

Managing Knowledge Transfer in the Drilling and Completion Division at the End of Oilfield Concession (Case Study PT Riau Oil)

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Abstract - Study related to the transition between oilfield operators after concession expiration has shown significant cases where the production declined after the transition and it may happen during Andalas block transition from PT Riau Oil to PT Indo Oil. Some of the causal factors are closely related to the failure of knowledge transfer. There are very limited studies on how to implement knowledge transfer methods during oilfield operator transition, especially in the Drilling and Completion (D&C) department. The D&C knowledge bases, transfer strategy, and implementation plan shall be developed to overcome the problem. The qualitative method is used for this research which is more suitable to describe the knowledge transfer process. The data was taken from the author's own experience, group discussion, and observation. As the result, the crucial D&C knowledge bases have been listed, the specific D&C knowledge transfer strategy and implementation plan for PT Riau Oil side have been constructed from the existing knowledge transfer model. This research can be used as an example and a possible solution to execute specific knowledge transfer during oilfield operator transition.

Keywords - Company Transition, Drilling and Completion, End of Concession, Knowledge Transfer

I. INTRODUCTION

Oil and gas energies are still the major energy sources that are used in many countries, including Indonesia. Generally, oil and gas fields are divided into concessions which are commonly offered to oil and companies through sharing agreements or contracts between the government or regulator and the company. The concession contract of an oilfield block is typically valid for a certain time which depends on its specific agreement. In Indonesia, oil and gas fields are divided into concession blocks which are commonly offered to oil and gas companies through Production Sharing Contract (PSC) scheme.

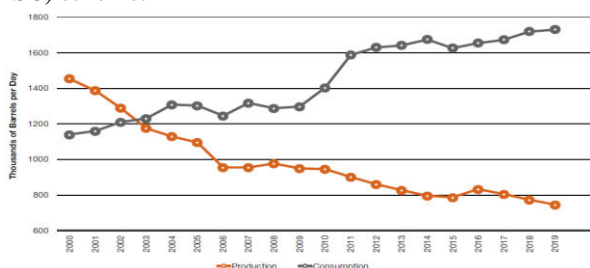


Fig. 1. Indonesian Oil Consumption and Production Gap (Source: *Oil and Gas in Indonesia: Investment and Taxation Guide*, 2019)

The Indonesian oil and gas industry has undergone a rise and fall since its early existence in the country. Indonesian crude oil production has declined during the 2009-2019 period, from 994 million barrels per day in 2009 to 745 million barrels per day in 2019. The decline of oil production is contradictory with the demand that is continuously higher every year. Fig. 1 shows that the gap between Indonesian oil consumption and oil production that tends to increase every year [1].

When a concession contract reaches its expiration date, the right to operate the concession block will be given to the new operator. There will be operator transition during this handover period. Operator transition may adversely affect the upstream performance, especially the oilfield block production if it is not managed properly. Reference [2] shows a study related to operator transition in Norway and United Kingdom on 50 assets shows in which there were around 60 percent cases that had production declined after the transition. This problem is caused by several factors such as major changes in procedure, loss of critical capability, cultural changes, and other causes. Some of those causal factors are directly related to the failure of knowledge transfer. This knowledge transfer issue may happen on many oil and gas companies, including PT Riau Oil during Andalas block transition to PT Indo Oil. This issue may take place in every division in PT Riau Oil, including the Drilling and Completion (D&C) Division. Hence, it can be concluded that at the end of oilfield concession, company transition is crucial to be managed carefully, including the knowledge transfer aspect which is an essential part of the transition.

To ensure the D&C knowledge transfer from PT Riau Oil to PT Indo Oil can be performed effectively, the crucial D&C knowledge bases shall be identified to ensure all essential knowledge for developing competitive advantage can be transferred. The most critical factor which becomes the main research question is about the knowledge transfer strategy that should be organized by the D&C Division of PT Riau Oil during the transition. After generating the knowledge transfer strategy, an implementation plan needs to be created as a guideline for the company during the execution.

II. LITERATURE REVIEW

Knowledge is a blend of outlined insight, values, pertinent data, and intuition of professionals that gives a structure for assessing and consolidating new information and experiences [3]. Based on its creation process, knowledge can be classified into two general categories; tacit knowledge and explicit knowledge. Knowledge can be created or converted through the tacit and explicit transformation that is commonly called as SECI model. The SECI model consists of four knowledge conversion mechanisms: Socialization, Externalization, Combination, and Internalization [4].

Knowledge transfer is a knowledge management section that has an interest in the knowledge flow between boundaries that have been created by knowledge territory [5]. The knowledge transfer process, in general, can be classified into two types which are intra-organization knowledge transfer and inter-organization knowledge transfer. Intra-organization knowledge transfer covers the knowledge transfer process that takes place within a company or an organization which usually happens between the individual in that company or organization. Whereas inter-organization knowledge transfer is a knowledge transfer process that occurs among two or more companies or organizations [6].

Knowledge transfer that is performed between groups/divisions in a company is crucial to support the company in achieving the top performance. Moreover, the competitive advantage of a company greatly depends on the capability of the company as an organization in creating and transferring knowledge [7].

The mechanism of knowledge transfer can be described through a model that is commonly called the knowledge transfer model or framework. Researchers have developed various knowledge transfer models/frameworks to define the appropriate knowledge transfer process. The knowledge transfer model/framework consists of several processes which may vary between model/framework. Knowledge transfer model/framework involves some processes/steps that take place during the transfer process. Reference [8] has proposed the knowledge transfer model that consists of the acquisition, communication, application, acceptance, and assimilation processes. Reference [9] also introduced a knowledge transfer model with different steps: initiation, implementation, ramp-up, and integration. Another study has introduced a knowledge transfer model which consists of 6 main processes: awareness, acquisition, transformation, association, application, and knowledge externalization or feedback [10]. Those literature and many others have similarities, but there is no clear guidance on what model/framework is the best to be used in a specific knowledge transfer. The literature also only addresses the general knowledge processes and does not show the actual implementation method of the knowledge transfer in various cases. This research will provide a real example of picking up a knowledge transfer framework and develop the implementation method and strategy for a specific condition and circumstance.

Reference [11] provided quite a detailed analysis related to the implementation of experience/knowledge transfer in the oilfield business but did not elaborate on the inter-organization knowledge transfer process. Reference [12] has explained the example of inter-organization knowledge transfer during the acquisition of a competitor manufacturing company, identified and analyzed the problem that took place. The analysis result may not be able to be implemented directly in other cases because every knowledge transfer case may have a different problem due to different circumstances and specific issues. So, this research would like to contribute the other perspective and implementation method on how to manage the knowledge transfer process and its associated problem in a specific inter-organization knowledge transfer case during PSC oilfield operator transition.

III. METHODOLOGY

This research is conducted through processes represented in Fig. 2.

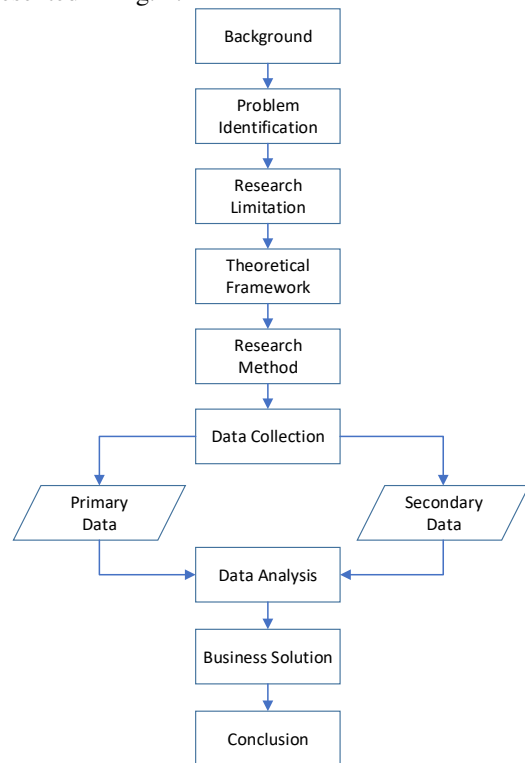


Fig. 2. Research Process (Source: Author, 2021)

This research is started by identifying the problem of knowledge transfer process during operator transition in Andalas block from PT Riau Oil and PT Indo Oil based on given background and then establishing limitations. In this research, the author used the qualitative research method due to the following reasons:

- 1) Qualitative method is more suitable to be used to answer research questions that require a qualitative method to explain the plan/process.

2) Qualitative method can explain in more detail the process (process-oriented) instead of the quantitative method, including the knowledge transfer process which is the main issue discussed in this research. Data is gathered from primary data and secondary data. The primary data come from the author's own experience and observation during working in the D&C Division of PT Riau Oil. The primary data is also taken from Focus Group Discussion (FGD) within the transition team and observation on D&C engineer's activities. The FGD is held by the transition team which is responsible to manage the D&C transition plan. The secondary data are taken from various company archives such as internal websites, internal documents, etc. The data is analyzed to provide a business solution.

III. RESULTS

The drilling and completion field consists of various knowledge bases as shown in Fig. 3. These crucial knowledge bases basically consist of technical and non-technical knowledge. This knowledge is typically managed in D&C Division using three knowledge management pillars concept which consists of people, process, and technology.



Fig. 3. D&C Knowledge Bases (Source: Author, 2021)

In this research, the author adopted the knowledge transfer model/framework that is used by Liyanage, Ballal, Elhag, and Li as a basis of the framework with some adjustment and modification by using other concepts [10]. This model is easy to be understood and can capture the essential processes of knowledge transfer.

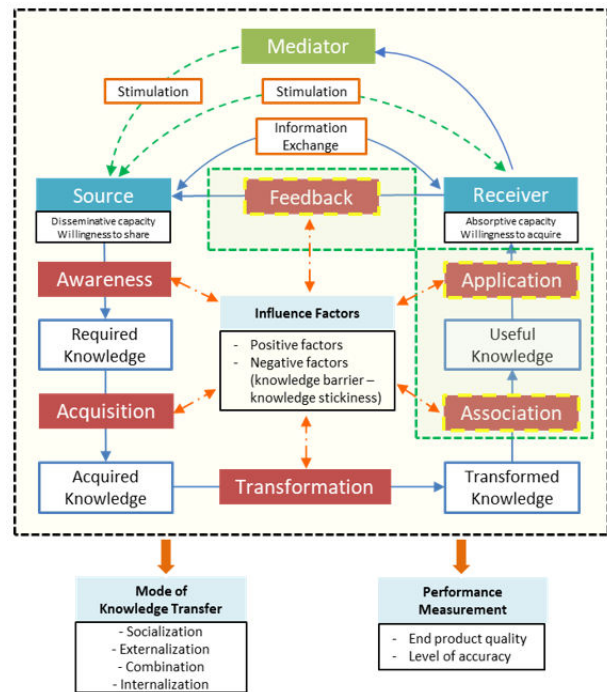


Fig. 4. Proposed Knowledge Transfer Framework (Source: Adapted from Liyanage et.al., 2009)

The modification is applied based on specific needs in knowledge transfer during the company transition from PT Riau Oil to PT Indo Oil. The modified model/framework can be seen in Fig. 4.

This research limits the analysis to the first three steps which belong to the pre-transfer activity that is carried out by PT Riau Oil. The last three steps are the post-transfer activity that is managed by PT Indo Oil.

1) Awareness. It is a process to identify the important knowledge that needs to be transferred. Knowledge awareness is very critical to ensure all required knowledge in the company can be transferred and then used by the knowledge receiver.

2) Acquisition. In Liyanage's model, the acquisition is a process to acquire or gain knowledge from knowledge sender to knowledge receiver. In this framework, based on the knowledge transfer context of the company transition in Andalas block, the awareness process focuses on acquiring knowledge from the knowledge sender/source but it is not directly transferred to the knowledge receiver. The knowledge is collected as the acquired knowledge by a transition team to be transferred later on during the process.

3) Transformation. It is a process to convert the knowledge to make it suitable for knowledge receivers to be implemented, to enrich existing knowledge, or to be used for creating new knowledge. In this framework, the transformation process has a similar meaning to Liyanage's model but in this framework, it is specifically performed by the knowledge sender/transition team who has collected the acquired knowledge. This is the last process on the knowledge sender side, before transferring the knowledge to PT Indo Oil as the final knowledge receiver.

A. Awareness

Awareness is a very critical process because all knowledge transfer processes will rely on the input of the process, which is the knowledge source itself. Failure to properly identify the required knowledge will lead to knowledge loss that causes some knowledge can't be transferred to the knowledge receiver, no matter how good the remaining transfer process is. Fig. 5 shows the proposed awareness process for D&C knowledge transfer.

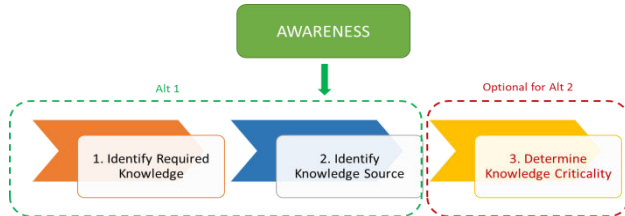


Fig. 5. Awareness Process Step (Source: Author, 2021)

Alternative 2 is preferable to be executed for D&C knowledge transfer because the criticality assessment will provide knowledge transfer prioritization that is crucial for a knowledge transfer activity with limited human resources (no fully dedicated team) and also considering the relatively short available timeframe.

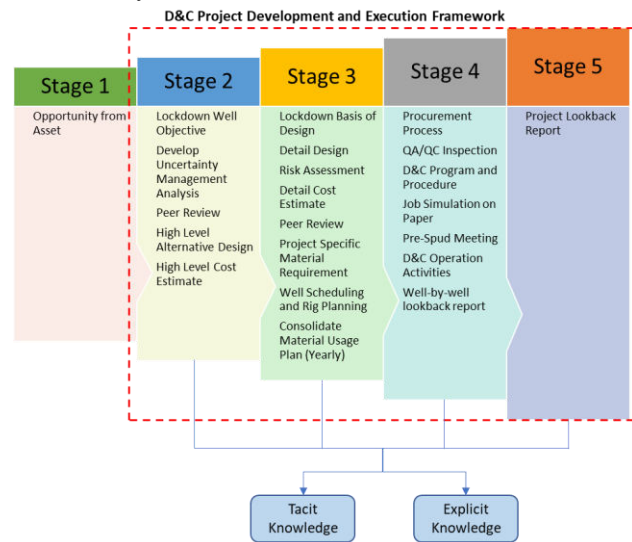


Fig. 6. Required Knowledge Identification from D&C Project Development and Execution Framework (Source: PT Riau Oil Internal Document, 2020)

Fig. 6 shows the D&C Project Development and Execution Framework that can be used as a tool for knowledge identification since it directly connects the project to the required knowledge during the process, either explicit or tacit knowledge.

D&C explicit knowledge can be identified using the above method by the D&C transition team. After that, the source and the criticality can be defined for each knowledge using the template that is shown in Table 1, utilizing D&C Project Development and Execution Framework as the basis for analysis.

TABLE 1
 D&C EXPLICIT KNOWLEDGE SOURCE AND CRITICALITY ASSESSMENT
 (SOURCE: AUTHOR, 2021)

Stage	Type	Item	Source	Criticality
Stage 1	D&C technical & process standard/ SOP, guideline, and reference	Item 1	Source 1	Critical or Not Critical
Stage 2		Item 2	Source 2	
Stage 3				
Stage 4	D&C supporting knowledge and tools	Item 3	Source 3	Critical or Not Critical
Stage 5		Item 4	Source 4	

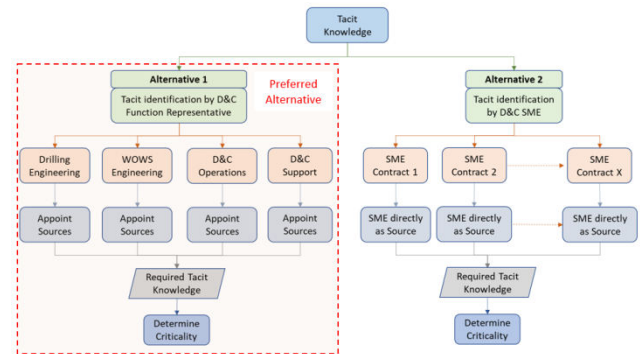


Fig. 7. Tacit Knowledge Source and Criticality Identification (Source: Author, 2021)

D&C tacit knowledge is more difficult to be identified because it is not available in written form. So that, alternative solutions have been developed to solve the issue as shown in Fig. 7. From both alternatives, Alternative 1 is a preferable method because with the tight knowledge transfer timeline, using a group of people from each D&C function will save more time for the process. Using Alternative 2 also may provide the risk of missing more knowledge if the appointed Subject Matter Expert (SME) in actual doesn't completely master the subject.

B. Acquisition

In the D&C knowledge acquisition process, the main activity is to acquire the knowledge from the knowledge source that has been identified in the Awareness process, for both explicit and tacit knowledge. Fig. 8 shows the proposed D&C knowledge acquisition process. D&C explicit knowledge acquisition can be performed directly by locating and listing the exact address of knowledge sources and retrieving from them. For D&C tacit knowledge, the first thing to do is to develop a template for knowledge externalization. After that, the process can be continued by externalizing each required tacit knowledge directly from the source.

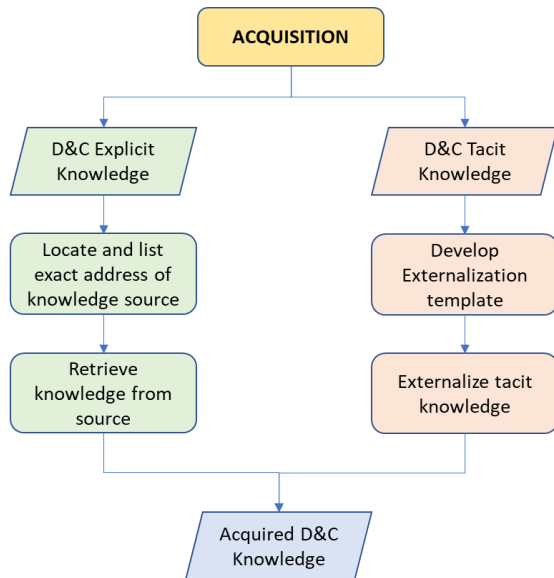


Fig. 8. D&C Knowledge Acquisition Process (Source: Author, 2021)

C. Transformation

D&C knowledge transformation is a process of converting or transforming the acquired D&C knowledge into a new form which is called the D&C transformed knowledge with the following purposes:

- 1) Transform the knowledge to be more suitable, understandable, and useful for the knowledge receiver.
 - 2) Transform the knowledge to meet the requirement of proprietary right governance.
- To achieve both purposes, a strategy has been developed for D&C knowledge transformation as shown in Fig. 9.

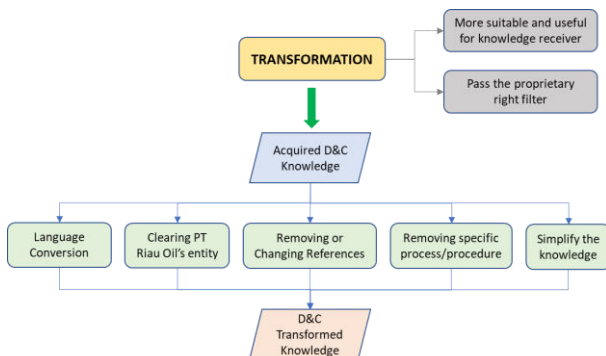


Fig. 9. D&C Knowledge Transformation Process (Source: Author, 2021)

D. Factors Affecting the Knowledge Transfer Process

Knowledge transfer may be affected by various factors. Some of those factors are positive factors that support the knowledge transfer process and others are negative factors that adversely affect the knowledge transfer. Identification of knowledge barrier/knowledge constraint/knowledge stickiness as the negative factor will provide a great influence on how knowledge transfer will succeed [10].

There are various knowledge transfer barriers that have been introduced by researchers. The authors have analyzed barriers that may exist during D&C

knowledge transfer from PT Riau Oil to Indo Oil. The main barriers that may exist are lack of communication and relationship, lack of motivation or willingness to share, lack of motivation or willingness to share from the company [9]. The potential solutions for these barriers have been developed to mitigate this problem. Various efforts may be performed to overcome the issue, such as increasing the communication and information exchange involving more working-level employees, provide stimulation for the company and employees, using D&C project development framework for knowledge identification, and also picking the correct knowledge source when doing the acquisition.

E. Performance Measurement

Performance measurement is recommended to be established for the knowledge transfer to ensure the effectiveness of the process. The performance measurement that is proposed is related to end-product quality and level of accuracy [10]. For the D&C knowledge transfer, performance measurement can be developed by doing some actions as shown in Fig. 10.

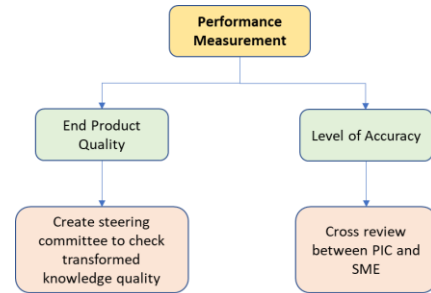


Fig. 10. D&C Knowledge Transfer Performance Measurement (Source: Author, 2021)

IV. IMPLEMENTATION PLAN

Fig. 11 shows the implementation plan of the knowledge transfer process solution that can be performed by the D&C Division of PT Riau Oil during the Andalas block's transition to the new operator (PT Indo Oil). This implementation plan is constructed based on the proposed knowledge transfer framework that has been developed can be used as general guidance throughout the process.

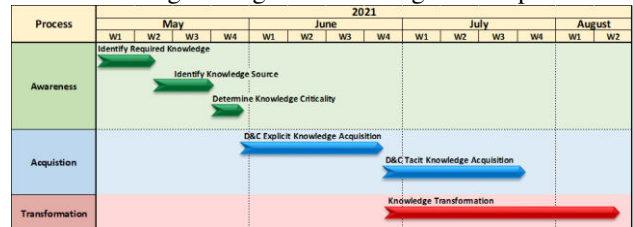


Fig. 11. D&C Knowledge Transfer Implementation Plan (Source: Author, 2021)

V. CONCLUSION

The crucial D&C knowledge bases which is the first research question of this research have been listed to help to ensure every important knowledge can be transferred to

the new oilfield operator. It consists of technical and non-technical knowledge. The second research question is about how to organized D&C knowledge transfer from PT Riau Oil to Indo Oil. It has been elaborated through the development of the D&C knowledge transfer strategy by utilizing and combining existing knowledge transfer frameworks and theories that have been developed by researchers and creating a specific strategy for the execution. The framework that is proposed for D&C knowledge transfer consists of six major steps: awareness, acquisition, transformation, association, application, and feedback. This research has developed a detailed strategy for the first three major steps which are categorized as pre-transfer activity and directly managed by PT Riau Oil. The last three steps shall be handled by PT Indo Oil as the final knowledge receiver. The detailed strategy for each step has been developed according to specific circumstances and conditions in D&C Division. Implementation plan as the last research question has been developed as the general guidance for D&C Division to execute the proposed knowledge transfer framework.

As for the implication, this specific D&C knowledge transfer strategy has been constructed as a possible solution to suit the actual condition and circumstances for the Andalas block operator transition from PT Riau Oil to PT Indo Oil, especially for D&C Division. This strategy could be used in similar cases in other operator transitions but the identification and analysis of the specific circumstance have to be performed carefully since every case may have its specific barrier that does not allow some knowledge transfer strategies to be implemented. Further research might be needed as a comparison for a similar case to improve the general knowledge transfer strategy between the operator of an oilfield concession. This strategy also needs commitment from the operator's employee and management, and also a mediator for a successful implementation.

The author expects that this research can give a contribution by providing a real example of how to pick up a knowledge transfer framework and develop the specific knowledge transfer strategy that is not explained in some literature. This research may contribute by providing other perspectives and implementation methods on how to manage the knowledge transfer process and its associated problem in a specific inter-organization knowledge transfer case during PSC oilfield operator transition.

REFERENCES

- [1] PricewaterhouseCoopers Indonesia, "Oil and Gas in Indonesia: Investment and Taxation Guide," Jakarta: PwC, 2020.
- [2] P. Graham, M. Mahringer, and A. Thain, "Ten Principles for Successful Oil and Gas Operator Transitions," London: McKinsey & Company, 2020.
- [3] T. H. Davenport and L. Prusak, "Working Knowledge: How Organizations Manage What They Know," Boston: Harvard Business School Press, 1998.
- [4] I. Nonaka, H. Takeuchi, "The Knowledge-Creating Company," Oxford: Oxford University Press, 1998.
- [5] P. R. Carlile and E. S. Rebentisch, "Into the Black Box: The Knowledge Transformation Cycle," *Journal of Management Science*, vol. 49, no. 3, pp. 1180-1195, 2003.
- [6] H. Yahya, M. N. Ahmad, R. Mohamad, and M. Z. H. Rodzi, "Essential Knowledge Transfer Process Model to Support Disaster Management," *Journal of Theoretical and Applied Information Technology*, vol. 87, no. 3, pp. 404-414, 2016.
- [7] L. Argote and P. Ingram, "Knowledge Transfer: A Basis for Competitive Advantage in Firms," *Organizational Behavior and Human Decision Processes Journal*, vol. 82, no. 1, pp. 150-169, 2000.
- [8] M. Gilbert and M. Cordey-Hayes, "Understanding the Process of Knowledge Transfer to Achieve Successful Technological Innovation," *Technovation Journal*, vol. 16, no. 6, pp. 301-312, 1996.
- [9] G. Szulanski, "The Process of Knowledge Transfer: A Diachronic Analysis of Stickiness," *Organizational Behavior and Human Decision Processes Journal*, vol. 82, no. 1, pp. 9-27, 2000.
- [10] C. Liyanage, T. Ballal, T. Elhag, & Q. Li, "Knowledge Communication and Translation – A Knowledge Transfer Model," *Journal of Knowledge Management*, vol. 13, no. 3, pp. 118-131, 2009.
- [11] K. Aase, "Experience Transfer in Norwegian Oil and Gas Industry," Trondheim: Norwegian University of Science and Technology, 1997.
- [12] J. Gruber and I. Paneva, "The Process of Knowledge Transfer in Mergers and Acquisitions," Linköping: Linköping University, 2014.