



Improving Demand Management Performance using Knowledge Management Approach in an Oil and Gas Company

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ABSTRACT: The oil and gas industry has become one of the most important sectors of the global economy, providing energy for transportation, industry and power generation. Indonesia is one of the world's largest producers of oil and gas and the oil and gas industries have been operating in Indonesia for several decades, contributing to the country's economic growth and development. PT. COPI, one of the entity in the oil and gas industry which focuses on downstream segment, plays an important role in this industry. However, to anticipate industrial competition, it requires the company to adapt and meet the minimum standards in order to remain competitive, through Continuous Improvement method which is implemented in departments, including Supply Chain Management (SCM) where, through the "Supply Chain Optimization (SCO)" approach, several obstacles are found, including Demand Management Process. This research uses the Knowledge Management (KM) approach to address the obstacles by conducting KM maturity analysis in PT. COPI's Supply Chain division and perform analysis and evaluation of the current KM practices in order to provide recommendations for improvement. This research uses qualitative methodology to perform data collection, obtained through an interview with the head of Supply Chain Management division of PT. COPI, using Asian Productivity Organization (APO) KM assessment tool which comprises seven APO audit elements: Leadership, Process, People Technology, Knowledge Processes, Learning and Innovation, and KM Outcomes as the baseline for the interview questions. The research shows that KM maturity level of PT. COPI's Supply Chain division sits at the fourth quadrant of the APO KM Maturity Model, which is refinement. Obstacles are identified from several audit elements of the APO KM assessment tool and marked as an area of improvement. This research provides recommendations for the identified area of improvements using the relevant KM method, which can be implemented by the company to increase their KM Maturity level, increase demand management performance and optimize Supply Chain Management process in the company.

KEYWORDS: Asian Productivity Organization, Demand Management, Knowledge Management, Knowledge Management Maturity.

INTRODUCTION

The oil and gas industry has become one of the most important sectors of the global economy, providing energy for transportation, industry and power generation. Oil and gas industry incorporates a broad range of activities, such as exploration, extraction, refining, transportation, and distribution of oil and gas products. This industry sector has experienced significant changes over the years, driven by the changing global demand, technological advancements, and growing environmental concerns. Increasing global competition for oil and gas companies is unavoidable as companies are pursuing transition to cleaner sources of energy through renewable energy sources such as solar and wind power generation (IEA, 2020)

Furthermore, growing concerns over climate change and greenhouse gas emissions have forced governments and international organizations to impose stricter environmental regulations on the oil and gas industry to reduce emissions and address climate change (HBR, 2007). This situation demands companies to adjust their operations and invest in new infrastructure and technologies which would meet the new regulations.

Indonesia is one of the world's largest producers of oil and gas and the oil and gas industries have been actively operating in Indonesia for more than 130 years, starting in 1885 with the first oil discovery in North Sumatra, contributing to the country's economic growth and development, providing major revenues to the government and creating employment opportunities (PwC, 2019). PT. COPI, one of the entity in the oil and gas industry which focuses on downstream segment, plays an important role in this industry. However, to anticipate industrial competition, it requires the company to adapt and meet the minimum standards in order

to remain competitive in the industry. One of the methods that PT. COPI has rolled out is through “Continuous Improvement” in all departments, including Supply Chain Management, through the "Supply Chain Optimization (SCO)" approach in the Supply Chain Process to cut costs through the result of efficiency.

According to the head of Supply Chain Management of PT. COPI, the company is currently evaluating the "Supply Chain Management (SCM)" process, as an effort to carry out "Continuous Improvement", where various attempts have been made, one of which is improvement through the "Supply Chain Optimization (SCO)" approach by continuing to make efficiency in the Supply Chain process with the aim of cutting costs through the result of efficiency. One of the processes being evaluated is the “Demand Management Process”, where this process is very important in optimizing and synchronizing supply in order to create a competitive supply chain advantage and utilize key performance indicators (KPI) – demand forecast accuracy level to identify early identification of disruptions on the supply chain.

Currently, Supply Chain Management division is conducting thorough evaluation on how to improve demand management performance, through increasing demand forecast accuracy level, as an effort to decrease inefficiency which would increase the cost of the supply chain process. Inaccurate demand forecasts would likely cause a mismatch between supply allocation and actual on-field demand, which could potentially raise several cost elements, such as Inventory Costs and Warehouse Costs.

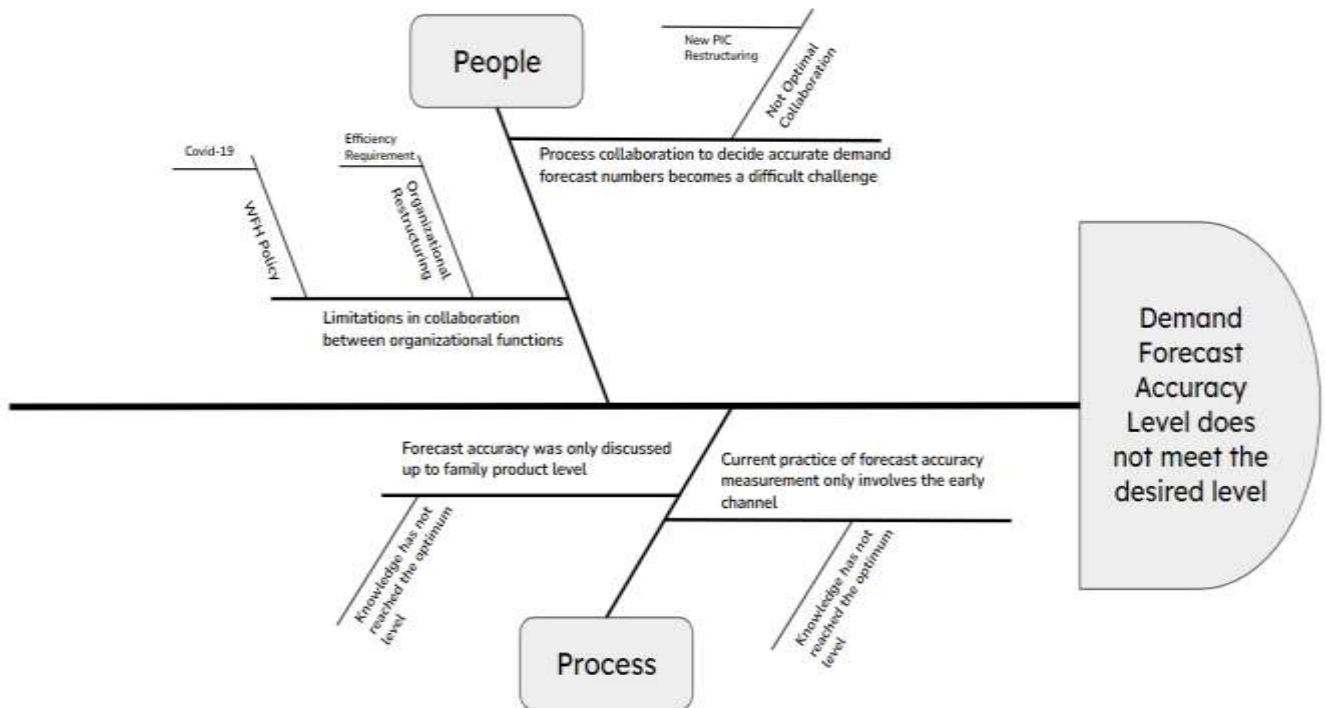


Figure 1. Fishbone Diagram of Root Cause Analysis

Supply Chain Management of PT. COPI believes that by improving demand forecast accuracy to a higher level, and close to the global best practice level, it would positively affect their operations such as lower costs, reduced capital, more efficient operational process, increase their competitive advantage and ensure the company’s sustainability in the competition.

In this research, the process of improving the Demand Management process will be conducted using a Knowledge Management approach. Knowledge is deemed to be a critical resource that provides sustainable competitive advantage in a competitive economy. Knowledge refers to what individuals or teams of employees know or know how to do as well as a company’s rules, processes, tools and routines (Krishnaveni, 2008). Knowledge combines data and information to allow decision makers to initiate actions based on that information. The importance of knowledge has become more important in the current business era as it's transforming into a knowledge and information era (Sedkaoui, 2019).



Knowledge Management (KM) is the process of identifying, capturing, organizing, and sharing knowledge within an organization with the goal of enhancing efficiency, innovation, and competitiveness. In practice, knowledge management is a conscious effort to gain from the knowledge that lies within an organization by using it to achieve the organization's mission (McInerney, 2002). KM enables organization executives to make accurate judgments and proceed in a coherent manner as well as improving organizational performance and its competitive advantage. Therefore, as part of the Supply Chain Management division's continuous improvement as well as the scorecard target that needs to be improved, the process of improving demand management performance is addressed through Knowledge Management approach.

Although, the mentioned process is typically solved from operations perspective, the use and improvement of KM practice would benefit the company in multiple areas in the long term, as improving KM results a more organized teams and employee management, which would increase employee's skillset and better chemistry between departments and thus, the organization continually improves their abilities, such as the problem solving. The Knowledge Management approach will also help companies to maintain the knowledge that has been formed to all existing employees, preventing knowledge loss and continuing to be shared with new employees. This will make it easier for the company to continue to achieve its strategic goals and maintain its competitive advantage in the industry.

LITERATURE REVIEW

The theoretical concept of Data, Information, Knowledge and Wisdom are often regarded as an interchangeable term. However, looking from Knowledge Management's perspective, those 4 elements are related to each other with a different meaning. According to (Ackoff, 1989), the differences between them are elaborated as follows:

Table 1. Differences between Data, Information, Knowledge, and Wisdom (Ackoff, 1989)

Elements	Description
Data	Data are defined as symbols that represent properties of objects, events and their environment. They are the products of observation. But are of no use until they are in a usable (i.e. relevant) form. The difference between data and information is functional, not structural.
Information	Information is contained in descriptions, answers to questions that begin with such words as who, what, when and how many. Information systems generate, store, retrieve and process data. Information is inferred from data.
Knowledge	Knowledge is know-how, and is what makes possible the transformation of information into instructions. Knowledge can be obtained either by transmission from another who has it, by instruction, or by extracting it from experience.
Wisdom	Wisdom is the ability to increase effectiveness. Wisdom adds value, which requires the mental function that we call judgment. The ethical and aesthetic values that this implies are inherent to the actor and are unique and personal.

The DIKW framework emphasizes the importance of each stage as it is useful to understand how data, information, knowledge, and wisdom are interconnected and how they can be used to inform decision-making and drive innovation, as without data, there can be no information, without information there can be no knowledge, and without knowledge, there can be no wisdom. Knowledge, located on the third level of the DIKW framework, refers to what individuals or teams of employees know or know how to do as well as a company's rules, processes, tools and routines (Krishnaveni, 2008). Knowledge combines data and information to allow decision makers to initiate actions based on that information. It is "justified beliefs about relationships among concepts relevant to that particular area (Becerra-Fernandez and Sabherwal, 2014).



Tacit knowledge and explicit knowledge are two types of knowledge that can be distinguished by how they are stored, shared, and transferred. Tacit knowledge refers to a knowledge that is difficult for others to articulate or exchange and is often personal and experiential, derived from personal experience, intuition, and insight. Tacit knowledge tends to be difficult to express in words or numbers, which makes it difficult to document. Tacit knowledge is commonly acquired on the job or in a specific situation and is often said to be a competitive advantage within companies due to the difficulties it possesses to be imitated and copied, thus making it more difficult to store and transfer (Ambrosini and Bowman, 2008).

Explicit knowledge refers to the knowledge which can be expressed in words and numbers and can be easily communicated and exchanged in the form of hard data, scientific formula, codified procedures or universal principles (Nonaka, 1995). In addition, Explicit knowledge could be codified in corporate procedures, policies, manuals, computer programs as well as dialogue scripts for call center operators (Clarke and Cooper, 2000).

While tacit knowledge is more difficult to formalize and exchange, it is often regarded as having more value than explicit knowledge due to the nature of tacit knowledge which is fundamentally rooted within an individual's experience and expertise, making it difficult to replicate or replace. Explicit knowledge, on the other hand, is simpler to acquire and exchange, however, it might be regarded as less valuable than tacit knowledge, considering it is easily replicated or outdated by others.

Knowledge management is the pinnacle and implementation of methodologies and devices to translate data into practical information effectively, purposely for the company and individual (Randeree, 2006). Knowledge Management refers to the process of identifying, capturing, organizing, and sharing knowledge within an organization with the goal of enhancing efficiency, innovation, and competitiveness. It is argued that one of the most crucial elements for organizations to understand is that knowledge management is a collection of ideas and experiences, not a single set of skills or use of technologies, which then passed on by those who lived and understood it (Aronson and McCarthy, 2004).

In practice, knowledge management is a conscious effort to gain from the knowledge that lies within an organization by using it to achieve the organization's mission (McInerney, 2002). Thus, having knowledge about something, some process or method, can allow executives to make judgments and proceed in a manner that is just and coherent.

The changing trends and popularity of knowledge management in the business organization context still creates confusion on the concept of knowledge management itself within organizations practice. Furthermore, the increasing variety of knowledge management tools and techniques adds to the confusion for organizations that are trying to understand the true meaning of knowledge management. To address those confusion, a framework needs to be established to define the components in knowledge management as a guidance in understanding and implementing knowledge management in organizations.

This research utilizes Asian Productivity Organization (APO) Knowledge Management Framework to elaborate the elements of knowledge management. The framework describes knowledge management as an integrated approach for creating, sharing, and applying knowledge to enhance organizational productivity, profitability, and growth (Asian Productivity Organization, 2020). The framework classifies knowledge management into four major categories: vision and mission, accelerators, knowledge process, and outcomes.

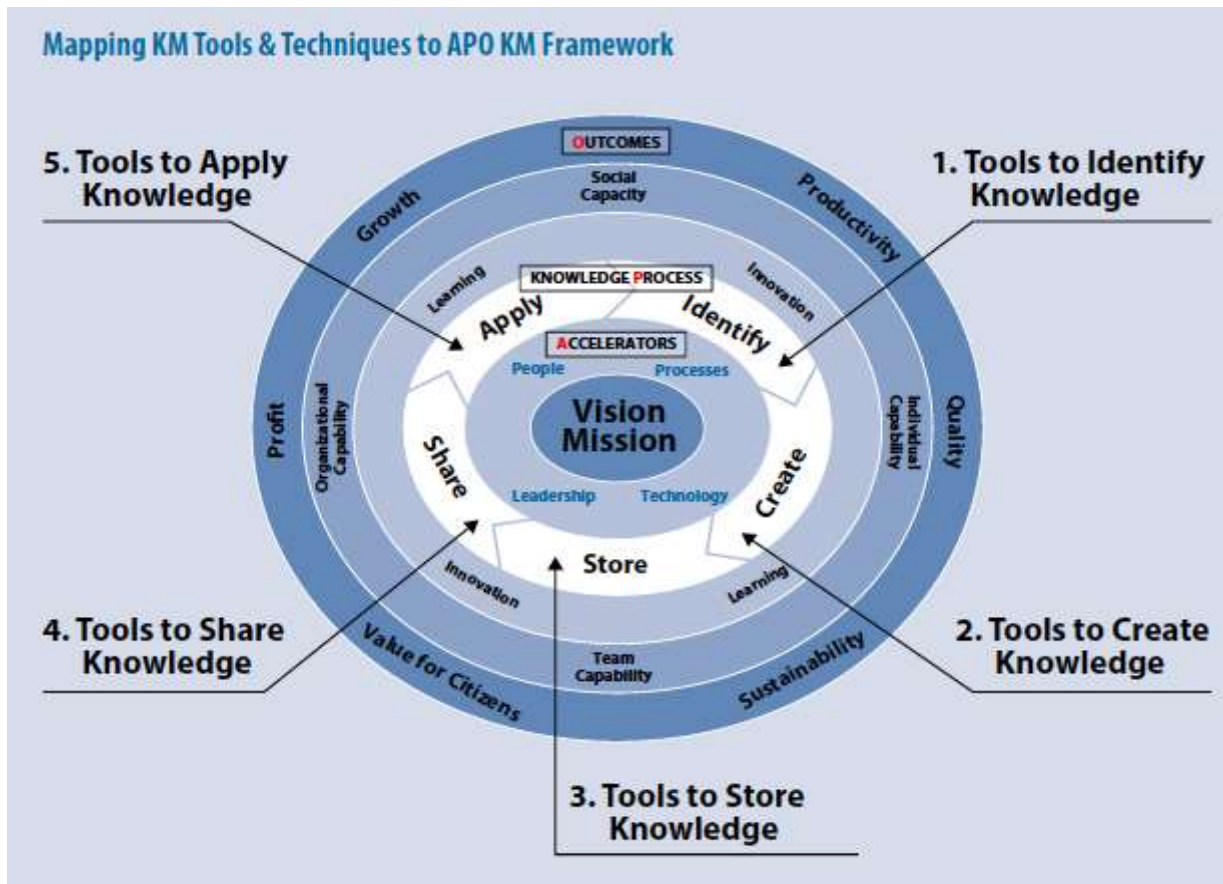


Figure 2. The APO Knowledge Management Framework (Asian Productivity Organization, 2020)

The framework begins with addressing the vision and mission, business goals, and strategic directions of the organization. Knowledge management is designed to achieve organization goals and objectives, thus knowledge management initiatives must be aligned with the vision and mission of the organization. Moreover, it helps to provide better understanding of organizational core competencies and capabilities, providing clues and hints on the areas that need to be developed.

The practice of knowledge management involves several process cycles, where most of the KM frameworks agree on a five-step knowledge process, consisting of: Identification, Creation, Storing, Sharing, and Application. (Asian Productivity Organization, 2020). The KM process starts with knowledge identification where it identifies and creates new critical knowledge as the organization’s core competence which are then shared within the organization as well as identify knowledge gaps in the organization. The process is performed through research and development, experimentation, or collaboration.

Knowledge creation refers to the continuous process of individuals and groups within a firm and between firms sharing tacit and explicit knowledge (Bohn, 1994). The process involves collecting and storing knowledge in a way that makes it easy to access and share by addressing knowledge gaps through knowledge conversion and generation of new knowledge.

Knowledge storing refers to the collection and preservation of organizational Knowledge, allowing the knowledge to be easily accessed, acquired and utilized when needed. The process of knowledge storing might include capturing, organizing, structuring, and storing information in various forms such as text, images, audio or video recordings, databases, and other digital formats. This process stores the knowledge internally, in the forms of individual’s skills and organizational culture and externally, through utilization of policies, procedures, manual, and repositories which can be accessed by all members of the organization (Franco & Mariano, 2007).

Knowledge sharing could be interpreted as the process of exchanging or dissemination of knowledge, information, or expertise between individuals, groups, or organizations. The process is performed by making knowledge available for employees who need



it and when they need it as well as creating knowledge sharing platforms, such as conversations, presentations, meetings, reports, articles, blogs, wikis, social media, and other communication channels. In addition, (Silva and Odelius, 2018) point out that knowledge sharing must be located at the center of the discussion which requires the understanding of knowledge management as an organizational action that provides the use of knowledge which supports organizational objectives.

The last step of the KM process is the knowledge application where it transforms the previously identified, created, stored and shared knowledge into concrete results and applies it to problem solving, knowledge strategy implementation, process improvement, and organizational performance outcomes achievement (Raudeliūnienė & Kordab, 2019).

KM outcomes act as the final form of the knowledge management framework after KM is implemented in the organization. Outcomes that are expected to be achieved is improvement in learning and innovation processes which leads to improved individuals, teams, organizational and societal capabilities. Thus, it is expected, with the improved capabilities being established in the organization, that organizations would achieve improvements in profitability, productivity, product and service quality, as well as sustained growth. (Asian Productivity Organization, 2020).

The conceptual framework is used to simplify the understanding of this research for the readers. The elaboration of the conceptual framework are as follows:

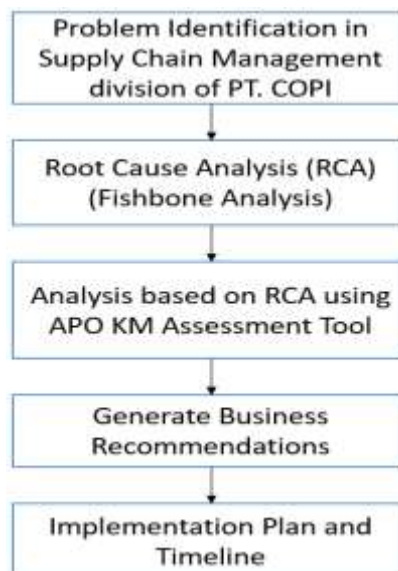


Figure 3. Conceptual Framework

The conceptual framework used in this research begins with problem identification occurring in the Supply Chain Management (SCM) department of PT. COPI, specifically in the Demand Management Process. The second step is to perform Root Cause Analysis (RCA), using fishbone analysis to further identify the main cause of the occurring issues, which is demand forecast accuracy level has not met the company's target. The third step is then followed up by conducting analysis based on the RCA result using Asian Productivity Organizations (APO) KM Assessment tool, where it assesses the current KM Maturity level in PT. COPI and identify Opportunity for Improvements (OFI) from 7 audit elements contained in the framework. The fourth step generates business recommendations based on the OFI to address the issues by improving the KM practices in the company. The last step is to arrange the implementation plan and timeline of the actions in previous step, discussed with the head of SCM to ensure the feasibility of the plan.

METHODS

Data Collection

This research obtains the main source of data from primary data which is obtained using an interview method with the head of Supply Chain Management of PT. COPI, using APO KM assessment tool as the baseline for the interviewer's questions. The interview extracts data and findings from a single respondent, which is the head of Supply Chain Management of PT. COPI, as the



mentioned respondent has deeper knowledge and comprehensive insights and provides sufficient information which represents the related respondents from other departments within the umbrella of Supply Chain Management.

Interview

The interview method is utilized to collect qualitative data regarding the occurring business issues as well as KM maturity level in the scope of Supply Chain Management department. The interview is performed with the head of SCM of PT. COPI as the respondent. The interview uses the APO KM assessment tool as the baseline to obtain a descriptive explanation of the current KM practice in the company. The APO KM assessment tool comprises seven APO audit elements namely: Leadership, Process, People Technology, Knowledge Processes, Learning and Innovation, and KM Outcomes (Asian Productivity Organization, 2020).

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Data Analysis

The APO KM assessment tool is utilized to provide highlights and analysis of the company’s strength and Opportunity for Improvement (OFI) areas and it is identified from each audit element. The strength describes the strong points that the company has already acquired and implemented, whereas OFI identifies areas of improvement that could be performed to address the identified gap. Furthermore, ratings which will be used to analyze the interview results.

The Ratings will be using a 5 point likert scale to rate each question within each audit element based on the descriptive information extracted from the interview, where 1 point indicates that the situation does not reflect the practices in the company at all and 5 points indicates that the situation accurately reflects the practices in the company.

Upon determining the scores for each question, the scores are then totaled and each audit element’s scores are also totaled. Furthermore, the accumulated total score for all audit elements are adjusted with the APO KM Maturity model to determine the company’s current KM Maturity state. APO classifies KM maturity into five levels in the framework, ranging from the reaction level as the least mature level and up to maturity level which acts as the highest level of maturity (Asian Productivity Organization, 2020).

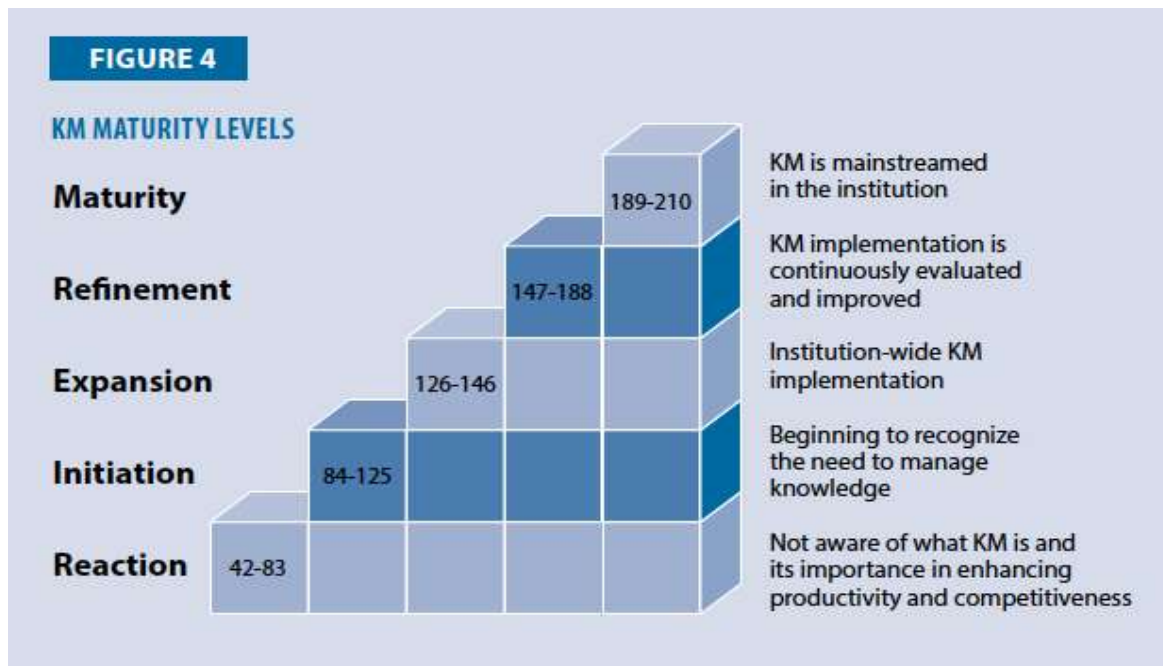


Figure 4. KM Maturity Level (Asian Productivity Organization, 2020)



Upon determining the company’s current KM Maturity state, the strong points and OFI from each audit element are identified and analyzed according to the score of each audit element. Furthermore, identified business issues and OFI will be addressed accordingly by proposing a business solution and recommendation, using KM approach and practical methods in determining the solution.

DISCUSSION

KM Maturity level is determined through the result of APO KM assessment tool, in which the score is captured, analyzed, and determined from the interview. The interview result consists of seven audit categories, based on the APO KM assessment tool category which acts as the baseline for the interview questions. The discussion presents the findings obtained from the interview and each audit element is scored based on the descriptive analysis. The accumulated total score for all audit elements are then adjusted with the APO KM Maturity model to determine PT. COPI’s current KM Maturity state.

In order to determine KM Maturity level at Supply Chain Management division of PT. COPI, the accumulation of each audit element score is 188, which falls in the refinement category.

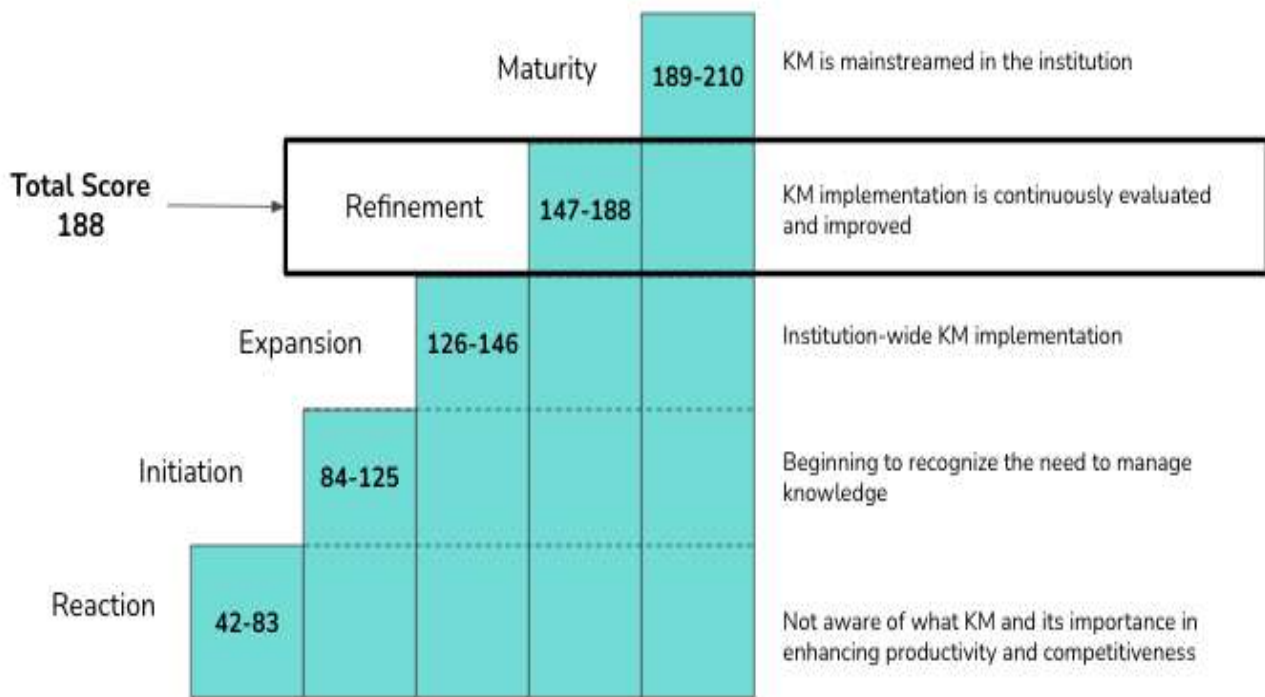


Figure 5. KM Maturity Level of PT. COPI

The score represents the current maturity condition of the Supply Chain Management division, where KM implementation has been widely implemented and continuously evaluated and improved. Despite the KM maturity stage that has been performed, some areas of improvement could be performed at several elements that need to be addressed and improved, as identified in each audit element’s OFI, which would help to increase the KM maturity level and support the Supply Chain Optimization process.

Based on the findings and elaboration of each audit element on the previous sub-chapter, the OFI from all audit elements are accumulated and proposed for improvement. The first OFI comes from the leadership element where currently, the Supply Chain Management division does not have a specific unit assigned to handle knowledge/information management. Forming a KM Task Force team that focuses on implementation KM concept and practice would provide a long term benefit for the division, as the team could assess and utilize the existing KM system to its best potential and continuously refine the system. Furthermore, the team could make specific adjustments between departments and regionals where different operating and application styles might occur. Therefore, forming a KM Task Force team for the Supply Chain Management division is deemed to be beneficial to support the Supply Chain Optimization process.



The second OFI comes from the people element, where reinforcement of the mentoring and coaching program is needed. The mentoring and coaching process has already been implemented in the system, however, the implementation and routine agenda of the program is not performed regularly and in addition with the recent organization restructuring and COVID-19 pandemic, effective communication between employees and departments is difficult to achieve and this results in lower performance as reflected by one of the Demand Management scorecard parameter, demand forecast accuracy level. Moreover, the depth of the program's effectiveness and regularity has not been measured. Therefore, it would be better if the implementation of this program is reinforced and becomes a regular agenda for employees and managers from departments to perform mentoring and coaching process as this process highly benefits the company to develop its employees effectively, by acquiring lots of insights, knowledge, techniques and wisdom that is passed from its seniors to junior associates. In addition, it is important to measure the effectiveness and regularity of the program when it has become a regularity in order to provide an area of improvement and maintain the program's implementation.

The third OFI comes from the knowledge process element, where reinforcement of the best practices sharing and lessons learned across the organization and benchmarking activities is needed. The current implementation of this process is not routinely performed throughout departments after organization restructuring where new employees have not fully adapted with how the process works and newly formed teams and organizations still lack harmonious chemistry and effective working performance. Therefore, reinforcing these practices and benchmarking in the division and with other regional and international branches would benefit the organization with insights which could be used to improve organizational performance and adopt new knowledge. Moreover, routine implementation of best practice sharing greatly benefits the company when performed regularly to prevent constant reinventing of the wheel and work duplication, which adds additional costs and resources and less efficient operation.

The fourth OFI comes from the people and learning and innovation elements, where cross-functional teams could be reinforced and performed more often. Cross-functional teams in the Supply Chain Management division have been organized to tackle problems/concerns across different units in the company. However, the implementation of these teams has not been performed regularly, which is also aligned with the fourth OFI where best practice sharing also applies in these cross-functional teams and not often conducted. The reinforcement and effective operation of the cross-functional teams guarantees the division with highly effective teams to address different levels and complexity of issues that requires multiple department involvement and in addition, sharing practices and continuous learning across teams and employees is performed more often, along with the regular implementation of this process.

The continuous improvement effort and KM improvement through the identified OFI could be performed to result in better KM implementation throughout all employees, teams, and departments. The increased KM implementation results in better employees and team skills, effectiveness and efficiency in tackling complex problems and being able to put higher performance, encourages others to conduct best practices and sharing knowledge, and in turn, leads to a more efficient organization.

Implementation Plan

Based on the analysis result and proposed business recommendation in the previous sub-chapter, the implementation plan begins with broadcasting the current KM maturity level to the employees within the Supply Chain Management division, based on the conducted KM assessment. The result could be used by management to formulate the relevant KM strategy and policy to improve the current KM processes.

CONCLUSION

Based on the results and discussion of this research, it is found that the current KM implementation of the Supply Chain Management division has been widely implemented and continuously evaluated and improved. However, some areas of improvement could be performed in several elements that need to be addressed and improved, in order to improve the KM maturity level, supporting the Supply Chain Optimization process and the company's effort of continuous improvement. The 4 identified opportunity for improvement (OFI) and proposed recommendations consist of:



Table 2. Relations between OFI and Proposed Recommendations

Opportunity for Improvement	Proposed Recommendations
Currently, the Supply Chain Management division does not have a specific unit assigned to handle knowledge/information management.	Form a KM task force team which focuses on implementation KM concept and practice in the division.
Reinforcement of the mentoring and coaching program is needed.	Reinforcing the implementation of the formal mentoring and coaching program, so that it becomes a regular agenda for employees and managers from departments to perform mentoring and coaching process. Furthermore, measurement of the effectiveness and regularity of the program is needed as well.
Reinforcement of the best practices sharing and lessons learned across the organization and benchmarking activities is needed.	Reinforcing the implementation of best practice sharing and benchmarking inside and outside the company, with other regional and international branches
Cross-functional teams could be reinforced and performed more often.	Reinforce the implementation of cross functional team and enforce it to be a regular agenda. In addition, sharing best practices and continuous learning across teams and employees could be performed more often.

LIMITATION

The scope of this research is limited to the Supply Chain Management process under the Supply Chain Management Division of PT. COPI, specifically Demand Management Process, as part of the Supply Chain Optimization process. Furthermore, the data collection that is being used in this research is limited to qualitative methods, conducted with an interview with the head of Supply Chain Management of PT. COPI. Therefore, the result of this research might not be suitable for other divisions in the company or external parties to refer to. In addition, suggestions and recommendations for further research improvements are welcomed.

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