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THE DESIGN OF KNOWLEDGE MANAGEMENT SYSTEM IN PT. ASMIN BARA BRONANG

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ABSTRACT

In the situation of a very complex competition, business organizations realize that in order to improve its competitiveness, it is necessary to constantly develop their competence and their knowledge (Orr and Persson, 2003). This paper aims to present the design of the knowlege Management System in PT. Asmin Bara Bronang (ABB). This company is a coal mining company that has a total area of 86 240 hectares. PT. ABB has a 73% market prospects are used to meet the export market and the rest is as much as 27% for domestic market.

The level of efficiency and productivity of the mining process depends on the technology used and experience possessed by the workers. Often the experience of the workers were only kept in his minds as tacit knowledge and other workers are not shared. In order that the knowledge possessed by workers can be shared with other workers, it is necessary to design a knowledge management system (KMS). Through this system, the tacit knowledge is converted into a formal knowledge and stored in a knowledge base system. To identify the problems and requirement of the system, we used PIECES approach (Performance, Information, Economy, Control, Eficency and Service). As for designing KMS, the method used is the Knowledge Engineering Process.

One of the valuable lessons of the existence of KMS for PT ABB is their enthusiasm for learning, as well as organizations increasingly growing. While the difficulty is getting used to write down all the experience of the workers and transformed into a formal knowledge.

***Keywords**: Knowledge Management System, Tacit Knowledge, Formal Knowledge*

1. INTRODUCTION

1.1 Background

Nowdays, we enter to the situation of very complex competition. In this era, business organizations realize that in order to improve its competitiveness, it is necessary to continously develop their competence and their knowledge (Orr and Persson, 2003). Furthermore, Chauhan, Bontis and Kawalek (2004) stated that at this time we have entered the era of knowledge. Only organizations capable of managing its optimal knowledge are able to survive. Knowledge is a key asset that a company has a sustainable competitive advantage.

This project aims to design the knowlege Management System in PT. Asmin Bara Bronang (ABB). This company is a coal mining company that has a total area of 86 240 hectares. Majority of shares are owned by PT. Pama Persada Nusantara which is a member of the United Tractors Group. PT. ABB produces two types of coal that is high grade coal and low calorie. The quality of coal it produces has specifications that are eligible for export to Asia, Europe and America. Therefore, PT. ABB has a 73% market prospects are used to meet the export market and the rest is as much as 27% for domestic market. The mining blocks of PT. ABB is in the province of Central Kalimantan, currently divided into 3 blocks namely Block Bekanon, Block and Block Mamput Merangun.

The level of efficiency and productivity of the mining process depends on the technology used and experience possessed by the workers. Often the experience of the workers were only kept in his minds as tacit knowledge and other workers are not shared. In order that the knowledge possessed by workers can be shared with

other workers, it is necessary to design a knowledge management system (KMS). Through this system, the tacit knowledge is converted into a formal knowledge and stored in a knowledge base system

One of the benefit and the valuable lessons of the existence of KMS for PT ABB is their enthusiasm for learning, as well as organizations increasingly growing. While the difficulty is getting used to write down all the experience of the workers and transformed into a formal knowledge. As stated by Tobias (Tobias, 2009), the benefits of KM is to encourage the learning process with implications for the improvement of innovation capabilities through the creation of new knowledge. The most important part of KM is how to encourage individuals in the organization to share the knowledge about what they know (Orr and Persson, 2003).

1.2 Problem Definition

The difference in distance between the Head Office (HO) in Jakarta with Sepan uring Site in Borneo, often constrain communication and coordination between organizational units. Therefore. PT. ABB has equipped itself with adequate information technology infrastructure that is by using a system of Very Small Aperture Terminal (VSAT). Currently, the facility is limited to be used only to support the administrative process only, not used as a knowledge exchange facility.

Employees of PT. ABB more are in the Site, because it is the main mining activity there. Various problems often arise at the site and need help from the HO to resolve. Actually the solution to dealing with a problem often been owned by some of the employees in the field. But because it is still in the form of tacit knowledge, then the solution can not be formalized and used as learning for other workers.

Based on this fact, the company is looking at the need to design a system that can encourage the creation of a culture of knowledge sharing. Thus, every member of the organization can learn from other employees. Through this system, also can produce a variety of new innovations that can be created from existing knowledge (knowledge innovation). With a culture of knowledge sharing and knowledge innovation, the ability to work of all employees can be improved. In addition, innovations and new knowledge is an intangible asset for the company.

In summary, two major issues of this project, namely:

1. How to cultivate a culture of knowledge sharing in enterprise integrated between the Head Office (Jakarta) and Site (Central Kalimantan)?
2. How to foster innovation based on knowledge that has been owned by PT. ABB?

2. THEORETICAL BACKGROUND

2.1 The Concept of Knowledge Based Management System

According to Davenport (2002), Knowledge is defined as the overall skills and concepts used by someone to solve their problems. While Kluge (2001) defines that Knowledge is the understanding of the causal relationship, and is also the basis for making the activities more effectively, build a business process or to estimate the output of the model. While Awad, Elias M and Gharizini, Hasan M (2003) states that knowledge is a human understanding of a particular field has been learned through education and experience.

Knowledge using data and information as the basis for generating knowledge. Knowledge arranged and formed from the experience of a process activity or a subject or form of best practice in terms of providing solutions to problems that occur. Knowledge may be restricted to any individual, organization, or may be open in general.

2.2 Types of Knowledge

Nonaka and Takaeuchi in his book The Knowledge Creating Company (1995) divides knowledge into two types based on its shape, the Tacit Knowledge (implicit knowledge) and Explicit Knowledge (codifed knowledge).

Tacit knowledge is a kind of knowledge that is difficult to share with others. Tacit knowledge is knowledge that is stored in the memory of either the individual or the community of experts based on their experience. One example of tacit knowledge is an IT specialist resolve the problem based on intuition and experience in the absence of

guidelines. Tacit knowledge is a source of knowledge that is invaluable to the company and is the source for the creation of an innovation in organizations. Gamble and Blackwell (2001) argues that if organizations pay less attention to its tacit knowledge, the organization's ability to innovate and improve its competitiveness will be reduced.

Meanwhile, explicit knowledge is knowledge that has been articulated, codified and stored in certain media. Therefore, explicit knowledge is knowledge that is easily identified, stored and retrieved. Information in the text book is one example of explicit knowledge.

2.3 Levels of Knowledge

There are four levels or tiers of knowledge as defined by Tiwana (Tiwana, 2000). The four levels are as follows

1. Know what or cognitive knowledge is knowledge gained through training, learning and formal qualifications. This level is the most important level for the company. But in fact it has not received serious attention from most companies.
2. Know-how or practical application level is the level of practical application. This level is related to the ability to transform and translate what has been gained at the previous level (know what) in the implementation phase.
3. Know why or system understanding is the deepest knowledge of the causal relationships that exist within an event or discipline. This level allows the professionals to be more active in carrying out their work to solve more complex problems in order to find a solution.
4. Care why an advanced level of creative self (self-motivated creativity).

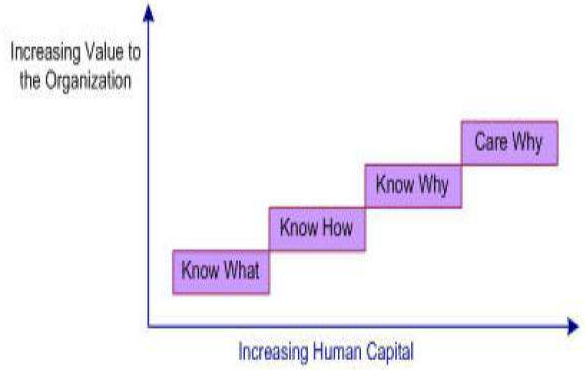

Figure 1. The level of knowledge

2.4 Knowledge Management

Knowledge management is the process of managing organizational knowledge to add value to the business and maintain its competitiveness through the creation, communication and application of knowledge (Tiwana, 2002). According to Awad & Ghaziri (2003), knowledge management is an interdisciplinary business model is emerging that focuses on knowledge as an organizational framework. Knowledge management involves people, technology and processes in an integrated manner. Knowledge management is a process that helps organizations identify, select, manage, distribute, and transfer important information and expertise that are part of the assets of corporate memory (Turban, 2002). In other words, knowledge management basically serves as the manager of the knowledge that can be used in general, embedding knowledge on his part and storing knowledge in databases and well documented. With the knowledge management, then the company may be creating a culture of sharing knowledge. Because knowledge management is also a framework, mindset for management, including the experiences of the past were built (libraries, expert choice) and establish a means for the exchange of knowledge (O'Dell, 2005)

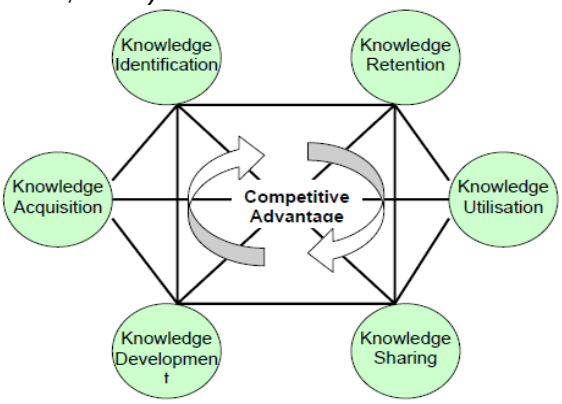

Figure 2. Stages of Knowledge Process (Duvenpart et al, 2002)

According to Turban (2005) in his book, Decision Support Systems and Intelligent Systems, 7th edition explained that the Knowledge Management System (KMS) is a system that has the ability to perform the classification of existing knowledge, the

dissemination of knowledge, storing knowledge, update knowledge, creating knowledge to construct knowledge in a tree of knowledge (refine knowledge).

Briefly, the life cycle of knowledge management can be seen in the figure below.

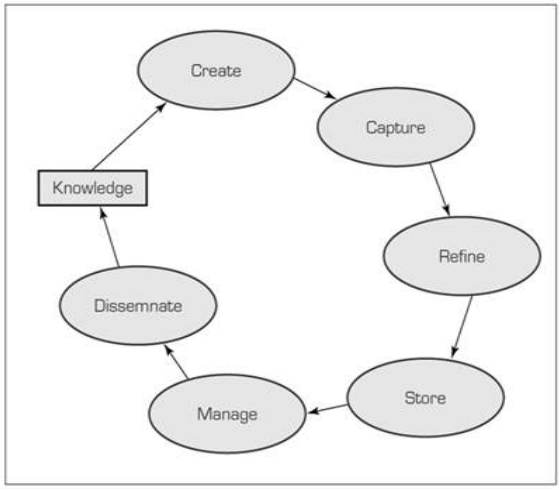

Figure 3. Knowledge Management System Cycle (Turban, 2005)

2.5 Design of Knowledge Management System

In recent years, KMS became a term used to describe the efforts of organizations to capture, store, represent and share knowledge. KMS helps the organization to achieve a competitive advantage and increase effectiveness through the sharing and reuse of knowledge in an organization. Most current knowledge management activities rely on database and web-based technologies, document management systems and artificial intelligence. However, some organizations have a systematic process to identify existing knowledge and process it into new knowledge (Preece, 2000). One approach used to design a knowledge management system is knowledge engineering.

Stages of knowledge engineering process is as follows:

1. **Analyzing**. The first stage is to analyze the role of the knowledge, skills and experience of experts in an organization.
2. **Understanding**. Stage two is to understand how knowledge can support the organization in order to acieve the objective.
3. **Indentifying**. This stage is to identify the source of knowledge, knowledge flow, knowledge constraints, and the level of vulnerability of the company against the loss of knowledge in line with the cessation of its employees.
4. **Determining**. This stage is the process of determining the scope of the KMS to improve the performance of Integration through a procedure of knowledge acquisition, knowledge utilization, knowledge communication and knowledge representation.
5. **Implementing**. This step is the final stage which is the stage for the implementation of the system in order to improve the effectiveness of the management of the organization.

3. RESEARCH METHOD

3.1 Research Method

The methods used to design KMS PT ABB is a knowledge engineering. As described above, this approach will be carried out through five stages, namely; Knowledge Acquisition, Knowledge Validation, Knowledge Representation, Interfencing, Explanation and justification (Figure 4).

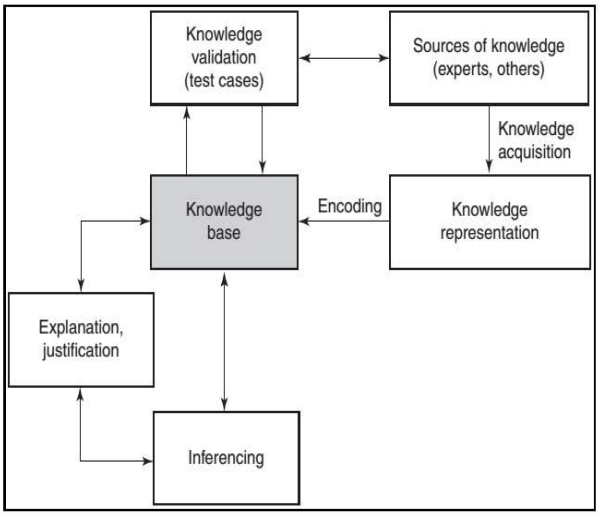

Figure 4. Knowledge Engeneering Process

3.2 Data Collection

The required data were collected through interviews. Interviews will be done to the workers of the Department of exploration, especially the manager. Not all workers will be interviewed, only workers in key positions (about 3 people). The data

collected can be briefly seen in the table below.

Table 1. Data Requirement Matrix

Data	Metode	Format
Work flow	Interview Document Observation	Flowchart
Organization Structure an Behaviour	Document Observation	Diagram
Job description	Interview Document	Document
Communication System	Interview Document	Document
Sugestion	Interview	
Project	Interview Document	Document
Work Schedule	Interview Document	Documnet

4. RESEARCH FINDINGS

4.1 Knowledge Acquisition

Knowledge acquisition is aimed to extract all the knowledge from multiple sources, and experts. The knowledge collected and then transferred into a knowledge base that will sometimes be used as an inference engine (Turban, 2001). People who interact with experts to gain knowledge is called knowledge engineer (Turban, 2001). Knowledge that will be collected is the variety of knowledge that currently exists in PT ABB.

The sources of knowledge that is used consists of documentation, individual knowledge (tacit knowledge), knowledge acquisition from the data bank / databases or the Internet. Because the concentration of jobs is in the exploration department, the knowledge gathered in this project will be prioritized on the knowledge of this department.

The knowledge that has been collected which are

1. SOP (Standard Operating Procedure)
2. Work Instructions
3. Annual Work Plan
4. Forms and Reports
5. Problem Solving
6. Undocumented (people's minds)

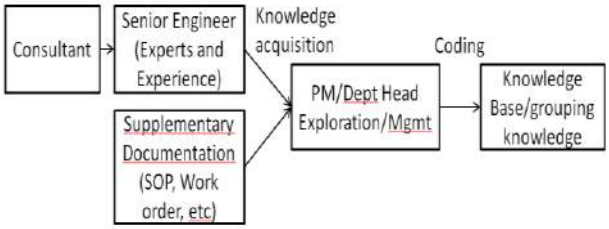

Figure 5. Knowledge Acquisition Process

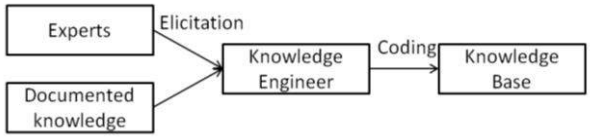

Figure 6. Manual Acquisition

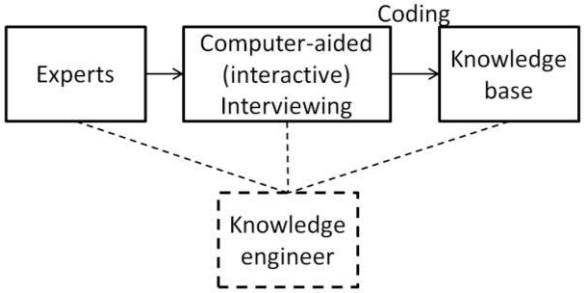

Figure 7. Computerized Acquisition

Currently, PT ABB already has a wide range of knowledge in the form of SOP (Standard Operating Procedure), checklist, JSEA (Job Safety Environmental Analysis), Work Instructions (IK), various mining reports, and several other supporting documents operasioanal. As an example is as follows:

1. SOP Geological Mapping
2. SOP Drilling Exploration
3. SOP Geological Model
4. Form Drilling Logcheck
5. Form Geology Logcheck
6. Form Checklist Post-Drilling
7. Form Logcheck
8. Standard Form Data Quality
9. Determine JSEA Drill Point
10. JSEA Eject Core Sample
11. Sampling JSEA outcrop
12. IK Drill Point Determination
13. IK Marking Drill Point Open
14. IK cuting Drilling Decision
15. Dictionary Logcheck
16. Dictionary Logcheck BOR
17. Daily Drilling Progress

The results of knowledge acquisition in PT. ABB, further categorized into various classifications as follows:

1. Learning
2. Project
3. Information
4. Community

4.2 Knowledge Representation

Knowledge representation aims to present data, information and knowledge to be incorporated into the knowledge base. Before input into the knowledge base, data is transformed first into a format appropriate to the system

In accordance with the theory proposed by Durkin (Durkin, 1994; Turbin, 2011), some knowledge representation methods are used, including; heuristic rules, semantic networks, frames, objects, decison tables, decision trees, and predicate logic. In this study, the method used more emphasis on the use of the method frameworks, both for the design of communication systems, workflow systems design, menu structure, and design of the knowledge base itself.

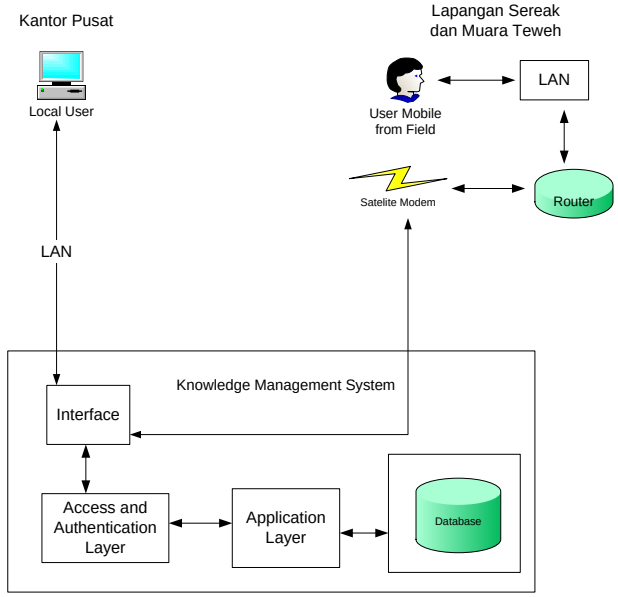

Figure 8. Design of Communication System for PT ABB KMS

4.3 Design of Menu Structure

Based on the results of knowledge acquisition in PT. ABB, the structure menu consists of 5 elemens as follow:

1. User
2. Learning
   a. Ressources: Article, Books, Form, Guidelines, Work Instruction, Journal, Problem-Solving Material, Report, SOP
   b. Training
3. Project
4. Information
   a. Events
   b. MoM
5. Community
   a. Annoucement
   b. Forum
6. Helpdesk

The following figure is the menu structure for knowledge management system of PT. ABB.

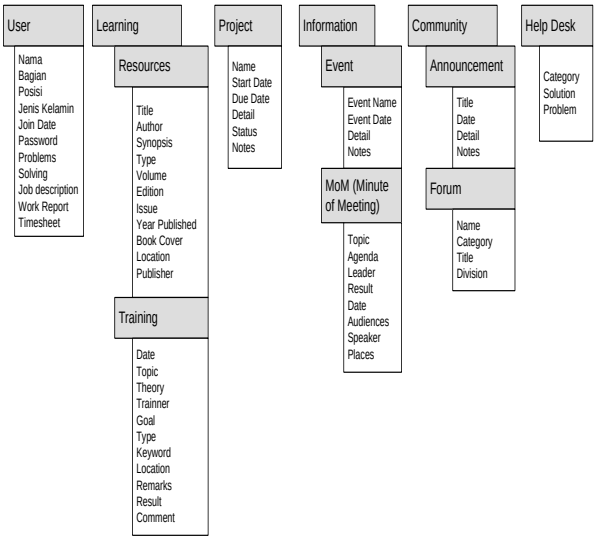

Figure 9. Desgin of Menu Structure of Knowledge Management PT. ABB

4.4 Design of the Framework Knowledge Base

Framework knowledge base is very important to see how the relationship between the parts of the menu structure with the other parts. In addition, to regulate the relationship between the parts of the menu structure to the knowledge base. Here is a knowledge base framework that will be built based on the design of the menu structure which has been described previously.

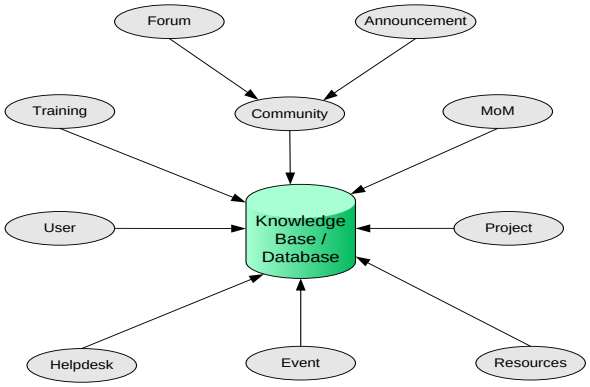

Figure 10. Knowledge Base Framework PT. ABB

From the picture above we can see that every part of the menu structure directly linked to the knowledge base as a central storage for data, information and knowledge in a knowledge management system. It is claimed that when one part of the menu structure is active, then that part directly connected to the knowledge base.

4.5 Knowledge Validation Process

Knowledge validation is one of the knowledge engineering process that aims to validate the data, information and knowledge that will be incorporated into the knowledge base. Validation and verification of the knowledge base must be in accordance with the principles of the implementation of quality control including evaluation, validation and verification (Turban, 2001).

The data, information and knowledge that will be incorporated into the knowledge base will be validated by experts or people who have the expertise and authority of the system. Validation of the system that has been designed in the previous point, it will be validated by the manager of the exploration department of PT. ABB. Validation is done to harmonize the design of a new knowledge management with the knowledge needed by the exploration department of PT. ABB.

Moreover, validation was also done to the communication system will be applied. This communication system will be used to implement the KMS system that will connect between the HO and SO. The communication system will be validated and verified by the IT Department of PT. ABB.

Here is a knowledge management workflow validation conducted by the Manager of Exploration Department, while the communication will be validated by the IT department.

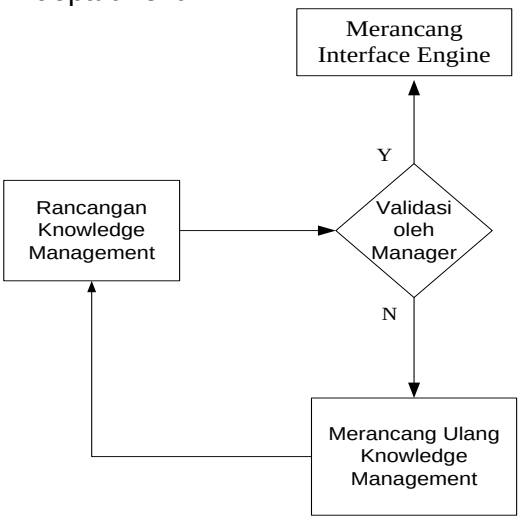

Figure 11. Flow of the Validation process of the Knowledge Management PT. ABB

5. LESSON LEARN AND DISSCUSION

From the discussion with managers and users can be concluded that the KMS has been designed to PT ABB is in conformity with the requirements. But still need to be socialized to all stakeholders.

To corroborate this, we did an evaluation using the method PIECES (Performance, Information, Economic, Control, Effectiveness). As for the results we present in the following table:

Table 2. Evaluation Before and After Design KMS at Pt ABB

1.Aspect : Performance

Before	After
1.Knowledge is not documented. 2. Knowledge is more tacit knowledge. 3. There is no means of connecting between the HO and SO. 4. There is no system that	1. Knowledge has been concentrated in the KMS system. 2. The system can be accessed at the HO and SO. 3. The knowledge already has a clear division of the types of knowledge held

Before	After
manages knowledge owned by PT. ABB	by PT. ABB. 4. Employees can access knowledge directly from the KMS.

2.Aspect: Information

Before	After
1. Lack of information up to date for employees. 2. Knowledge is still centralized in HO.	1. information is up to date, and can be accessed at any time. 2. Information is no longer centralized in HO but has been centralized in the system.

3.Aspect: Economic

Before	After
Requires the cost of ink and paper to print knowledge, more to do printing work.	The efficiency cost of ink and paper, because all existing knowledge can be viewed on computer media

4.Aspect: Control

Before	After
The lack of control of documents that are confidential, because all knowledge is only stored in the folder sharing between HO and SO.	KMS has a log system and each user who will access the knowledge required to login in the system. If there is knowledge that is confidential, the access can be limited

5.Aspect : Effectivness

Before	After
The time required to obtain an information and knowledge is still long, because they use email / phone to contact the HO or SO. There is still a difference in working hours between HO and SO.	KMS can be accessed at any time, so if the needed information or knowledge, it can directly access the KMS. Existing knowledge in KMS already composed of various types of resources, including SOPs, Work Instructions, Books, Materials Problem Solving, Journal, Training Materials, and other types. So the solution or finding needed knowledge accessible in a practical and easy.ways.

6.Aspect: Service

Before	After
Dissemination of information on the Department of Exploration conducted by email, by phone and verbally.	KMS has a menu Information and Community so as to spread the information can be easily done

6. CONCLUSIONS AND FINAL REMARKS

6.1 Conclusions

1. After the development of KMS, knowledge that was initially still be tacit, can then be transformed into the form of a formal or explicit knowledge
2. After the formation of KMS, the knowledge sharing culture began to be created, although not as easy as imagined.
3. One of the benefits with the KMS, then each employee can explore new knowledge via KMS
4. The relationship between headquarters and branch offices can be occurred at any time.

6.2 Final Remarks

1. Reflecting on the experience of this project, the design of KMS can be done for the coal industry.
2. Designing KMS using knowledge engineering methods allow for knowledge acquisition process carried semiautomatic

or automatic, so that the results obtained are more accurate and precise because it is not only based on expert opinion. .

3. KMS of PT ABB should be updated continouslly in accordance with technological developments.

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