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Knowledge Management Enabler (KME) to Promote Innovation Capabilities in Public R&D Centers in Indonesia

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Abstract. *In the organizational context, innovation capabilities is influenced by knowledge management process. To improve the performance of innovation capabilities, further identification on most influential factors in implementing knowledge management is needed, referred to knowledge management enablers (KME). This study aims to determine the specific factors of KME dimensions affecting innovation capabilities in R&D organization. Furthermore, this study also focuses on the strength and direction of the correlation between KME dimensions of personal, organizational, and technology to innovation capability. Quantitative research approach was conducted and data were taken from 134 respondents of employees/researchers at research centers/units in a public R&D organization. The results show that personal dimension (interpersonal trust and learning motivation) becomes the most significant factor affecting innovation capability in the R&D organization, followed by technological dimension (ICT use,) with a correlation value of 0.44 (ρ <0.05) and 0.36 (ρ <0.05) respectively. The results of this study recommend that the governance of knowledge management process in R&D organization should be put mainly on personal dimension as a major driver of innovation.*

Keywords: *Innovation capability, knowledge management enabler (KME), R&D organization.*

1. Introduction

Innovation is a key prerequisite for attaining organizational competitiveness (Esterhuizen, Du Toit, & Schutte, 2012). Organization must assure the availability of valuable knowledge to create innovations, new products and services through knowledge management (KM) process. The activity of managing knowledge is mainly implemented through knowledge transformation among individuals. In an organizational context, innovation capabilities can be affected by the presence of barriers in knowledge management processes (Kaur & Suri, 2014; Tan & Md. Noor, 2013). Hence, KM plays a pivotal position to improve innovation capability (Shettar, 2007; Suh, Sohn & Kwak, 2004).

R&D organization produces various kinds of knowledge derived from experiences and experiments, and integrates them to create new knowledge and innovation (Shettar, 2007). Unfortunately, most R&D organizations have not created an organizational culture and established KM system that 'forces' knowledge workers to transfer knowledge with other colleagues (both from within and outside his/her organization), integrate and ultimately create new knowledge. Talented and well-educated people, most of whom come from engineers and scientific backgrounds, work in their own style and work preferences according to their own individual research goals without aligning it with the organization's performance. Individuals tend to consider all experiences, skills, and research outputs as a matter of personal goal and reputation. In that case, knowledge, in individual contexts, is often associated with job security (Suh et al., 2004). Johnsson (2017) also noted that KM sharing process does not always take place scientifically among colleagues. Furthermore, the absence of a system that allows a cross functional team within organization to transfer knowledge will affect the innovation capabilities of an organization.

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The term of 'KM enabler' roots from the KM dimensions which enable R&D organization to improve innovation, represented by an integrated dimensions of personal, organizational system, as well as information and communication technology. The three dimensions are also known as the most critical knowledge sharing dimensions in KM process (Ho, Hsieh, & Hung, 2014; Lin, 2007; Lin & Lee, 2006). Even Lawson and Samson (2001) investigated that KM knowledge sharing is closely related to dimensions of innovation capability. However, no specific works on relationship between organizational context of KME and innovation capability were found. In this study, the three integrative KM enablers dimensions in organizational knowledge context (personal, technology, and organizational system), in relation to innovation capability, are investigated. As the critical factors in KM knowledge sharing, the personal context is constructed by 'learning motivation', 'knowledge self-efficacy' and 'interpersonal trust'. Meanwhile, the organizational dimension is contributed by constructs of 'top management support' as well as 'reward system'. The technology dimension is the third dimension in which 'ICT use' is measured.

The objective of this study is to determine the relationship and strength of the KME dimension (personal, organization, and technology) which affects innovation capabilities in R&D organizational context. The factors should be optimized in order to set up KM initiative and strategies to improve R&D organizations' innovation capability.

2. Literature Review and Hypothesis

Innovation Capabilities in R&D Organization

Some authors described different perspectives of the innovation capability. Damanpour (1996, as cited in Rahmani & Mousavi, 2011) stated that the term 'capability' in innovation emphasizes the key roles and strategic management that adapts, integrates and reconfigures all skills, abilities, functional competencies and other resources in responding to environmental challenges. Another study done by Glynn (1996) focused on intelligence in relation to the innovation capability to process, interpret, encode, manipulate, and access information in purposeful, goal-oriented manner to increase adaptive potential of the organization. Furthermore, Hogan, Soutar, McColl-Kennedy, and Sweeney (2011); and Gor, Mummassabba, and Muturi (2015) expanded the concept and defined innovation capability as 'a firm's ability, relative to its competitors, to apply the collective knowledge, skills, and resources to innovation activities relating to new products, processes, services, or management, marketing or work organization systems, in order to create added value for the firm or its stakeholders'.

In line with its definition, innovation capability is strongly affected by managing a collective knowledge process in organization (Ardichvili, Maurer, Li, Wentling & Stuedemann, 2006). A study in R&D institutions conducted by Liao, Wu, Hu and Tsuei (2009) also showed a positive correlation between innovation capabilities with knowledge management processes and absorption capacity, which is a mediator between knowledge acquisition and innovation capability.

Innovation capability has at least 7 elements that are closely related to personal, organizational, and technological dimensions (Lawson & Samson, 2001). The elements include vision and strategy, utilization of competency bases, organizational intelligence, creativity management and ideas, organizational systems and structures, climate and organizational culture, and technology management.

Asim & Sorooshian (2019) also stated that the interdependent elements among knowledge, innovation, and technology management capability were comprehensively proven to depend on the process, the infrastructure, and

the strategy. Accordingly, factors such as ICT use (technology dimensions), interpersonal trust, and learning motivation also affect capabilities.

The dimensions of Knowledge Management Enablers (KME) to spur innovation

Ajmal, Helo and Kekäle (2010, 159) define KM as 'a systematic coordination of the human, technological, process and structural aspects of an organization in order to increase value through reuse and innovation'. Another perspective stated by Arnzten and Voransachai (2008) emphasizes KM as organized and the systematic efforts on knowledge processes that include use, transform, transfer, store, and retrieve knowledge for improving organizational performance.

One of the main determinants of the knowledge transfer and sharing is the flow of knowledge in organizations, both from the tacit (individual knowledge) and the organizational knowledge (explicit) (Nonaka & Takeuchi, 1995). Furthermore, Nonaka and Takeuchi (1995) explained that the knowledge flow from tacit to explicit and vice versa (knowledge externalization to knowledge internalization) will be gained through information technology as a key enabler factor as well as the flow of explicit to explicit (knowledge combination). In case of the flow of tacit knowledge to tacit (knowledge socialization), it highly depends on individual's willingness to share knowledge.

However, R&D organization should establish the KM system to capture and integrate knowledge from individuals and keep it in a storage system that can be accessed by other employees. Shettar (2007) stated that the KM system will also connect people involved in the same activity and encourage the research team's attachment. The components of the KM processes must be easily understood by all members of the organization. Ardichvili et al. (2006) stated that the KM process includes standard processes for contributing knowledge, content management, retrieval, and involvement in community of practice (CoP), implementing project-based knowledge reuse, methodology and standard formats for documenting best practices and case studies.

To ascertain the sustainability of the critical factors of KM process in an organization, the term 'KM enabler' is used to describe factors influencing the implementation of KM processes (Yeh, Lai, & Ho, 2006). KM enabler (KME) can encourage organization members to share knowledge and experience as well as knowledge creation which is in line with the strategic objectives of the organization, and ultimately can encourage innovation capabilities (Liao et al., 2009; Rahmani & Mousavi, 2011). In the organizational context, KME dimensions consist of three levels, namely personal, organization and technology of Information and Communication (Ho et al., 2014; Lin, 2007; Lin & Lee, 2006) as following descriptions.

The personal dimension

The personal dimension in KME is the dimension that explains the factors affecting KM at the individual level in the organization. According to Lin (2007), factors affecting KM's personal dimensions can be in a person's self confidence for his/her knowledge capacity (hereinafter referred to as 'knowledge self-efficacy'), 'learning motivation', and trust between colleagues or 'interpersonal trust'. Individuals with better knowledge usually believe that they have a bigger contribution to organizational performance, therefore have confidence to share valuable knowledge which is important key knowledge in knowledge flow (Ardichvili, Page & Wentling, 2003). Based on their study, Wu, Yeh and Huang (2007) explained that the higher the activity of sharing knowledge in a research team, the higher the learning motivation of team members. Abrams, Cross, Lesser and Levin (2003) also concluded that interpersonal trust is a major characteristic that strongly affects the process of creating and sharing effective knowledge.

H_1*: The personal dimension (learning motivation, knowledge self-efficacy and interpersonal trust) positively affects the innovation capability.*

The organizational dimension

The organizational dimension in KME is the dimension that explains the factors influencing KM at the organizational management level. Factors affecting KM's organizational dimensions can be constructed by 'top management support' and 'reward system'. The top management support factor is considered as one of the most potential factors affecting the organizational dimension of the knowledge base as presented by Connelly and Kelloway, (2001, as cited in Lin, 2007). Support from top management is critical in the growth of KM practices (Kang, Kim, and Chang (2008, in Tan & Noor, 2013), therefore will encourage commitment and affect other members of the organization to share valuable knowledge among colleagues in order to improve organization performance (Al-Hakim & Hassan , 2011).

H_2: *The organizational dimension (top management support and reward system) positively affects the innovation capability.*

The technological dimension

The technological dimension in KME is the dimension that explains the factors of technology use affecting KM process. The factors influencing KM's technological dimension are the use of information and communication infrastructure (ICT use). ICT use, in the context of this research, refers to the use of integrated tools of communication and information in sharing knowledge.

Research by Whelan, Teigland, Donnellan, & Golden (2010) has examined the impact of information flow in R&D organizations through internet technology, and concludes that internet technology has dramatically changed the sources and ways of knowledge workers sharing through a technological gatekeeper concept. Some technical tools can be used to facilitate the knowledge transfer, for example, in the form of groupware and e-mail, as well as sharing practices within colleagues through the community of practices (Wenger, McDermott, & Snyder, 2002). The importance of technology tools in KM due to the tacit knowledge tends to be more difficult to be codified, therefore these devices can be tools in the coding and knowledge dissemination process (Krogh, 2003).

***H_3**: The technological dimension (ICT use) positively affects the innovation capability.*

3. Methodology

Research Instrument

The survey was conducted in 2015 by applying purposive sampling taken from a total of 134 respondents at five bio-based research centers/units of a public R&D organization in Indonesia. This included Research Center (RC) for Biotechnology, RC for Biology, RC for Limnology, Research Unit for Development and Chemical and Processing Technology, and RC for Appropriate Technology. The targeted loci was based on the rapid growth of IP intellectual properties right's (IPR) registered by the centers/units in the key areas over the last decade (Pusat Inovasi LIPI, 2013). The IPR's portfolio is one of R&D's key performance indicators, also known as one important aspect in innovation capability (Rahmani & Mousavi, 2011).

A five likert scales questionnaire was developed in accordance with Gravetter and Forzano (2009), then distributed to respondents in order to identify correlation between KME of personal, organizational as well as technological dimensions and innovation capability. Items of the questionnaire were adapted from Lin (2007), Maccoby (2003), and Ardichvili et al. (2003), which revealed 9 items on the personal variable, 6 items on the organizational context, 4 items on the technological level, and 7 items on the innovation capability respectively. The items of 'learning motivation', 'interpersonal trust' and 'knowledge self-efficacy' represented personal dimension, while 'top management support' and 'reward system' described KME's organizational dimension. The technological dimension in the measuring instrument covered only three items of communications and information technology (ICT use) in

sharing knowledge. The capabilities of innovation covered three aspects of assessment, namely product innovation, process innovation, and management innovation (Liao et al., 2009; Rahmani & Mousavi, 2011). A recapitulation of the items for each variable and construct can be seen in Table 1.

Table 1.
Variables, Constructs and Items to be Measured

Variables	Constructs	Item no.
Personal Dimension	Learning motivation	3, 5,10
	Interpersonal trust	4, 6, 32
	Knowledge self-efficacy	8, 11, 14
Organizational dimension	Top management support	12, 15, 23
	Reward system	13, 16, 22
Technological dimension	ICT use	2, 9, 18, 29
Innovation capability	Innovation capability	1, 17, 20, 24, 26, 28, 31

The questionnaire were statistically tested for reliability and validity. In addition, the entire data processing was supported by the SPSS 24.0. Bivariate Pearson correlation (Pearson product moment) and corrected item-total correlation was applied in validity analysis, which in principle to determine whether an item is appropriate or not as a measurement tool based on the correlation coefficient value at the 0.05 significance level (Azwar, 1999). The valid items were selected 4 times according to their value of corrected item-total correlation after comparing to the value of the r table. In order to test instrument's consistency in case the measurement process is repeated, the reliability test was applied by determining Cronbach's alpha (Priyatno, 2009).

Data processing and analysis

Statistical correlation between KME variables and innovation capabilities at a public R&D organization was applied to test research hypothesis. Normality and multicollinity tests were formed prior to statistical multiple linear regression. Normality test was conducted to determine the population distribution of data. If the significant value of the Kolmogorof-smirnov value is> 0.05, it means the data is normally distributed (Priyatno, 2009). Multicollinearity in principle is a condition of a perfect or near perfect linear relationship between independent variables in the regression model. According to Santoso (2001), if VIF> 5, the variable has a multicollinearity problem with other independent variables. The output of this analysis was used to predict the value of the innovation capability variable as a dependent variable. The multiple correlation analysis was determined to show the correlation between two or more independent variables in KME simultaneously with the innovation capability. The determinant coefficient (R^2) statistical test was conducted to measure the percentage or strength of the independent variables simultaneously on the dependent variable.

4. Findings

Validity and reliability testing

Based on the demography of the respondents, the gender of the respondents was relatively balanced between women and men, with percentage of 45.5% and 54.5% respectively. As many as 63.4% of the total respondents had research and engineering positions at various levels. Majority of the age ranges of the respondents are 26–30 year and 45 years or above with percentages of 24.6% and 27.6% of the total population respectively. For the respondent's tenure, approximately 52.2% were the employees who have worked for 0–10 years.

The results of validity testing of the measuring instrument showed that from the total initial of 26 items, only 17 items remained valid and 9 item turned invalid. The recapitulation of the items can be seen in Table 2.

Table 2.
*Valid and Invalid Items after Validity and Reliability Tes*t

Variable	Construct	Valid items	Unvalid items
Personal dimension	Learning motivation	no.3, 5 (N=2)	no 10 (N=1)
	Interpersonal trust	no 4, 6, 32 (N=3)	(N=0)
	Knowledge-self efficacy	(N=0)	no 8, 11, 14 (N=3)
Subtotal (N)		5	4
Organizati-onal dimension	Top management support	No. 12, 15, 23 (N=3)	(N=0)
	Reward system	No. 16 (N=1)	No. 13, 22 (N=2)
Sub total (N)		4	2
Technological dimension	ICT use	No.2, 9, (N=2)	No.18, 29 (N=2)
Subtotal (N)		2	2
Innovation capability	Innovation capability	No.1, 17, 20, 24, 26, 28 (N=6)	31 (N=1)
Subtotal (N)		6	1
Total items (N)		**17**	**9**

Furthermore, Table 3 displayed the total of 9 invalid items that must be discarded.

Table 3.
Invalid items should be discarded.

No	Item no	description
1	10	I always try to get inputs from partners/colleagues to improve my performance.
2	8	I feel that other colleagues can fulfill valuable knowledge in my workplace.
3	11	I feel that it makes no difference to my organization if I share the knowledge or not.
4	13	Sharing knowledge should be rewarded with a higher incentive.
5	14	I feel I have sufficient ability and expertise to meet the needs of valuable knowledge in my workplace.
6	22	Knowledge sharing should be rewarded by opportunities for expertise/competence improvement.
7	29	Our workplace uses technology that eases the employees to share knowledge with others in our organization.
8	18	Our workplace uses technology that eases the employees to share knowledge with others outside of our organization.
9	31	Innovation is considered too risky for our organization.

The result showed that only 4 items are valid for measuring personal dimension variable. Due to no valid items (item no 8, 11, 14) to measure the construct of 'knowledge self-efficacy', the personal dimension variable could only be determined by two aspects of 'learning motivation' and 'interpersonal trust'. Furthermore, the reliability test expressed by the Cronbach's alpha was displayed in Table 4.

Table 4.
Reliability Testing for Research Variables

Variables	**N**	***Cranbach's alpha***
Personal dimension	5	0.712
Organizational dimension	4	0.710
Technological dimension	2	0.704
Innovation capability	6	0.874
Total	17	0.878

The reliability test as shown in Table 4 indicated that validated items of the personal, organizational as well as technological dimensions and innovation capabilities are reliable as a repeatable measurement tool during the study.

KME and Innovation Capability

A Kolmogorov-smirnov one-sample test results indicated that the data were normally distributed with significant values from Kolmogorov-smirnov. Therefore, the obtained data were suitable for multiple linear regression analysis.

The linear regression statistical test was applied in accordance with the objectives of this study in determining the direction and strength of the correlation between independent variable (personal, organizational and technology dimension) and dependent variable (innovation capability), as seen in Table 5. Table 5 showed that among the three independent variables affecting innovation capability, only two variables could significantly predict innovation capabilities at the R&D organization, namely the personal dimension and the technological dimension, each of which was significant at the level of p <0.05.

Based on the β values listed in the table, the personal dimension variable with the value of 0.213 was known as the most significant predictor on innovation capability. The multiple linear regression calculations also resulted in the insignificant value of organizational dimension (p>0.05) to predict innovation capability. In this case, the organizational dimension is not a predictor of innovation capability. It could also be seen that simultaneously the strength of personal, organizational, and technological dimensions on innovation capabilities was classified as 'medium' (indicated by R value: 0.48)

Based on the F test, it could be explained that both independent variables (the personal and technological dimensions) significantly affected the innovation capability variable, with the value of F (3.78) = 13.27 at p <0.01. Meanwhile, the result of the determinants analysis (R^2) which showed the effect of the independent variables (personal and technology dimensions) simultaneously on innovation capability variable was only 23%.

Table 5.
Multiple Linear Regression Statistics between Personal, Organizational and Technological Dimensions with Innovation Capability

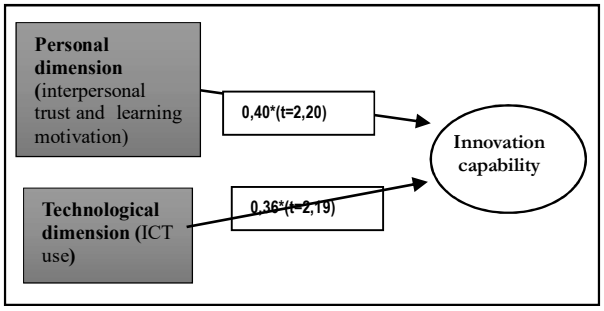
variabel	Innovation capability	Personal dimension	Organiza-tional dimension	Techno lo-gical dimension	B	β	
Personal dimension	0,40				0,254*)	0,213	
Organizational dimension	0,42	0,61			0,202	0,200	
Technological dimension	0,36	0,33	0,47		0,152*)	0,191	
					= 1,072		
everage	3,47	3,96	3,96	3,83		R^2	= 0,23
					adjusted	R^2	= 0,22
Dev. standard	0,39	0,53	0,56	0,62		R	= 0,48

* p <0.05

Table 5 also displayed that the two independent variables (personal dimension and technological dimension) had positive correlation with innovation capability variables significantly at the level of p <0.05, meaning that the increasing value of each variable of personal and technological dimensions would increase the innovation capability. The correlation between independent variables (personal and technology dimensions) and innovation capability could be expressed in the following mathematical equation.

$Y=1.072 + (0.254)X_1+(0.152)X_2$

Note:
Y : predicted value (innovation capability)
1,072 : constant
X_1, : personal dimension (interpersonal trust and learning motivation)
X_2 : technological dimension (ICT use)
0,254 : personal dimension's regression coefficient
0,152 :technological dimension's regression coefficient



**) p <0,05*

Figure 1.
The Correlation between KME Variables with Innovation Capabilities

Figure 1 illustrated the strength of the relationship between the independent variables (personal and technological dimension) and the innovation capability, which was categorized as 'medium', according to criteria by Santoso (2001).

6. Discussion

Personal Dimension as KME

According to the results, the personal issues play a central role, and are the most significant predictors to innovation capability in organization compared to other dimensions (organizational and technological dimensions). It is understandable since 'interpersonal trust', 'knowledge self-efficacy' and 'learning motivation' are the key elements to encourage knowledge sharing and strongly affected by key individuals who have most valuable knowledge in the organization, as presented by Abrams et al. (2003); Ardichvili et al. (2003); Wu et al., (2007). Unfortunately, due to invalid items, 'knowledge self efficacy' can not be assessed as a factor that simultaneously affect personal issues to predict innovation capability. Lawson and Samson (2001) also noted that in the context of the personal issues, managing individual's competency base to sharpen organizational competency is one of the critical KM processes. Since knowledge sharing was a vital KM process as well as innovation (Iqbal et al., 2011), the results proved that KM process to improve innovation process in organization can not be sustained without 'interpersonal trust' and 'learning motivation' through knowledge sharing process.

In relation to personal dimension and innovation capability, the dimension emphasizes on knowledge sharing process in which the knowledge transfer occurs in all level (individual, group, and organization). In line with the previously mentioned results, Liao, Wang, Chuang, Shih and Liu (2010) also stated that the level of knowledge sharing indicates to what degree an organization divides knowledge resources that passed functional boundaries. Therefore, organizations must be able to distribute knowledge and encourage individual's learning motivation in the organization. Bari, Fanchen and Baloch (2016) also noted that relation between personal issues and innovation capability depends on the degree of knowledge sharing culture and KM practices in organization.

Furthermore, the interpersonal trust in personal dimension is a very significant factor in the KM process. If someone does not trust colleagues, then the transfer process of valuable knowledge cannot take place properly. Similar result by Mehrabani and Shajari (2012) indicated that four of seven processes of knowledge management, including knowledge creation, knowledge organization, knowledge dissemination, and knowledge application, are strongly associated with innovation capability.

In the context of R&D organization, naturally knowledge transfer is often difficult due to job security (Shettar, 2007). The security arises from self-confidence that with the accumulation of employees' current knowledge, it can give them certain position. In that case, if the valuable knowledge is shared, it might be a threat to employee's current position. Therefore, knowledge transfer process mostly takes place in a R&D organization where the good interpersonal trust atmosphere occurs in the organization. Holste and Fields (2010) explained that interpersonal trust can be effect-based trust (trust based on mutual care and attention among members of the organization) or cognition-based trust (trust based on one's reliability and competence). Furthermore, they also explain that effect-based trust tends to deeply influence knowledge sharing. Meanwhile, cognition-based trust has a very large role in the utilization of tacit knowledge. This study does not specifically refer to certain types of trust that underline the personal dimensions supporting innovation capabilities. In principle, the two types of trust, as part of the conception in the personal dimension, have a positive correlation with the innovation capability. The involvement of

two types of trust in the conception of the personal dimension is illustrated by the whole question items in the instrument for constructing reliable and valid interpersonal trust. In general, respondents agree and want aspects of interpersonal trust as the following items.

Item no. 4	:	I consider my colleague to be trusted.
Item no 6	:	I consider my colleague's commitment to be very reliable.
Item no 32	:	Once my colleague knows about my shortcomings at work, he/she will help me.

Another aspect of personal dimension in this study is learning motivation. It is possible that individual learning motivation is driven by individuals or intrinsic learning motivation. Referring to the major population of respondents in this study, this intrinsic learning motivation reflects the preferred learning process in self-improving performance, which is also reflected in the valid and reliable items (see also the statistical processing results in Table 5 and Figure 1). In general, respondents agree and want aspects of learning motivation in accordance with the following items.

Item no 3	:	I always try to find new methods or approaches to improve my performance.
Item no 5	:	I always try to find learning opportunities rather than waiting for others to help me.

Even the respondents are not convinced that the inputs to develop their learning motivation is provided by colleagues. In fact, learning motivation is directly related to knowledge sharing activities. This is in line with the study done by Wu et al. (2007) that there is a correlation between learning motivation and knowledge sharing. Moreover, they also note that a more frequent knowledge sharing activities results in a higher learning motivation in a research team. However, knowledge sharing is a vital KM process since engineers or researchers in R&D organization tend to have aspirations to push their own research goals, and place a high value on knowledge as an asset (Suh et al., 2004). Furthermore, knowledge sharing will also encourage and assist colleagues in the learning process and developing new abilities. Accordingly, it is the mediating factor of KM enabler which affects the organization's performance & innovation, as found by Baskaran (2018); Iddris (2016); and Selakjani and Kelidbari (2016).

Technological Dimension as KME

In general, respondents acknowledge that the information and communication use (ICT use) as the technological issue significantly affects the innovation capability. This is reflected in the reliable and valid items below.

Item no 2	:	Employees at my center intensively use electronic storage (e.g. database, data warehousing) to access knowledge.
Item no 9	:	Employees at my center use networks for knowledge (e.g. groupware, intranet, virtual communication) to communicate with their colleagues.

While interaction among colleagues within a smaller groups is believed to have taken place at this time, respondents generally rely on the ICT use could not fully facilitate the knowledge sharing among colleagues across R&D centers. This is understandable, the researchers/knowledge workers tend to engage in a smaller research group or subsystem at the individual R&D center, which implemented different systems, cultures, and values. The formation of subsystems, where the innovative atmosphere occurs, is likely encouraged by knowledge sharing activities among colleagues on the basis of strong interpersonal trust. Therefore, in that case, ICT infrastructures play an important role as mediating tools in knowledge sharing.

Organizational Dimension as KME

In this study, the correlation of organizational issues do not significantly affect the innovation capability in a public R&D organization. Therefore, the organizational dimension is not significant to the predictor of innovation capability. Nonetheless,

organizational roles must be established to foster a conducive climate to ensure the process of personal issues (i.e. the creation of interpersonal trust and increased learning motivation), and the technological facilitation (i.e. ICT use) are taking place. In fact, the organizational issues also play pivotal role to ensure the preservation of culture, systems and values that motivate individuals in a R&D organization with their valuable and unique knowledge. To tap the knowledge, top management of R&D organization should also be able to define the vision and strategy of innovation, and then translate and align them into the R&D's operational strategies (Wang & Noe, 2010).

A similar study by Lin (2007) showed different result regarding the organizational dimension. Lin also noted that organizational dimension (top management support and reward system) significantly affects knowledge sharing and innovation capability in R&D organization. The insignificant effect to innovation capability resulted from this study might be caused by the different R&D organization's culture and system at the respective R&D centers. Respondents are certain that top management must foster the knowledge sharing activities and provide the system and tool to support it as the following valid and reliable items.

Item no 12	:	our manager/leader considers knowledge sharing at work valuable.
Item no 15	:	our manager/leader always encourages knowledge sharing activities with partners.
Item no 23	:	our manager/leader provides the tools and resources for employees to share knowledge.

The different result also reflects that the specific organization system to reward knowledge worker toward knowledge sharing and innovation in the public R&D organization is unavailable. The respondents likely assumed that the reward system is merely financially related. Unsurprisingly, the most desirable award by the knowledge worker is the designation or recognition as an 'expert' in their communities. This is in line with the results of Ensign and Hebert (2010) who conducted study of 2000 employees at the pharmaceutical research organizations in Canada. Shettar (2007) also stated that in R&D organizations, the most expected rewards from this community is recognition 'expert' in their respective expertise and competency.

In general, respondents also acknowledge a non-financial appreciation, such as promotions, opportunity to advanced training and study, or chances to occupy strategic positions, as indicated by valid and reliable items for the following aspects.

Item no 16	:	Sharing knowledge should be rewarded with promotion of certain positions.

The result also shows that the reward system in job promotions is the most motivating reward for researchers in the R&D organization. According to survey, promotion is more accepted or desired by respondents or researchers, compared to other reward systems, such as incentives, salaries, or opportunities for skills or competencies improvement.

Innovation Capability in Public R&D Organization

In general, from the respondents' point of view, their perception of the innovation capabilities is considered 'dubious' (see also average value at Table 5). It might be caused by information shortage as described by the following valid and reliable items.

Item no 1	:	our registered patents have increased in the last 5 years.
Item no 17	:	our certified patents have continued to increase in the past 5 years.
Item no 24	:	up-scaling of our products/technology have increased in the last 5 years.
Item no 26	:	our products/technology licensed to industry have continued to increase in the past 5 years.
Item no 28	:	our products/technologies that have been on the commercial market have increased in the last 5 years.

In general, respondents do not aware of the current status of the organization's innovation

capabilities since R&D commercialization and technology management are handled by other center within the R&D organization.

In order to improve innovation capability, cross-functional and cross-disciplinary network is beneficial for knowledge workers and organizations in order to gain valuable knowledge related to market opportunities, technological development opportunities, and new innovations and financing channels. At that point, valuable knowledge from external can also be accumulated to create new ideas and creativity, as stated by Whelan, Collings & Donnelan (2010).

6. Conclusion

The 2 out of 3 hypotheses are accepted. The *first*, personal dimension of KM enabler (interpersonal trust and learning motivation) positively affects the innovation capability. Furthermore, the *second*, technological dimension of KM enabler (information and communication technology use) positively affects the innovation capability. However, the three integrative dimensions (personal, organizational, and technological dimension)played role as knowledge sharing enabler in organization.

Although the personal issues strongly affect the innovation capability, the three integrative dimensions should be managed inseparably in improving innovation capabilities. There is a tendency that sharing activities are carried out among smaller groups or subsystems environment of the R&D centers. To improve innovation performance, R&D organization must continue to encourage factors of the personal dimension and develop a conducive environment for knowledge sharing that is based on strong interpersonal trust among employees in the organization. Furthermore, sharing and capturing knowledge, particularly those from external sources, can increase employees' motivation.

From the perspective of KM processes, the phenomenon of gaining more knowledge beyond the scope of employee's responsibility can be categorized as 'information redundancy'. Nonaka and Takeuchi (1995) state that these aspects of 'information redundancy' are important for fostering an innovative culture in organizations. Although a researcher is encouraged to become an expert and has accumulated qualified knowledge in his field, cross-functional and interdisciplinary knowledge can improve the R&D performances. This innovation capability ultimately enables the organization to absorb valuable knowledge from the external of the organization and synergize it into different technical competencies.

Even when the organizational items remain invalid, the organizational dimension in correlation to innovation capabilities is strongly affected by the ability of top leaders in decision making. Furthermore, as the central decision maker in an organization, a top leader acts to process, interpret, code, manipulate, and facilitate access to beneficial information that leads to create a conducive environment for innovation. Top management must support and encourage organizational culture and climate that ensures easy access for each employee to share knowledge, not only within research team but also across-functional research groups and intra-organization, as well as across organization border or subsystems.

Although knowledge transfer activities should be facilitated through the quality improvement of ICT infrastructures and system, organization should not be over-reliance on IT tools and system. Top management must also encourage the formation of organizational structures and systems, and knowledge governance that are more conducive to support and ease each person in knowledge sharing. R&D organizations must establish the governance to motivate for personal learning through knowledge sharing activities, hence it can improve innovation capabilities. Other organizational issues, such as the reward and punishment system toward learning

motivation to promote innovation, must also be applied.

The scope of an integrative dimensions in organizational context consists of personal, organization system, and technology. However, the limitation of the research roots from the limited variables in assessing innovation capability. The two out of three factors are the major issues in personal dimension affecting innovation capability.

Furthermore, Baskaran (2018) as well as Selakjani and Kelidbari (2016) highlighted that other factors, such as 'managing ideas and creativity' through knowledge transfer at the levels of individuals, groups, and organizations, are the key roles in KM process.

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