

# KM Maturity for A Gas Company in Indonesia: G-KMMM Assessment and Improvement Recommendation

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**Abstract**— Knowledge is an intellectual asset owned by each organization that greatly influences the performance of the organization. Knowledge management, tacit knowledge, and explicit knowledge in an organization become crucial for the organization's sustainability. In order to adjust between company objectives, it is necessary to know the KM maturity index in an organization. Knowledge Management (KM) is a science that focuses on knowledge initiatives by collecting, storing, and applying knowledge. The governance depends on many things such as organizational structure, human resources and culture, technology, and the company's vision and mission. So based on the maturity index, the organization can prepare and adjust company conditions based on the target to be achieved. Knowledge Management (KM) has helped many companies or organizations in developing companies or their organizations, especially for the oil and gas industry. In this study, the authors used the G-KMMM method to conduct KM assessments and provide recommendations for increasing KM at an oil and gas company in Indonesia. From the KM assessment results using the G-KMMM method, it was found that KM in that company is at the awareness level. These results are obtained by considering aspects of people, processes, and technology.

**Keywords**— *Maturity Model, Knowledge Management, oil & gas industry*

## I. INTRODUCTION

Companies in the oil and gas sector operate based on the strength of natural resources, infrastructure, technology, human resources, and market demand for energy [1]. Oil and gas consumption in Indonesia continues to increase from year to year. Based on British Petroleum (BP) data quoted on kadata.co.id, oil consumption increased from 28.38 MToe (Million Tonnes Oil Equivalent) in 2000 and reached 33.51 MToe in 2018. Because of the increasing demand for oil and gas in Indonesia, it is necessary to capture internal knowledge, customers, and product innovation. Knowledge has become a valuable asset for most companies, so efforts are needed to manage these assets to ensure effective and efficient use of resources [2]. Market demand for energy is increasingly high requires companies to improve the quality of Knowledge Management (KM) as a means to enhance their competence in meeting market needs. Thus, KM becomes an important strategy for organizations in improving performance, including in the upstream oil and gas industry.

Knowledge Management (KM) is a science that focuses on knowledge initiatives by collecting, storing, and applying knowledge. Organizations and governments use KM to guide and manage knowledge initiatives [3]. KM is essential because it can provide direction to improve organizational performance. However, the application of KM can be done

using various theories and methods in various types of organizations with different focus and scope [4]. The KM application needs to be assessed to see the condition of KM in the company and its impact; one of the ways is by conducting KM maturity assessment. KM maturity assessment will provide an overview of KM's application in a company so that it can provide a recommendation to determine the strategies needed to improve it [5].

PT XYZ is a company engaged in oil and gas in Indonesia. PT. XYZ has implemented KM. This paper aims to assess maturity and implement a recommendation method after the maturity assessment has been carried out. Related to KM, maturity is the level of effectiveness and efficiency of an organization in managing its knowledge assets [4]. The maturity model can be said as a pattern or stage in guiding achieving a condition. The KM maturity model can help companies identify obstacles that need to be overcome and make adjustments to reach the next level of maturity [6]. Based on these problems, it is necessary to study the maturity model of oil and gas companies according to the organization's goals and needs of the organization.

## II. THEORETICAL BACKGROUND

### A. Knowledge Management

Knowledge is a combination of experience, values, information, and perspectives from experts that provides a structure for evaluating and combining new experiences and information. Knowledge is generally embedded in documents and repositories, but there is also in the form of organizational routines, processes, practices, rules, and even in humans [7].

KM is a paradigm with the concept of BPR (Business Process Re-engineering). The paradigm is to manage all types of current knowledge and identify and explore knowledge and get opportunities to develop it. In the KM context, KM infrastructure consists of learning an organization that can create knowledge and shares knowledge, which is a core of the KM process. Based on the KM cycle, there are several important KM cycles, such as knowledge capture, knowledge development, knowledge sharing, and knowledge utilization [8].

### B. Maturity Model

Maturity Model describes the development of an entity from time to time. Each entity develops through stages from maturity level from time to time to reach the highest level. An example of the maturity model was found by Maslow (1943). Knowledge management maturity model (KMMM) can be defined as a business or KM development condition that can describe the quality and effectiveness of the KM process.

Besides showing its suitability with the social and technical environment in managing knowledge in an organization [9]. The maturity model is a structure that can be used to identify the cultural transformation that must be established to move the organization to a better level of organizational maturity and effectiveness in the utilization of information and knowledge [7]. According to Pee and Kankanhalli [10], KM is one of the most important business initiatives impacting the business sector.

### III. RESEARCH DESIGN

#### A. Case Background

PT. XYZ is one of the largest Indonesian national companies in the transportation and distribution of natural gas. This company was founded in 1965 and has four segments of business areas, namely the transmission and distribution of natural gas, the business commerce, and natural gas, the business of oil and gas, as well as other businesses consisting of telecommunications, construction, LNG, property management, leasing (financial lease). The vision of PT. XYZ is: "To be World Leading National Gas Company for a Sustainable Future and National Energy Sovereignty". To achieve this vision, the company has a mission of running a gas business in the midstream, downstream, and other supporting businesses committed to increasing value for all stakeholders by:

- Providing gas and developing infrastructure for the use of gas as energy and raw material to create optimum value for the benefit of customers and the community
- Creating added value for shareholders and employees, being environmentally friendly, having an excellence and prioritizing safety
- Implementing the principles of professional, responsible and sustainable company management
- Carrying out other businesses to support gas utilization and sustainable business management

It is necessary to know the KM maturity index at PT. XYZ. Based on the maturity index, organizations can prepare and adjust company conditions based on the targets to be achieved to adjust between company objectives. Therefore, it is now necessary to conduct a KM assessment so that those from the LKM department can develop KM in PT XYZ. We use the G-KMMM because the G-KMMM

assessment instrument functions as a diagnostic instrument that can show aspects that need improvement and can potentially become a general model that facilitates communication and increases understanding.

#### B. Methodology

The research used the general KM maturity model (G-KMMM) method to determine the level of KM maturity in the company where the case study is conducted. G-KMMM includes the stages of initiation (initial), awareness (aware), defining (defined), management (managed), and optimization (optimizing) KM, which are distinguished based on characteristics related to human aspects, processes, and technology [10]. According to Pee and Kankanhalli [10], G-KMMM has two main components: the maturity level and the key process area (KPA). Each level of maturity is marked in three KPAs, namely people, processes, and technology. Each KPA is explained by a set of characteristics that determine the main practices or actions that a company must take to reach a certain level of maturity. Details about the stages, components, and KPA in the G-KMMM can be seen in Table 1.

In G-KMMM, organizations must pass each level of maturity without passing a certain level. In its application, the organization can implement several main practices that are at a higher level. However, the application of practices at a higher level cannot be said that the level has been reached because it must apply all the practices that exist consistently to reach a level of maturity [10].

We use G-KMMM to determine the level of KM maturity because, according to Pee and Kankanhalli [10], we can identify important aspects of KM development. In addition, this method is flexible enough to be applied at various levels of aggregation, including the unit, department or organization as a whole. This method also does not depend on the type of KM applied to the company. This explanation is in line with the purpose of this research.

Pee and Kankanhalli [10] provided instruments in assessing the level of KM maturity. The instrument aims to validate the conditions of KM in the organization according to the main practice that characterizes the level of KM maturity based on the G-KMMM. Table 2 describes the instruments in the G-KMMM maturity assessment compiled by Pee and Kankanhalli [10].

Table 1. G-KMMM Key Process Area [11]

Maturity Level		Information	Key Process Area		
			People	Process	Technology
1	Initiations	There is little or no effort at all to manage knowledge formally.	The organization and its people are not aware of the need to formally manage their knowledge resources	There is no formal process in the process of capturing, sharing, and reusing knowledge.	There is no special technology or infrastructure dedicated to KM.
2	Aware	The organization is conscious and has the intention to manage knowledge, but there is a possibility of not knowing how to do it.	Management is aware of the need for KM	Documenting knowledge that is needed in the organization's routine.	The initiation of projects related to KM.
3	Defined	The organization has provided the necessary infrastructure to support KM.	<ul style="list-style-type: none"> <li>• Management is aware of its role in encouraging KM</li> </ul>	<ul style="list-style-type: none"> <li>• The process for formalized content and information management.</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of basic infrastructure for KM purposes.</li> </ul>

			<ul style="list-style-type: none"> <li>• Basic training related to KM is provided</li> <li>• Implement basic KM strategies</li> <li>• Individual roles related to KM are applied.</li> <li>• An incentive system is in place.</li> </ul>	<ul style="list-style-type: none"> <li>• Use metrics in measuring productivity improvements related to KM.</li> </ul>	<ul style="list-style-type: none"> <li>• Some enterprise-level KM projects have begun.</li> </ul>
4	Managed	The organization has a well-established KM initiative.	<ul style="list-style-type: none"> <li>• General strategies and standard approaches to KM</li> <li>• KM is incorporated into the overall organizational strategy</li> <li>• Further KM training</li> <li>• Organizational standards</li> </ul>	There is a quantitative assessment of the KM process.	<ul style="list-style-type: none"> <li>• The KM enterprise-level system has been fully implemented.</li> <li>• The use of the KM system is at a reasonable level.</li> <li>• Integration of technology with architectural content.</li> </ul>
5	Optimizing	KM has been integrated and continues to experience improvements.	There is a strong culture of information sharing.	<ul style="list-style-type: none"> <li>• The KM process continues to be reviewed and developed.</li> <li>• Existing KM processes can be easily adjusted to meet new business requirements.</li> <li>• KM procedures are an integral part of the organization.</li> </ul>	Existing KM infrastructure continues to be improved

Table 2. Assessment instruments G-KMMM [11]

Level	Question
<i>KPA: People</i>	
2	<b>PEO2a</b> - Is organizational knowledge considered important for the long-term success of the organization?
	<b>PEO2b</b> - Is KM considered the main competency of the organization?
	<b>PEO2c</b> - Employees are ready and willing to provide advice or assistance based on requests from others in the company
3	<b>PEO3a</b> - Are there incentives to encourage knowledge sharing between employees? <ul style="list-style-type: none"> <li>• Employee contributions to KM are considered</li> <li>• Prizes for teamwork in terms of sharing or reuse of knowledge</li> </ul>
	<b>PEO3b</b> - Is the incentive system effective enough to promote the use of KM in the organization?
	<b>PEO3c</b> - Is the KM project coordinated by management?
	<b>PEO3d</b> - Are there individual roles in KM that are defined and given an appropriate level of authority? <ul style="list-style-type: none"> <li>• CKO</li> <li>• Knowledge worker/officer</li> </ul>
	<b>PEO3e</b> - Is there a formal KM strategy that applies?
	<b>PEO3f</b> - Is there a clear vision for KM?
	<b>PEO3g</b> - Is there a KM training program or awareness campaign?
4	<b>PEO4a</b> - Are there regular knowledge sharing sessions?
	<b>PEO4b</b> - Is KM incorporated into the overall organizational strategy?
	<b>PEO4c</b> - Is there a special budget for KM?
	<b>PEO4d</b> - Is there a measure or assessment of KM conditions in the organization? <ul style="list-style-type: none"> <li>• Balanced scorecard approach</li> <li>• Have key performance indicators in place</li> <li>• Knowledge RO</li> </ul>
5	<b>PEO5</b> - Are KM initiatives available that produce a culture for sharing knowledge?
<i>KPA: Process</i>	
2	<b>PRO2</b> - Is the knowledge needed to perform routine tasks documented?
3	<b>PRO3a</b> - Does KMS improve the quality and efficiency of work?
	<b>PRO3b</b> - Is the process for gathering and sharing information formalized? <ul style="list-style-type: none"> <li>• The practices, methods, and experiences gained are documented</li> </ul>
4	<b>PRO4a</b> - Is the existing KM system used actively and effectively?
	<b>PRO4b</b> - Is the knowledge process measured quantitatively?
5	<b>PRO5</b> - Can existing KM processes be easily adjusted to meet new business requirements?
<i>KPA: Technology</i>	
2	<b>TEC2a</b> - Are there any pilot projects that support KM?
	<b>TEC2b</b> - Is there technology and infrastructure that supports KM?

Level	Question
3	TEC3 - Does the system only support business units?
4	TEC4a - Does KMS support the entire organization?
	TEC4b - Is KMS integrated with business processes?
5	TEC5 - Does the existing system continue to be improved?

### C. Data Collection

Data collection was carried out by distributing questionnaires to several work units in PT. XYZ, namely the Human Capital Management (HCM) work unit 6 out of a total population of 41 people, Business Gas Product Unit (BUGP) 6 people out of a total population of 46 people, Business Unit Infrastructure (BUI) 6 out of a total population of 54 people, Center of Technical Excellence (COTE) 6 people from a total population of 27 people, Gas Distribution Management Regional III (GDMR-III) 6 people from a total population of 31 people, Gas Transmission Management (GTM) 6 people from a total population of 30 people, Project Management Office (PMO ) 6 people out of a total population of 118 people. The total population is 42 out of 347 people. Due to differences in business processes and different cultures, the results of the KM maturity level assessment in each work unit can be different. The results of this study will contribute to the G-KMMM at PT. XYZ. The G-KMMM assessment instrument was used as a guideline for the questionnaire that has been made.

## IV. RESULT AND ANALYSIS

The level of KM maturity in each work unit is assessed by evaluating whether the practice is carried out or not. For every practice carried out, the answer is "Y". If the practice is not carried out, the answer is "N" (see Table 3). Based on the assessment using the G-KMMM and using data from the results of the questionnaire, the level of KM maturity at PT XYZ is still at Level 2: Awareness (Aware) because level 1 (Initial) and level 2 (Aware) all question components have a value of "Y" and at level 3 (Defined) only partially has a value of "Y" so PT. XYZ has only reached Level 2 (Aware) and cannot be said at Level 3 (Defined). The assessment

results indicate that the company is aware of KM's existence, but the company has not clearly defined KM related to the organization (see Table 1). We describe these level factors in the area of people, process areas, and technology areas.

### A. People Area

All factors at the level of KM maturity in people maturity are still at level 2. this is because KM has been considered the main competency for the organization. KM has been considered important for long-term success, and employees at PT XYZ are willing to conduct knowledge sharing activities with other employees. However, in PT XYZ, there is no formal KM strategy that applies. There is no clear vision for KM; there is no training related to KM. KM is not included in the overall organizational strategy, and assessment of KM conditions.

### B. Process Area

KM maturity level is still at level 2 in the maturity process. The implementation of KM becomes important for all work units in PT XYZ because some work teams consist of many people and spread out, so KM will improve the process of team performance in PT XYZ. The process area has no KM measurements, and the use of KM is not yet effective at PT XYZ.

### C. Technology Area

KM maturity level is at level 2 in technology maturity. This is due to the presence of KM technology and infrastructure at PT XYZ. The KMS at PT XYZ was developed in line with the company's commitment to ensure that workers have the right knowledge, skills, experience, and behavior to achieve the company's business goals in the short and long term.

Table 3. Assessment Result

Item	GTM	GDMR-III	BUI	BUGP	PMO	COTE	HCM
<b>People Maturity</b>	2	2	2	2	2	2	2
PEO2a	Y	Y	Y	Y	Y	Y	Y
PEO2b	Y	Y	Y	Y	Y	Y	Y
PEO2c	Y	Y	Y	Y	Y	Y	Y
PEO3a	Y	Y	Y	Y	Y	Y	Y
PEO3b	Y	Y	Y	Y	Y	Y	Y
PEO3c	Y	Y	Y	Y	Y	Y	Y
PEO3d	N	N	N	N	N	N	N
PEO3e	N	N	N	N	N	N	N
PEO3f	N	N	N	N	N	N	N
PEO3g	N	N	N	N	N	N	N
PEO4a	Y	Y	Y	Y	Y	Y	Y
PEO4b	N	N	N	N	N	N	N
PEO4c	Y	Y	Y	Y	Y	Y	Y
PEO4d	N	N	N	N	N	N	N

PEO5	Y	Y	Y	Y	Y	Y	Y
<b>Process Maturity</b>	2	2	2	2	2	2	2
PRO2	Y	Y	Y	Y	Y	Y	Y
PRO3a	N	N	N	N	N	N	Y
PRO3b	N	N	N	N	N	N	Y
PRO4a	N	N	N	N	N	N	N
PRO4b	N	N	N	N	N	N	N
PRO5	N	N	N	N	N	N	N
<b>Technology Maturity</b>	2	2	2	2	2	2	2
TEC2a	Y	Y	Y	Y	Y	Y	Y
TEC2b	Y	Y	Y	Y	Y	Y	Y
TEC3	N	N	N	N	N	N	N
TEC4a	Y	Y	Y	Y	Y	Y	Y
TEC4b	N	N	N	N	N	N	Y
TEC5	N	N	N	N	N	N	N
<b>Overall Maturity</b>	2	2	2	2	2	2	2
<b>Company Maturity</b>	2	2	2	2	2	2	2

## V. RECOMMENDATIONS

Based on the KM maturity level assessment results at PT XYZ, it was found that the KM at PT XYZ was at level 2. These results were obtained from an assessment carried out by considering aspects of people, process, and technology. PT XYZ has realized that KM is essential for its organization, but PT XYZ has not been maximized in terms of KM implementation and KM development in its organization.

The following are recommendations for increasing the level of KM maturity at PT. XYZ:

From the aspect of human are as follows;

- Establish KM implementation strategies in the company.
- Establish a clear vision and mission related to KM implementation.
- Conduct regular training related to competencies that support the company's business processes.

From the aspect of the process is as follows:

- Increase motivation to use the KM system actively and effectively.
- Quantitatively measure KM processes for evaluation.

From the aspects of the technology are as follows:

- Develop a system scope for all existing process lines in the company.

All these recommendations are suggestions for reaching maturity level 3: define, for higher levels, can follow the assessment instruments in the G-KMMM.

## VI. Conclusion

Based on the KM maturity level assessment results in an oil and gas company in Indonesia, the KM in this company was at an awareness level. These results were obtained from an assessment conducted by considering aspects of people, process, and technology. The company has realized that KM is very important for its organization, but it has not been maximized in KM implementation and

KM development. We recommended some strategies to increase the KM maturity level to the defined level in people, process, and technology areas.

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## REFERENCES

- [1] C. Ramanigopal, "Knowledge Management for the Oil and Gas Industry - Opportunities and Challenges," *Adv. Manag.*, vol. 6, no. 8, pp. 3–8, 2013.
- [2] F. Torabi and J. El-Den, "The impact of Knowledge Management on Organizational Productivity: A Case Study on Koosar Bank of Iran," *Procedia Comput. Sci.*, vol. 124, no. January 2017, pp. 300–310, 2017, doi: 10.1016/j.procs.2017.12.159.
- [3] M. E. Jennex, S. Smolnik, and D. Croasdell, "The search for knowledge management success," *Proc. Annu. Hawaii Int. Conf. Syst. Sci.*, vol. 2016-March, no. May, pp. 4202–4211, 2016, doi: 10.1109/HICSS.2016.521.
- [4] G. Escrivão and S. L. Da Silva, "Knowledge management maturity models: Identification of gaps and improvement proposal," *Gest. e Prod.*, vol. 26, no. 3, pp. 1–16, 2019, doi: 10.1590/0104-530X3890-19.
- [5] U. Kulkarni and R. St. Louis, "ORGANIZATIONAL SELF ASSESSMENT OF KNOWLEDGE MANAGEMENT MATURITY Uday," in *Ninth Americas Conference on Information Systems*, 2003, no. January, pp. 2542–2551.
- [6] P. Akhavan, S. M. Hosseini, M. Abbasi, and M. Manteghi, "Knowledge-sharing determinants, behaviors, and innovative work behaviors: An integrated theoretical view and empirical examination," *Aslib J. Inf. Manag.*, vol. 67, no. 5, pp. 562–591, 2015, doi: 10.1108/AJIM-02-2015-0018.
- [7] R. C. Follador and L. G. Trabasso, "Knowledge Management maturity level in a Brazilian Air Force flight test environment," *Portl. Int. Conf. Manag. Eng. Technol.*, vol. 2015-Sept, pp. 1296–1304, 2015, doi: 10.1109/PICMET.2015.7272952.
- [8] S. M. Lee and S. Hong, "An enterprise-wide knowledge management system infrastructure," *Ind. Manag. Data Syst.*, vol. 102, no. 1, pp. 17–25, 2002, doi: 10.1108/02635570210414622.
- [9] M. A. Wibowo and R. Waluyo, "Knowledge management maturity in construction companies," *Procedia Eng.*, vol. 125, pp. 89–94, 2015, doi: 10.1016/j.proeng.2015.11.014.

- [10] P. J. Hsieh, B. Lin, and C. Lin, "The construction and application of knowledge navigator model (KNM™): An evaluation of knowledge management maturity," *Expert Syst. Appl.*, vol. 36, no. 2 PART 2, pp. 4087–4100, 2009, doi: 10.1016/j.eswa.2008.03.005.
- [11] H. Y. Teah, L. G. Pee, and A. Kankanhalli, "Development and application of a General Knowledge Management Maturity Model," *PACIS 2006 - 10th Pacific Asia Conf. Inf. Syst. ICT Innov. Econ.*, no. January, pp. 401–416, 2006.