertise*: To design a good system, we need people who are in charge of this field. Without mastery of material gained from experience, it's impossible to produce a good system design. A design requires creativity and not everyone has it - it can't be learned. Creativity is a gift.
- *Data Processing*: Generally, data mining (sometimes called data or knowledge discovery) is the process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both. (Palace, 1996).
- *Adding Suggestion*: This capability is similar to decision-making skill. We can't imagine if we create suggestions only based on written references. We can't do that because this is not trial and error.
- *Technology Development / Improvement*: A person can learn about business process, but not all have observations about how and what can be developed.
- *Common problem Solving*: Someone is often faced with the same problem and the source of the problem has been already known, then the solution can be written to becomes explicit knowledge.
- *Create Report (SLA, monthly incident)*: A report that is given by staff to the manager can be done by anyone. It only needs data input, because a report already has its own format.
- *Reporting issue*: The process describing how the issue is reported on the help desk and then mapped to the expert can be written to a procedure because of the repeating steps.
- *Working completion (daily, weekly, monthly job)*: An employee has a record of his/her job, what he/he does daily, weekly, monthly or even notes about work 4 hours a week, 8 hours a week etc. So the new worker has no problem in following the written description.
- *Scripting / coding skills*: The ability of programming can be learned by everyone, because it has been structured and has a pattern.
- *Airline business process*: The ability to control the business process is explicit knowledge. This is the result of tacit to explicit knowledge transformation.
- *Infrastructure knowledge*: When you buy a TV, there is a manual book to operate it. Same with the knowledge of

Infra (Storage, Server, Disk, etc.) which is the result of tacit to explicit knowledge transformation.

Based on the existing problems analysis in the company, we conducted SECI model analysis to see, that current knowledge management process is:

TABLE II. SECI MODEL ANALYSIS

<b>Socialization</b> <i>(Tacit to Tacit)</i> <ul style="list-style-type: none"> <li>• Sub Division Internal Meeting</li> <li>• Internal Seminar</li> </ul>	<b>Externalization</b> <i>(Tacit to Explicit)</i> <ul style="list-style-type: none"> <li>• Making / update SOP (Standard Operating Procedure) for each division</li> <li>• Internal product training</li> </ul>
<b>Internalization</b> <i>(Explicit to Tacit)</i> <ul style="list-style-type: none"> <li>• Product Review</li> <li>• Product Development</li> </ul>	<b>Combination</b> <i>(Explicit to Explicit)</i> <ul style="list-style-type: none"> <li>• SLA Report Making</li> <li>• Problem Management Report Making</li> </ul>

From above analysis, we can see that the management of tacit knowledge to become explicit knowledge in the company hasn't run optimally, because only support operational activities.

To achieve optimally implementation of knowledge management system, organization should be focused on the process of idea / innovation. Based on the analysis of this problem, it is proposed to use the KM system so that there is an improvement or change to the running system and the achievement of the objectives of the company, to facilitate in

the management of knowledge that focuses on learning and growth.

In the table below, we are mapping problems (from the interview results) and suggestions to make better knowledge management, where no 3 and 4 in this table state the need of a knowledge management system to help the knowledge management in XYZ company.

TABLE III. SUMMARY OF PROBLEMS AND PROPOSED SOLUTIONS

No	Problems	Proposed Solutions
1	No face to face information gathering on every employee, so the process of tacit knowledge codification is inhibited.	Need to held regular face to face discussions between knowledge worker and knowledge leader related to tacit knowledge codification
2	No cross-division meetings that make it possible to create a product from the collaboration	Held cross-division meetings based on tacit knowledge combination.
3	There is a <i>gap</i> of unequal capacity on each personnel	Need media as sharing and Learning Point
4	The difficulty in capturing information for further use to get the idea of new product initiatives	To support the above proposal required a system that can accommodate or store all existing knowledge in personnel and divisions.  The system can provide information to the knowledge leader as a reference for the proposed of collaborative projects or new products

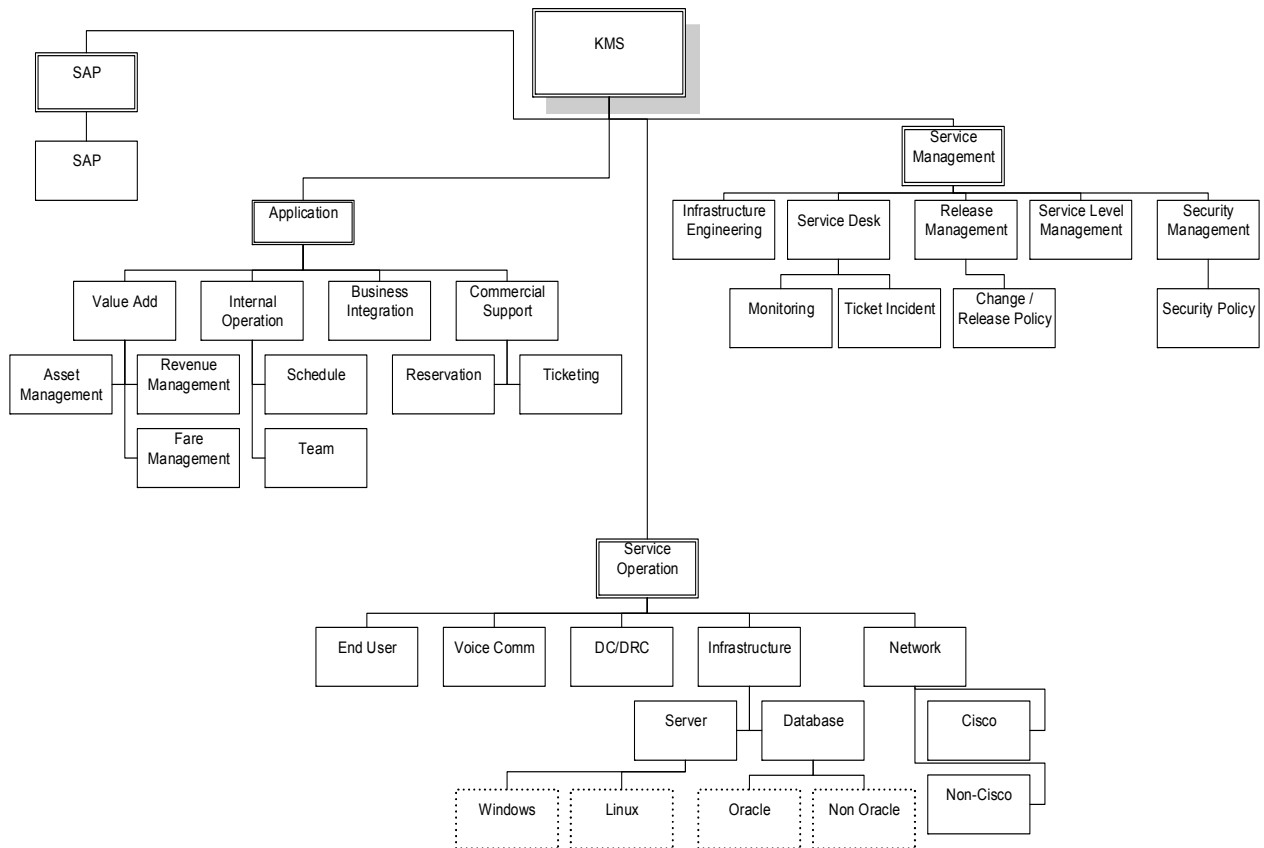


Fig. 3. Knowledge Taxonomy

After identifying solutions to this knowledge management problem, we create knowledge taxonomy to represent organizations structured with expertise in each field. Knowledge taxonomy will be used as a guide in categorizing or grouping knowledge that exist in the organization (Figure 3).

After making knowledge taxonomy, in designing this system, we make use case diagram to describe system functionality in organization.

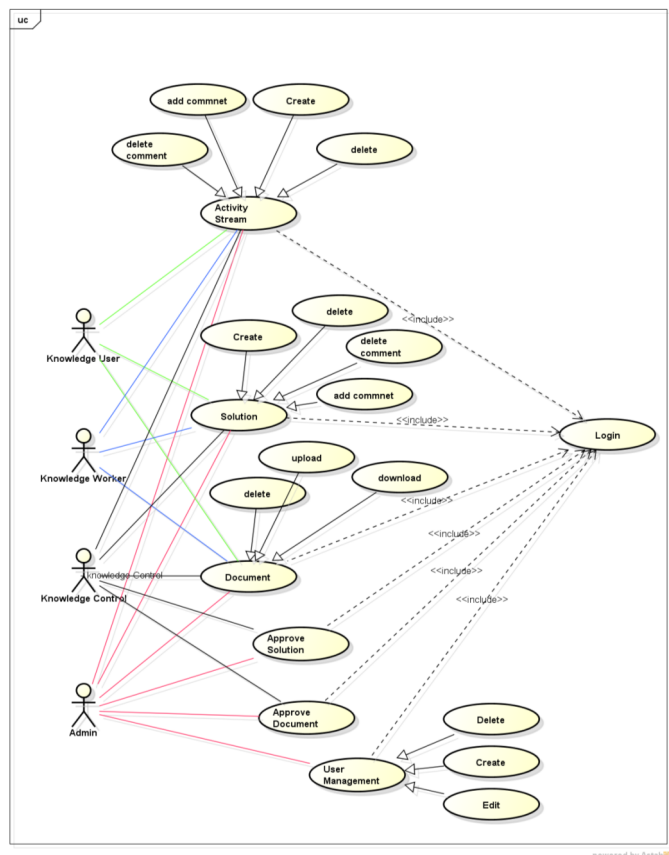


Fig. 4. Use Case Diagram

After we create the use case diagram, then we continue with database design to simplify the design of knowledge

management system database in this company (can be seen in the picture below,

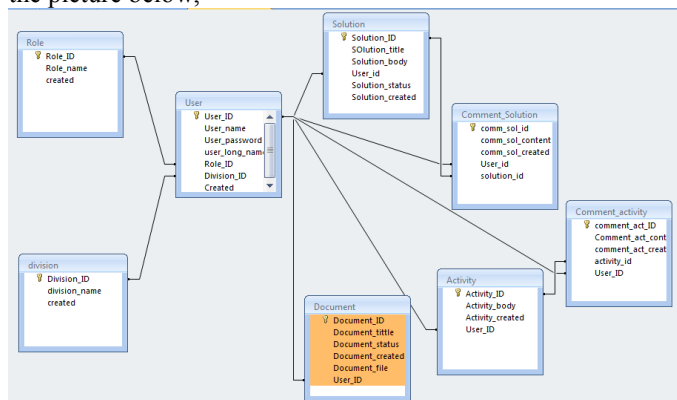


Fig. 5. Relational Database Management Systems

where on that picture illustrated knowledge management system needs access rights management, solution sharing and comments on existing solutions, including support in document management, and the last is recording of activities or event that performed by the knowledge worker in this system (daily activities recording), see figure 5

Below is the software specification which is required to support the server from the proposed knowledge management system:

- OS: Linux Ubuntu 14
- Database: MongoDB
- Application Server: Node.js runtime, Node.js application, and PM2
- Web Server: Nginx web server

#### Hardware Specification

- Processor: Dual Core processor
- SSD / Hard Drive: minimum 10 GB
- RAM: 1 GB

From this case study approach research on XYZ Company, by designing use case diagrams and databases, it's enough to describe the functionality of the system and also the data requirement on the KM system that the company wants to build. The company can choose whether they will develop this system from zero or by using open source or license software in accordance with the needs of this KM system, which is depends on the budget and also company needs.

In the case of this XYZ company, based on the analysis of system functionality, it was decided to use open source KM (Open KM), because this software can be customized easily in accordance with system requirements as shown in use case diagram. So they don't need to make this system from scratch, just custom from open source KM software that already exists in the market.

#### V. CONCLUSION

Basically, the design of knowledge management system can be concluded by several points below:

1. Knowledge management system at the company can trigger Knowledge Collaboration Activity, and not only

document management system. In this condition, the features of comments will become very important in KMS applications.

2. Knowledge management system can be an effective media of sharing and learning point if used every day to record employee daily activities. So, based on this condition, we need to think about these features (record employee daily activities).
3. Knowledge Management System can be used as a media for capturing knowledge to get new product initiative idea. In this case study, there is solution feature to get new product initiative idea.

As the suggestions for this Knowledge Management system, if the system will be very useful, we can it publicly accessible. Also, if it will be possible, the company can make a mobile version of the KM system, so the employees can use it even more easily.

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