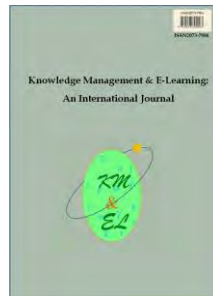# Effects of knowledge articulation and self-reflection on team performance

Vichita Vathanophas Ractham
Phocharapol Srisamran
Mahidol University, Thailand

Effects of knowledge articulation and self-reflection on team performance

Vichita Vathanophas Ractham*

College of Management
Mahidol University, Thailand
E-mail: vichita.rac@mahidol.ac.th

Phocharapol Srisamran

College of Management
Mahidol University, Thailand
E-mail: cmtopphoch@gmail.com

*Corresponding author

Abstract: The objective for this study is to investigate the impact of knowledge externalization on team performance by the study of knowledge articulation and self-reflection. Multiple regression is applied for analysis of the data collected from 401 participants. The findings designate the significant positive relation between knowledge articulation and team performance. On the other hand, self-reflection is found to have negative relation with team performance. The findings also designate interaction between individual knowledge articulation and self-reflection on team performance. An individual's knowledge articulation is found to be more effective on team performance when the individual has high self-reflection. However, the effectiveness of an individual's knowledge articulation on team performance is prone to be less when that individual has low self-reflection.

Keywords: Knowledge management; Knowledge creation; Knowledge externalization; Team performance; Self-reflection

Biographical notes: Dr.Vichita (Vathanophas) Ractham is currently an Associate Professor in the College of Management, Mahidol University, Thailand, where she teaches Knowledge Management, Management Information System, and Consulting Practice in the Master of Management, International Program. Earlier, she taught in School of Computing, Department of Information System, National University of Singapore (NUS), Singapore for couple of years in the same area. She received her BSc. (1992) in Business Administration (concentration: Statistics) from Chulalongkorn University, Thailand and MSc. (1995) and PhD. Degree (2000) in Information Sciences from University of Pittsburgh, USA. Her primary research interests include Knowledge management, Social interaction in teamwork, Enterprise Resource Planning, and e-Learning.

Phocharapol Srisamran is a PhD. candidate at the College of Management, Mahidol University, Thailand. He received his Bachelor of Science degree in Information Technology from Sirindhorn International Institute of Technology, Thammasat University, Thailand and Master of Management from the College of Management, Mahidol University. His research interests include Knowledge management and Customer Relationship Management.

1. Introduction

Knowledge externalization is a part of knowledge creation (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka, Toyama, & Konno, 2000). It refers to the process of creating new knowledge by converting an individual's tacit knowledge into a new comprehensive form of explicit knowledge. In other words, it is concerned with how individuals express or articulate their ideas, thoughts, or knowledge into words, documents, graphs, etc. (Nonaka, 1994; Nonaka & Takeuchi, 1995). However, this process does not focus only on how individual's knowledge is articulated; it is necessary to focus on how individuals reflect and analyze themselves as well (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka et al., 2000). The focus on how individual's knowledge is articulated refers to knowledge articulation while the focus on how individuals reflect and analyze themselves refers to self-reflection.

As knowledge externalization is a part of knowledge creation, most studies focus on knowledge creation rather than a specific aspect similar to knowledge externalization. Also, most studies of knowledge creation focus on organizational performance (Tsai & Li, 2007; Li, Huang, & Tsai, 2009; Mills & Smith, 2011; Chung, Liang, Peng, & Chen, 2012; Shah, Rahneva, & Ahmed, 2014) rather than team performance (Von Krogh, 1998; Bennett, 2001; Janhonen & Johanson, 2011; Zhou, Yan, & Zhang, 2017). However, there is no study focusing on the impact of knowledge externalization on team performance specifically. Additionally, as knowledge articulation and self-reflection are essential to knowledge externalization, it is interesting to investigate the impact of these two factors separately. In other words, the investigation is to find whether knowledge articulation or self-reflection has more significant impact on team performance. Review of the previous literature suggested that attempting to measure these two factors separately in terms of knowledge externalization still remains underexplored. Therefore, this topic is interesting to study.

This study aims to find out the impact of knowledge externalization on team performance by studying the impact of self-reflection and knowledge articulation on team performance separately and investigating the impact of these two factors together on team performance. This paper is constructed as follows; first, the concept of knowledge externalization including self-reflection and knowledge articulation is reviewed. Next, we describe the study setting and methodology. Then, the data analysis is presented and discussed. This paper concludes with a summary and an outlook for future research opportunities.

2. Background

2.1. Knowledge creation and the concept of "BA"

Knowledge Creation refers to a process involving the interactions between tacit and explicit knowledge that lead to the conversion of knowledge between these two categories of knowledge in spiral movements flowing from one stage to another (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998). There are four stages in knowledge creation, which are socialization, externalization, combination and internalization. In socialization, new knowledge is created by exchanging an individual's

tacit knowledge with another individual's tacit knowledge. In externalization, new knowledge is created by converting an individual's tacit knowledge into a new comprehensive form of explicit knowledge. In combination, new knowledge is created by reorganizing, consolidating, and synthesizing existing explicit knowledge into new, complex yet usable, forms of explicit knowledge. In internalization, new knowledge is created by converting explicit knowledge in an organization into an individual's tacit knowledge. Nonaka (1994), Nonaka and Takeuchi (1995), and Nonaka and Konno (1998) referred to this process as the SECI model which is extensively used in the knowledge management field.

The concept of "Ba" was introduced by Nonaka and Konno in 1998 which refers to "shared space" occurring in the business world (Nonaka & Konno, 1998; Nonaka et al., 2000; Nonaka & Toyama, 2015). This shared space can be physical space (e.g. office, meeting room, etc.), virtual space (e.g. e-mail, internet forums, teleconference, etc.) or even mental space (e.g. shared ideas and experience). "Ba" can be viewed as a platform for tacit knowledge and explicit knowledge. These two types of knowledge interact with each other and are then converted into new knowledge in a spiral movement within "Ba" (Nonaka & Konno, 1998; Nonaka et al., 2000). In other words, "Ba" can be viewed as a foundation for knowledge creation. There are four types of "Ba" which correspond to each stage of knowledge creation in the SECI model. In "Originating Ba", tacit knowledge of individuals is shared among them and converted into new tacit knowledge via face-to-face or physical interaction. This represents socialization of knowledge creation. In "Interacting Ba", individuals' tacit knowledge becomes explicit knowledge. This represents externalization of knowledge creation. In "Cyber Ba", existing explicit knowledge is combined in virtual space to create new explicit knowledge in an organization. This represents combination of knowledge creation. In "Exercising Ba", the formal explicit knowledge is internalized to become individuals' tacit knowledge. This represents internalization of knowledge creation.

Most studies of the knowledge creation field focus on the entire process of knowledge creation as well as the concept of "Ba" (Brännback, Carsrud, & Schulte, 2008; Hautala, 2011; Wulystan, Dulle, & Benard, 2013; Srisamran & Vathanophas Ractham, 2014). There are only few studies that pay attention to specific parts of knowledge creation or the concept of "Ba". Knowledge combination seems to be the most popular topic (Tolstoy, 2009; Tsai & Wu, 2010; Ţivković, Ţivković, Manasijević, & Kostadinović, 2010). Knowledge socialization and knowledge internalization are also gaining popularity in research (Nguyen & Barrett, 2006; Tsai & Lee, 2006; Lawson, Petersen, Cousins, & Handfield, 2009). In terms of knowledge externalization, there is still a big gap for study (Yi, 2006), especially for a study focusing on knowledge externalization and team performance in "Interacting Ba". Therefore, knowledge externalization and "Interacting Ba" has been selected as our main research topic.

2.2. Knowledge externalization in "Interacting BA"

Knowledge externalization is one of the main knowledge creation processes. It refers to the process of creating new knowledge by converting individual's tacit knowledge into a new comprehensive form of explicit knowledge (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka et al., 2000; Nonaka & Toyama, 2015). In this process, the interaction between tacit knowledge and explicit knowledge leads to creation of new explicit knowledge from existing tacit knowledge from individuals. It is concerned with how individuals express or articulate their ideas, thoughts, or knowledge into words, documents, graphs, etc. However, this process does not focus only on how

individual's knowledge is articulated; it is necessary to focus on how individuals reflect and analyze themselves as well (Nonaka & Konno, 1998; Nonaka et al., 2000).

"Interacting Ba" is one of the four fundamentals "Ba". "Interacting Ba" has embodied the theory of knowledge externalization to practice in the real world (Nonaka & Konno, 1998; Nonaka et al., 2000). Nonaka and Konno (1998) provides a remarkable insight into teams in this "Ba". People gather together to form a team. Each person has different knowledge and experiences (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Rosendaal, 2009; Pacharapha & Vathanophas Ractham, 2012). Nonaka and his colleagues have specified that individuals' knowledge and the capabilities of people who are included in the team should be involved. Knowledge externalization is represented in "Interacting Ba" (Nonaka & Konno, 1998; Nonaka et al., 2000). It is the place or shared space where tacit knowledge is converted to explicit knowledge through dialogue (Nonaka & Konno, 1998; Nonaka et al., 2000). It is the shared space where people engage in co-operation in creation of knowledge (Nonaka & Konno, 1998; Nonaka et al., 2000; Bennett, 2001). In other words, knowledge externalization is likely to occur within the environment that engages people in co-operation. That type of environment can be observed in the team environment. Therefore, according to "Interacting Ba", knowledge externalization is associated with co-operation between members in a team.

According to knowledge externalization, it is important to realize that individuals do not only articulate their knowledge, it is also necessary to focus on how individuals reflect and analyze themselves as well (Nonaka & Konno, 1998; Nonaka et al., 2000). This focus also corresponds to what Nonaka and his colleagues (Nonaka & Konno, 1998; Nonaka et al., 2000) have emphasized on "Interacting Ba". In "Interacting Ba", the two key factors are the focus on how individuals' knowledge is articulated and the focus on how individuals reflect and analyze themselves. The focus on how individuals' knowledge is articulated refers to knowledge articulation while the focus on how individuals reflect and analyze themselves refers to self-reflection.

2.2.1. *Knowledge articulation*

Knowledge Articulation refers to the articulation of tacit knowledge (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka et al., 2000; Hakanson, 2002). Since tacit knowledge is personal, complicated, informal and difficult to communicate to other individuals, it needs to be articulated to be understood by others (Strang, 2011). The reason why we need to understand tacit knowledge is that tacit knowledge is a foundation for building structure to interpret and understand explicit knowledge (Polanyi & Prosch, 1975). Therefore, in order to understand each individual's knowledge, their tacit knowledge requires articulation. The articulation of tacit knowledge does not only impact at the interpersonal level. In fact, knowledge articulation has impact on the overall organization as well. Hedlund (1994) has defined organizations as "Articulation Machines". It is the machine that is "built around codified practices and deriving some of their competitive advantages from clever, unique articulation." (Hedlund, 1994, p. 76). Nonaka and his colleagues (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998) have identified that, in order to articulate individual's tacit knowledge, there should be some techniques to assist the articulation of tacit knowledge. Examples of these techniques are: words, concepts, dialogue, figurative language (i.e. metaphor), etc.

Hakanson (2007) proposed knowledge articulation framework as the articulation circle. There are three main components in this framework: theory, code and tool. In order to articulate tacit knowledge, a cognitive theory is necessary for comprehending the received information and providing the meaning to that information. Hakanson (2007)

called this cognitive theory a frame of reference. This frame of reference has impact on the process of coding. Without theory or a frame of reference, the coding could lead to misinterpretation or wrong codification of tacit knowledge. It requires the use of cognitive theory as a frame of reference to provide meaning to that tacit knowledge. In articulating tacit knowledge, tacit knowledge is transformed or coded into explicit forms of knowledge. In other words, the tacit knowledge is coded into words, concepts, dialogue, figurative language (i.e. metaphor), visuals, etc. (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998) or "writing, mathematics, graphs and maps, diagrams and pictures, in short, all forms of symbolic representation which are used as language." (Polanyi, 1962, p. 78). The code in articulation of tacit knowledge can be categorized into two main types. The first type is Language. This ranges from ordinary language that we use every day to specialized languages including mathematical formulae, computer code, etc. The second type is Pictorial Representation. This type includes maps, graphs, diagrams, pictures, drawings, etc. The tool is also significant in order to articulate tacit knowledge, whether it is in the direct or indirect approach, and it could represent the articulation of tacit knowledge into real practice. The tool can be further categorized into three types. The first type is embodied knowledge. This type refers to the tools that could increase efficiency of the body, which could range from simple hand tools to machines. The second type is instrumentalities. This type refers to the tools that could increase efficiency of sense. This type mainly involves tools for measurement which yield greater precision and reliability than individuals' sense. The last type is memory tool. This type refers to the tools that could increase the power of human intellect. It serves as media to communicate articulated knowledge.

Hakanson (2007) also mentioned the benefits of knowledge articulation. When tacit knowledge from an individual is articulated, it is codified into explicit form which is more understandable and easier to communicate to other people. In "Interacting Ba", when knowledge of a team member is articulated, that knowledge becomes more understandable and easier to communicate to other team members (Nonaka & Konno, 1998). Therefore, other team members can utilize this articulated knowledge. Also, when new members join the team, time spent in acquiring tacit knowledge from other team members can be slow and ineffective. If the tacit knowledge of team members is articulated into more understandable and easy-to-communicate form, the time spent for new members to acquire knowledge from the team can be faster and more productive. These benefits of knowledge articulation can contribute to increasing team performance. Thus, the first hypothesis of the present study is specified as follows.

Hypothesis 1: *Individual's knowledge articulation is positively associated with team performance*

2.2.2. Self-reflection

Self-reflection has been a topic of interest of many researchers for nearly a century. Some defined it as "Active, persistent and careful consideration of any beliefs or supposed form of knowledge in the light of grounds that support it and further conclusion to where it leads" (e.g. Dewey, 1933, p.9). Some defined it as "The process of internally examining and exploring an issue of concern triggered by an experience which creates and clarifies meaning in terms of self and which results in a changed conceptual perspective" (e.g. Boyd & Fales, 1983). In whichever ways researchers try to define the term "reflection", it leads to the same conclusion that "Reflection is a form of response of the learner to experience" (Boud, Cressey, & Docherty, 2005, p. 18).

Amongst many reflection frameworks (Hutchinson & Allen, 1997; Scanlan & Chernomas, 1997; Riley-Douchet & Wilson, 1997; Kember et al., 1999), Scanlan and Chernomas (1997) proposed a Reflection model that is not complicated and can be easily applied in many cases. This model is comprised of three stages. The first stage is awareness. In this stage, individuals are stimulated or interrupted by thoughts, doubts or feelings. This can be either positive or negative. The second stage is critical analysis. In this stage, after having awareness, individuals attempt to analyze the situation that they aware of critically by using their knowledge and experience. The new knowledge resulting from this critical analysis is also used. Critical thinking and evaluation have major roles in this stage. The third and final stage is learning. In this stage, after analyzing critically, individuals develop a new perspective based on critical analysis which is marked by affective, cognitive and behavioral changes.

In many studies, it is observed that the benefits of self-reflection are mainly concerned with individuals in terms of feedback and self-improvement (Getliffe, 1996; Scanlan & Chernomas, 1997; Riley-Douchet & Wilson, 1997; Boud et al., 2005; Letch, 2012; Burr, Blyth, Sutcliffe, & King, 2016). Loo and Thorpe (2002) propose that self-reflection is not only of benefit to the individual but to the team as well. As Loo and Thorpe (2002) investigated self-reflection using qualitative approach, it is observed that self-reflection does not only stimulate critical thinking and critical reflection to analyze and reflect on one's self for individual improvement, but it also reflects on the team environment and team effectiveness as well. These benefits of self-reflection can contribute to increasing team performance. Thus, the second hypothesis of the present study is specified as follows.

Hypothesis 2: Self-reflection is positively associated with team performance

As mentioned earlier, knowledge articulation can make an individual's tacit knowledge become more understandable and easier to communicate to other people (Nonaka & Konno, 1998). Hence, in a team, team members also benefit from knowledge articulation since it can make the tacit knowledge of a team member become more understandable and easier to communicate to other people in team. This reduces time spent in acquiring tacit knowledge from other members. Thus, individual's knowledge articulation is likely to enhance team performance. As Hakanson (2007) proposed in knowledge articulation framework, there are three main components: theory, code and tool. In order to articulate individual's tacit knowledge, theory or cognitive theory plays a major role as frame of reference to provide meaning to that tacit knowledge (Hakanson, 2007). Otherwise, the individual's tacit knowledge cannot be coded accurately, and it can lead to misinterpretation. This frame of reference can be "provided by the habits, conventions and traditions of national or organizational cultures" (Hakanson, 2007, p.15). Frame of reference is self-reflective and integrative with an individual's experience (Mezirow, 1997). Self-reflection encourages individuals to critically think and reflect on themselves using their knowledge and experience which develops a new perspective based on critical analysis (Scanlan & Chernomas, 1997; Loo & Thorpe, 2002). Hence, the relation between individual's knowledge articulation and team performance can be moderated by self-reflection. Thus, the third hypothesis of the present study is specified as follows.

Hypothesis 3: Individual's knowledge articulation is more strongly associated with team performance when self-reflection is engaged

3. Methodology

The study employs a quantitative approach. The samples are graduate students. The total sample size is 401 students. Since 90% of graduate students who join this class are employees and workers, this sample could reflect the perceptions of workers in the business world. Therefore, this study could reflect the situation in the business world as well.

3.1. Measures

In this study, there are three main variables: team performance, knowledge articulation, and self-reflection. The measurement of each variable in this study is based on group project. The first study variable is team performance. The performance for each team was investigated and evaluated by two experts based on group project. The criteria for evaluating team performance is developed based on Stevens and Campion (1994)'s theory of essential knowledge, skill and ability for team performance. The second study variable is knowledge articulation. To measure knowledge articulation, the problem-solving case analysis is employed (Collins, Brown, & Newman, 1989). Individual case analysis based on their group project is assigned to students. The questions and criteria for measuring knowledge articulation using case analysis report are developed from the theory of knowledge articulation from Hakanson (2007) as mentioned in literature review. Students can articulate their tacit knowledge based on group project to words and model (Collins et al., 1989). The last study variable is self-reflection. To measure self-reflection, reflective essay is employed (Loo & Thorpe, 2002; Rosier, 2002). Student must submit an individual reflective essay reflecting on his/her role in the team and his/her perception toward teamwork based on his/her group project. The questions and criteria for measuring self-reflection using reflective essay are developed from the theory of self-reflection from Scanlan and Chernomas (1997) as mentioned in literature review. Students are able to reflect on their knowledge derived from the group project. In the previous study from Loo and Thorpe (2002), a qualitative approach has been utilized to investigate self-reflection. However, in this study, it is interesting to observe the consistency of the results with a previous study if quantitative approach is utilized. Therefore, a quantitative approach is applied in this study for self-reflection. Experts graded the reflective essay for each individual. Table 1 summarizes measurements of all variables in this study (see Appendix I for more details).

3.2. Reliability and validity

A panel of experts had been formed to assess content validity of the questions and criteria. They provided their opinions as to whether or not the questions and criteria are essential and relevant to measuring the variables in this study. Pearson correlation between knowledge articulation and self-reflection from Table 1 is less than 0.5 which indicates discriminant validity between these two variables. Internal reliability for knowledge articulation and self-reflection are 0.674 and 0.553 respectively.

3.3. Data analysis

In this study, multiple regression is applied for data analysis. Assumptions for multiple regression are also tested for reliability of result. The non-linearity test cannot reject that the relationship is not linear. Violation of independence errors occurs only in time-series data. Since the data in this study is not time-series data, assumption of independence

errors is not violated. Test of normality of residual indicates that the assumption of normality of residuals is violated. However, due to the large sample size (N=401) which is more than 100, this violation is less likely to be involved. The test of homoscedasticity cannot reject that homoscedasticity is presented. Therefore, the assumption of homoscedasticity is not violated. Multi-collinearity test gives low VIF values for each variable indicating that the problem of multi-collinearity does not exist.

Table 1
Measurements of all variables

| Variables	Components	Measurement
Team Performance (Stevens & Campion, 1994)	Goal Setting and Performance Management	Analyze situation and propose marketing strategy with strategic objectives
	Planning and Task Coordination	Creates implementation plan and control plan based on the proposed marketing strategy
Knowledge Articulation (Hakanson, 2007)	Theory	Propose solution to the case and elaborate strategies (or theories) behind it
	Code	Create framework (or diagram) based on the proposed solution
	Tool (Application)	Elaborate on how the framework of the proposed solution can be applied in other situations
Self-Reflection (Scanlan & Chernomas, 1997)	Awareness	Reflect on your team's performance and your own role within the project
	Critical Analysis	Analyze the management within the project (e.g. leadership, conflict, time management, process management, etc)
	Learning	Reflect on what you have learn from this project

4. Methodology

In this study, since the measurement scale is different among three study variables, Log transformation of data has been utilized in order to reduce the scale distance of each variable. Table 2 represents means, standard deviations, and Pearson correlations for study variables. It is observed that the correlation between knowledge articulation and team performance is significant while the correlation between self-reflection and team performance is insignificant. To test the hypothesis, multiple regression is applied for data analysis. Three regression models have been identified using team performance as dependent variable. The first and the second model are used to inspect the effect of including self-reflection to the regression models. The third model represents the specification of the theory proposed in this paper. The results from each model are summarized in Table 3.

Table 2
Means, standard deviations, and Pearson correlations for study variables

Variables	Mean	S.D.	Team Performance	Knowledge Articulation
Team Performance	3.3938	0.0993		
Knowledge Articulation	2.9087	0.1944	0.241	
Self-Reflection	1.9748	0.1308	-0.324	0.094

Note. All correlations are significant at $p < 0.05$
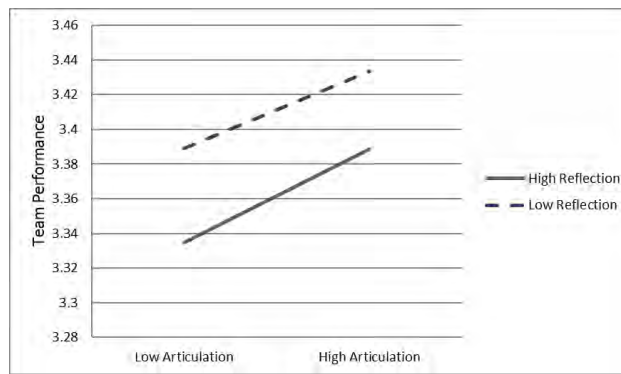
Fig. 1. Effects of individual's self-reflection on the relation of individual's knowledge articulation and team performance

Table 3
Beta coefficients in regression models of team performance, robust standard errors (N =401)

	Knowledge Articulation	Self-Reflection	Knowledge Articulation x Self-Reflection
Knowledge Articulation	0.123***	0.140***	0.145***
Self-Reflection		-0.266***	-0.269***
Knowledge Articulation x Self-Reflection			0.097*

Note. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

　　Hypothesis 1 posits that individual's knowledge articulation is positively associated with team performance. The coefficient for knowledge articulation is positive and statistically significant at $p < 0.05$. Thus, hypothesis 1 is supported. While hypothesis 2 posits self-reflection is positively associated with team performance, the coefficient for self-reflection is negative and statistically significant. Thus, hypothesis 2 is supported but uncorrelated with previous findings. Finally, hypothesis 3 posits that individual's knowledge articulation is more strongly associated with team performance when self-reflection is engaged. The coefficient for the interaction effect between knowledge articulation and self-reflection is positive and statistically significant at $p < 0.1$. Hence,

hypothesis 3 is supported. To provide further insight, an interaction plot is utilized as represented in Fig. 1. In order to illustrate the direction and magnitude of effects, knowledge articulation and self-reflection is dichotomized measuring as high (above mean values) and low (below mean values). Mean-centered values were used. It is observed that individual's knowledge articulation is associated with better team performance when that individual has high self-reflection. Moreover, it is observed that individual's knowledge articulation is less associated with team performance when that individual has low self-reflection.

5. Discussion

Measures were developed and hypothesized performance effects of the model are tested. The findings supported the proposed positive relationship between individual's knowledge articulation and team performance. Unlike previous findings, the findings also indicate the negative relationship between individual's self-reflection and team performance. Based on self-reflection model of Scanlan and Chernomas (1997), awareness is the first stage of self-reflection. Negative thoughts, doubts or feelings can have influence towards awareness of self-reflection (Scanlan & Chernomas, 1997). Gillespie (2007) has elaborated this phenomenon using Rupture Theories and Conflict Theories (Gillespie, 2007). Rupture Theories posits that self-reflection can occur when individual's path of action is blocked or facing alternatives while Conflict Theories posits that self-reflection can occur through social struggling. When working as a team, conflicts between team members are commonly known issues. One's opinion or decision can be conflicted with others. This creates the block to one's path of action which leads to form negative feeling in the awareness stage of self-reflection. This corresponds to Rupture Theories. Moreover, the team member with conflicted opinion tends to justify his/her opinion and criticize other's opinions as well. This is a good example of social struggling in team which can creates negative feeling in the awareness stage of self-reflection and corresponds to Conflict Theories. Doise and Mugny (1984) also support that conflicts between individual and others in a team can lead to individual cognitive development, which can enhance critical analysis stage of self-reflection. While the conflicts between team members can raise a team member's self-reflection, it can have negative effect towards team performance. Therefore, the result in this study designates that self-reflection is negatively associated with team performance. The findings also indicate the significant interaction between individual's knowledge articulation and self-reflection on team performance. Individual's knowledge articulation is found to have more effect on team performance when that individual has high self-reflection. However, the effectiveness of individual's knowledge articulation on team performance is prone to be less when that individual has low self-reflection.

In a team, each team member has different tacit knowledge based on each individual's experience, skills, and personal values and beliefs (Nonaka & Konno, 1998; Nonaka et al., 2000; Drach-Zahavy & Somech, 2002; Mohannak, 2014). This knowledge is a valuable resource for the team and it is important to team performance (Nonaka et al., 2000; Bennett, 2001; Janhonen & Johanson, 2011; Vathanophas & Chirawattanakij, 2011; Ullah, Akhtar, Shahzadi, Farooq, & Yasmin, 2016). However, the tacit knowledge dwelling inside team members is complex and difficult to be perceived by other team members (Polanyi, 1962, 1997; Alavi & Leidner, 2001; Wan, Haggerty, & Wang, 2015). It needs to be externalized to become explicit knowledge to be utilized by the team. The explicit knowledge externalized by an individual becomes more understandable and easier to communicate to other team members (Nonaka & Konno, 1998; Nonaka et al.,

2000). Therefore, other team members can utilize this explicit knowledge which leads to improved team performance.

Although explicit knowledge is important to team performance, it should also be a concern whether or not that explicit knowledge is articulated accurately and comprehensibly. Hakanson (2007) mentioned that, in order to articulate tacit knowledge, it requires the use of cognitive theory as a "frame of reference" to provide meaning to that tacit knowledge. As a "frame of reference" can be developed from critical thinking by using knowledge and experience which develops a new perspective based on critical analysis which is marked by affective, cognitive and behavioral changes, this is related to self-reflection (Scanlan & Chernomas, 1997). Hence, it can be implied that people with high capability of self-reflection tend to have more critical thinking and develop new perspective based on critical analysis. This leads to developing a better "frame of reference" for better coding in knowledge articulation. With a better "frame of reference", the tacit knowledge of that individual can be articulated more efficiently and accurately, resulting in more understandable and easy-to-communicate explicit knowledge. With the more understandable and easy-to-communicate knowledge, this leads to improved team performance.

On the other hand, effectiveness of individual's knowledge articulation on team performance is prone to be less when that individual has low self-reflection. The explanation can imply that people who have low capability of self-reflection tend to have less critical thinking and be less effective in developing new perspective based on critical analysis. Based on Scanlan and Chernomas (1997)'s reflection model, they are likely to stay at awareness stage rather than go on to critical analysis stage. This leads to development of a less efficient "frame of reference". Therefore, with a less efficient "frame of reference", the tacit knowledge cannot be articulated efficiently and accurately. The result might be a piece of explicit knowledge which still remains complex, difficult to understand, or an inaccurate interpretation of the original tacit knowledge. Consequently, that knowledge cannot be utilized efficiently and leads to poor communication (Cleveland & Ellis, 2015). Therefore, the team performance is less likely to be improved. This research shows the value of studying two main components of knowledge externalization which help us to have better understanding of how knowledge externalization affects team performance in "Interacting Ba".

6. Implications

6.1. Theoretical implication

This study has extended the exploration of knowledge externalization by studying its impact on team performance. This study also highlights two important factors of knowledge externalization: self-reflection and knowledge articulation. From this study, we gain more comprehension of the impact of knowledge externalization on team performance. The novelty to theoretical exploration is that there has never been study that attempts to investigate two important factors of knowledge externalization, self-reflection and knowledge articulation separately, especially in terms of their impact on team performance. The result of this study indicates the difference in impact of self-reflection and knowledge articulation towards team performance. Also observed is the significant interaction between an individual's knowledge articulation and self-reflection on team performance.

6.2. Managerial implication

An organization benefits from utilizing knowledge externalization for team performance improvement by leveraging knowledge articulation and self-reflection. In a team, people join together and become team members. Each team member has different background, experience, skill, and personal values and beliefs, resulting in different knowledge. This knowledge is a valuable resource for the team and it can be further utilized for better team performance. Team members' knowledge needs to be externalized into a comprehensible and easy-to-communicate format in order to be perceived by other team members and utilized for improving team performance. When the knowledge externalized from a team member becomes more understandable and easier to communicate to other team members (Nonaka & Konno, 1998), those team members can utilize this knowledge. This leads to improvement in team performance in many aspects. For instance, when a new member joins the team, time spent in acquiring knowledge dwelling inside other team members can be slow and ineffective (Nonaka & Konno, 1998; Nonaka et al., 2000; Hakanson, 2007). If team members' knowledge is externalized into a more understandable and easy-to-communicate form, the time spent for a new member to acquire the knowledge from the team can be faster and more productive. Knowledge externalization also benefits decision making, and problem solving. Courtney (2001) mentioned that knowledge plays an important role in decision making and problem solving since it requires a wide perspective of knowledge in order to make a decision or solve a problem. Since team members possess different knowledge based on their background, experience, skill, and personal values and beliefs, knowledge externalization can provide a wider perspective of knowledge from knowledge externalized from team members.

As knowledge externalization is comprised of two important factors, knowledge articulation and self-reflection, it is required to utilize both factors efficiently in order to enhance team performance. While the result of this study indicates the negative relationship between team performance and self-reflection, it also indicates that individual's knowledge articulation is found to be more effective on team performance when that individual has high self-reflection. People, who can reflect on their knowledge better, think and analyze more critically. This leads to developing a better frame of reference to provide the meaning for their knowledge. The better the frame of reference, the more accurately and efficiently they can articulate their knowledge, resulting in more comprehensible and easy-to-communicate knowledge that can be perceived and utilized by other team members. This leads to improved team performance. On the other hand, the effectiveness of individual's knowledge articulation on team performance is prone to be less when that individual has low self-reflection. People, who cannot reflect on their knowledge well, tend not to think and analyze critically. This leads to developing a poor frame of reference which cannot be used to provide the meaning for their knowledge efficiently. With a poor frame of reference, they cannot articulate their knowledge accurately and efficiently, resulting in a piece of complex, inaccurate and ambiguous knowledge which is difficult to be perceived and utilized by other team members. Therefore, this knowledge cannot be utilized efficiently to improve team performance.

In order to enhance team performance using knowledge externalization, both knowledge articulation and self-reflection must be utilized efficiently. When self-reflection is solely utilized, it can have negative effects towards team performance. On the other hand, knowledge articulation has positive relation with team performance. However, it can have stronger association towards team performance when utilizing with self-reflection. Therefore, it is recommended that those in managerial or executive roles place more emphasis on the capability of each team member and how well they can

reflect and articulate their knowledge. Those who can reflect on their knowledge efficiently should be encouraged to express their knowledge. Articulation training is also recommended in order to leverage articulating skills and teach articulating techniques. Training for self-reflection is recommended for those who cannot reflect on their knowledge efficiently, in order to improve their critical thinking and reflecting skills.

7. Conclusion

Knowledge externalization is important to team performance. Different people in a team possess different tacit knowledge. It will be benefit the team if this knowledge can be utilized. However, tacit knowledge is complex and difficult to communicate. Team members' tacit knowledge needs to be externalized to a more comprehensible and easy-to-communicate form of knowledge in order to be perceived and utilized by other team members. In previous studies, studying the impact of two important factors of knowledge externalization (knowledge articulation and self-reflection) on team performance has never been in the focus of researchers' interest. The result of this study illustrates the significant relationship between team performance and knowledge articulation and the significant relationship between team performance and self-reflection. The result of this study also illustrates the significant interaction between individual's knowledge articulation and self-reflection on team performance.

Although this study provides novelty in knowledge management study and interesting results, some limitations must be acknowledged. The sample in this study is graduate students. It is not randomly selected. The generalization of the findings can be limited. However, since these groups of graduate students are undertaking academic studies while also working, this study can reflect the sample in both the academic and business world. In future research, it is highly recommended to conduct the study with a larger sample size and more diversity in the participants. Cross-sectional study is also recommended.

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Appendix I

Table a1
Rating criteria for team performance

Variable	Component	Rating			
		4	3	2	1
1. Team Performance	Goal Setting and Performance Management	Demonstrates an in-depth situation analysis and propose appropriate marketing strategy with clear and detailed strategic objectives	Demonstrates adequate situation analysis and propose appropriate marketing strategy with sufficient details in strategic objectives	Demonstrates minimal situation analysis and propose appropriate marketing strategy with minimal detail in strategic objectives or the proposed marketing strategy is not appropriate	Lack of demonstrating situation analysis and the proposed marketing strategy is not appropriate. Lack of clear and detailed strategic objectives
	Planning and Task Coordination	Creates clear and applicable implementation plan and control plan based on the proposed marketing strategy	Creates appropriate and applicable implementation plan and control plan based on the proposed marketing strategy	The created implementation plan and control plan based on the proposed marketing strategy is appropriate but not applicable, or not appropriate.	The created implementation plan and control plan based on the proposed marketing strategy is inappropriate and not applicable.

Table a2
Rating criteria for knowledge articulation

Variable	Component	Rating			
		4	3	2	1
	Theory	Demonstrates clear understanding of the problem. Propose appropriate solution with clear details. Provide and elaborate clear strategy or theory based on proposed solution.	Demonstrates general understanding of the problem. Propose appropriate solution with adequate details. Provide and elaborate sufficient strategy or theory based on proposed solution.	Demonstrates minimal understanding of the problem. The proposed solution is appropriate with minimal details or not appropriate. Provide and elaborate inadequate strategy or theory based on proposed solution.	Demonstrates lack of understanding of the problem. Proposed solution is not appropriate and lack of details. Cannot provide and elaborate strategy or theory based on proposed solution.
2. Knowledge Articulation	Code	Creates clear and relevant framework (e.g. diagram, written description) based on proposed solution	Creates appropriate and relevant framework (e.g. diagram, written description) based on proposed solution	The created framework (e.g. diagram, written description) based on proposed solution is appropriate but irrelevant, or not appropriate.	The created framework (e.g. diagram, written description) based on proposed solution is inappropriate and irrelevant.
	Tool (Application)	Demonstrates clear application of the framework of the proposed solution in other situation with clear insight.	Demonstrates general application of the framework of the proposed solution in other situation with adequate insight.	Demonstrates minimal application of the framework of the proposed solution in other situation with inadequate insight.	Demonstrates lack of application of the framework of the proposed solution in other situation and lack of insight.

Table a3
Rating criteria for self-reflection

Variable	Component	Rating			
		4	3	2	1
3. Self-Reflection	Awareness	Demonstrates an in-depth reflection on your team's performance and your own role. Clear and detailed examples are provided as applicable.	Demonstrates general reflection on your team's performance and your own role. Appropriate examples are provided as applicable.	Demonstrates minimal reflection on your team's performance and your own role. Provided examples are irrelevant.	Demonstrates a lack of reflection on your team's performance and your own role. Examples are not provided as applicable.
	Critical Analysis	Provides in-depth analysis on the management within the project with detailed and relevant examples	Provides adequate analysis on the management within the project with decent examples	Provides minimal analysis on the management within the project. The provided examples are irrelevant.	Lack of providing analysis on the management within the project. Examples are not provided
	Learning	Reflection reveals clear and detailed insight of learning from the project. Clear examples are provided as applicable	Reflection reveals sufficient insight of learning from the project. Decent examples are provided as applicable	Reflection reveals minimal insight of learning from the project. When applicable, provided examples are irrelevant.	Reflection reveals lack of insight of learning from the project. Examples are not provided as applicable