Knowledge management practices and innovation performance

A study at Indonesian Government apparatus research and training center

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Abstract

Purpose – This paper aims to concentrate on the conscious and systematic managerial activities associated with handling knowledge in an organization [i.e. knowledge management (KM) practices] for the purpose of improving innovation performance through proactive management of knowledge assets. This study explores the impact of KM practices on innovation performance in the research and training center of government apparatus.

Design/methodology/approach – This research provides empirical evidence on how various KM practices influence innovation performance. The results are based on the survey data collected in four areas of research and training centers of government apparatuses in Indonesia. Partial least squares are used to test the hypothesized relationships between KM practices and innovation performance.

Findings – The study found that IT practices and work organizations are positively and significantly related to innovation performance. This means that better implementation of information and technology will push innovation performance. The study also points out that knowledge-based compensation practice is one of the KM practice variables which is negatively and significantly related to innovation performance. This result shows that innovation performance will decrease by compensating knowledge improvement.

Practical implications – This study implies that in developing innovation performance, the research and training center should not focus on providing compensation, as it will only increase the costs rather than the innovation performance itself.

Originality/value – This study adds a knowledge-based view of government agencies by demonstrating the significance of KM for innovation performance. This study is also valuable from a managerial perspective, as it highlights the most effective KM practice to improve organizational innovation performance.

Keywords Work organization, Innovation performance, IT practices, Knowledge management practice, Knowledge-based compensation

Paper type Research paper

1. Introduction

Indonesia is a developing country with a considerably stable economic growth (Anggadwita *et al.*, 2017). Innovation is a key to success for organizations to survive and win the competition not only in business sector but also in public sector. In business sector, innovation means the development of new products or services which directly impact on

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increasing market share and enhancing stakeholder values. Meanwhile, in public sector, innovation is an attempt to discover new ways which will simplify the complexities in the areas of service delivery, process improvement, regulation and policy implementation (Ernst and Young, 2017). Thus, innovation in public sector has considerable potential to contribute to economic growth (Anggadwita and Dhewanto, 2013). In recent years, political leaders and managers have emphasized the importance of innovation to fulfil the public sector missions (Palm *et al.*, 2015). It has also become an important issue on the agenda of Indonesian Government agencies considering the score of the Indonesian Govenment's effectiveness index in 2014 was −0.01 (Kaufmann and Kray, 2016). This index represents people's perception concerning the quality of public services. Among the ASEAN countries, Indonesia is on the sixth place after the Philippines, while Singapore has the highest score of 2.19 (Kaufmann and Kray, 2016). Innovation in the field of public services means a quality improvement effort to actualize one of the bureaucratic reform goals in Indonesia and improve the effectiveness index score.

One of the objectives of the Center for Research and Training of Government Apparatus of the Republic of Indonesia is to produce government apparatus capable of providing good public services and implementing innovation performance in their respective institutions. The research and training center has also a laboratory for innovation programs which offer solutions for state agencies having issues with their performance and public services. It indicates that this institution must have better innovation performance than any other government agency.

Knowledge is the integration of information, ideas, experiences, intuitions, skills and lessons that can create added value for the company (Dana *et al.*, 2005). Many companies in Indonesia have implemented knowledge management (KM), including Bank Indonesia, PT Telkom and PT Medco Energy International. Bandung Institute of Technology (ITB) is one of the educational institutions which makes KM as the real business by managing their intellectual capital to create value (Sulistyorini, 2015). The Government of Indonesia also acknowledges the importance of KM to make all government institutions becoming effective and efficient organizations. Ministry of Administrative and Bureaucracy Reform issued Ministerial Regulation No. 14 in 2011 on Guidelines for Implementation of KM Program. According to the Ministerial Regulation, KM is a structured and systematic effort in developing and using knowledge to assist the decision-making process for the improvement of organizational performance (Sulistyorini, 2015).

According to Abazi-Alili *et al.* (2016), some literature on the relationship between innovation activities and company performance define innovation using a variety of measures with the challenges in finding relevant variables to measure innovation activity. However, the most frequently used measures in empirical literature are R&D expenditure, patents and introducing new product/new process (Abazi-Alili *et al.*, 2016). Scholars have discovered that KM influences organization performance through the use of an effective framework for implementing innovation strategies (Inkinen *et al.*, 2015). Thus, KM is obviously an effective means for increasing the innovation performance of an organization. Many researches have focused on issues such as the relationship between generic knowledge processes (knowledge acquisition, sharing and creation) and innovation performance or the relationship between knowledge-based assets (human, structural and relational capital) and innovation performance (Inkinen *et al.*, 2015). Only a few studies have examined that the implementations of conscious and systematic managerial activities (i.e. KM Practices) have a strong impact on innovation performance. This paper attempts to address the question of how KM practices impact on organizational innovation performance, especially in government agencies. This research has a purpose to increase our

knowledge that any organization has the ability to improve their innovation performance through KM activities. In this study, KM activities are divided into nine out of ten types and their impacts on innovation are explored. In addition, this research contributes to the knowledge of innovation management by exploring new sets of managerial methods for improving organizational innovation.

2. Literature review

2.1 Knowledge management practices

Andreeva and Kianto (2012) define KM practices as a series of management activities undertaken in a company aimed at improving the effectiveness and efficiency of the organizational knowledge resources. KM practices refer to organizational aspects which can be manipulated and controlled by conscious and planned management activities. Accordingly, they are conceptualized as the set of management activities enabling the company to deliver value from its knowledge-based assets (Inkinen *et al.*, 2015).

Managing knowledge and innovation in the post-network era is a multidimensional challenge consisting of four integral domains such as culture, content, processes and infrastructure, all of them have also tacit and explicit dimensions (Dana *et al.*, 2005). Other existing literature usually discuss the four main categories of KM critical success factors which are human oriented – culture, people and leadership; organization oriented – processes and structures; technology oriented – infrastructure and applications; and management process oriented – strategies, goals and measurements (Heisig in Inkinen *et al.*, 2015). Inkinen *et al.* (2015) divide KM practices into ten main categories which can be tracked back to the quartet that Heisig mentioned earlier. The ten KM practices are related to supervisory work, knowledge protection, strategic management of knowledge and competence (strategic KM), learning mechanisms, information technology (IT) practices, work organization and four dimensions of human resources management (HRM) practices – recruiting, training and development, performance appraisal and compensation practices. In this study, supervisory work is called leadership role and knowledge protection is eliminated from the KM practices because in the government agencies, especially in this research object, there is no knowledge protection practice either formally or informally.

2.2 Leadership

Leadership is a catalyst for inspiring, mentoring, setting examples, creating an atmosphere of trust and respect, installing a creative culture, establishing a vision, listening, teaching, learning and sharing knowledge. Therefore, we consider leadership as a means of establishing an innovative culture within organizations (Inkinen *et al.*, 2015). Leaders in an organization should have capability to motivate, influence, create loyal employees, increase employee commitment, provide work satisfaction and give welfare for all of employees (Kasmir, 2016). A leader should break down technical barriers and workflows in communication and knowledge exchange (Tobing, 2007). Furthermore, Tobing (2007) also states that for the successful establishment of a sharing culture as the core of KM, the organization must meet several requirements. One of them is leadership role which provides a role model in the tradition of knowledge sharing and learning involving all personnel in the organization. The foundation of sharing culture is trust and openness among the organization members. The use of KM will depend on the leadership of the company. According to Donate and de Pablo (2015), knowledge-oriented leadership in KM positively influences corporate innovation performance.

2.3 Strategic knowledge management

Strategic KM can be defined as the strategic planning, implementation and updating activities related to knowledge-based assets in a company (Kianto *et al.*, 2014). The study of knowledge-based assets in the company has attracted academics since 1990 and resulted in a new approach to knowledge (Rexhepi *et al.*, 2013a). It is intended to identify key strategic knowledge within organizations and build knowledge-based strategies. The research is also to monitor and measure the knowledge assets in the company and their developmental needs related to the business environment (Inkinen *et al.*, 2015). Strategic KM activities can improve organizational performance through the following mechanisms: first, they enable the organization to focus on the most value-creating activities as researchers have highly suggested that the intangible assets are the focal sources of competitive advantage; second, strategic KM enables the organization to craft strategies based on the knowledge-based advantages they have over the competitors. Furthermore, strategic KM practices allow organizations to make strategic decisions on allocation, utilization, expansion and sharing of knowledge bases that support the company's overall strategic objectives (Inkinen *et al.*, 2015). According to Huang *et al.* (2016), integrating technology and human resources is essential in strategic KM. Strategic KM includes knowledge of managers and employees, but one of the biggest obstacles is that employee knowledge becomes a limited factor in formulating corporate strategy because not all employees understand it (Rexhepi *et al.*, 2013a). With appropriate strategic KM, knowledge will be easily tracked, shared, enriched and developed to stimulate innovation, assist problem-solving processes and support decision-making processes through knowledge productivity.

2.4 Human resource management practices

Human resource management (HRM) practices play a significant role in KM. Appropriate HR processes can contribute to organizational success (Kramar and Steane, 2012). HRM is typically defined as the management of employees in an organization. HRM functions usually include activities such as recruitment, compensation, performance appraisal and training and development. The ultimate goals of HRM are to find and select the best-fitting employees and to implement appropriate mechanisms in remuneration, training and evaluation for the best possible outcome.

HRM practices focused on KM can improve innovation performance through four major mechanisms. First, consideration on the candidate's knowledge and social skills in the recruitment process. Companies need to increase the number of knowledgeable employees to produce effective and efficient performance in knowledge-based tasks. In addition, the level of suitability, skills and duties of employees will increase if job roles and positions are determined on the basis of competence (Inkinen *et al.*, 2015). According to Kasmir (2016), recruitment is an activity to attract a number of applicants with qualifications desired by the company/organization. An organization conducting knowledge-based recruitment aims to gain knowledgeable workers. Knowledgeable workers will be able to leverage organizational information and knowledge. They will continue to learn throughout their lives, they are open and adaptable to new ideas. They will use their learning skills to enable them to remain innovative in rapidly changing situations (Tobing, 2007).

Second, training and development. The task of HR management is to assess and analyze training needs, provide and evaluate trainings. An organization which actively plans and arranges courses, seminars and other trainings for their employees will stay updated and competitive. Training is a process of shaping, equipping and improving the skills, abilities, knowledge and behavior of employees. Development is a process to refresh, develop and enrich the abilities, skills, talents, interests and behaviors of employees (Kasmir, 2016).

Third, performance appraisal is a system conducted periodically to review and evaluate individual performance. Traditionally, the purpose of performance appraisal is to improve the quality of work, help decide employee placement, make career planning and development, find training and development needs, adjust compensation, create employee competency data, provide fair job opportunities, communicate effectively between superiors and subordinates, create a culture that values work quality and become a means of providing rewards and punishment for employees (Kasmir, 2016). Generally, the basis of this performance appraisal is economic performance. However, performance appraisal of KM-based systems highlight the evaluation of knowledge activities such as knowledge sharing, knowledge creation and knowledge utilization, so that employee contributions are expected to increase in knowledge activities, as they are valued more than direct economic performance.

Fourth, compensation schemes based on knowledge activities will increase the employee likelihood to involve in such activities. In addition, compensation schemes based on knowledge activities will also increase employee motivation to use more of their knowledge in work. In the implementation of KM, the organization must pay attention to changes made in the compensation system. Galbaraith *et al.* in Tobing (2007) introduce a shift from "paying jobs" to "knowledge based payments." "Knowledge-based payments" appreciate the skills and knowledge of a person who is able to contribute to the organization. This compensation system values someone's learning process and ability to master new knowledge. Finally, HRM practices are related to retaining knowledge employees within the organization through the provision of remuneration, compensation and other ways to reward them (intangible and tangible motivations).

2.5 Learning mechanisms

Learning process is a KM product which has implications for improving innovation through the creation of new knowledge (Tobing, 2007). Furthermore, Tobing reveals that learning becomes very important in KM because through this process, ideas, innovation and new knowledge can be emerged. Thus, organizations need to encourage and facilitate the learning process by ensuring that each individual can collaborate and share knowledge optimally (Malik and Grag, 2017). Skills and knowledge possessed by employees need to be managed to ensure that "knowledge loss" will not happen. Alamanda *et al.* (2015) also explain how learning organizations are applied to develop new value creations. In essence, an integrated system within a learning organization may become a coherent body of theories, knowledge processes and practices.

An effective learning process involves exploration, exploitation and share of knowledge (tacit and explicit knowledge) using appropriate technology and cultural environment to improve the performance and intellectual capital of the organization. The principles of learning such as open-minded discussions, double-loop learning, multifaceted viewpoint considerations and systems thinking will facilitate the exploration of organizational principles (Huang *et al.*, 2016).

According to Inkinen *et al.* (2015), learning mechanisms (improvement of organizational knowledge and competence) are the key aspects of effective knowledge-based operation. In addition, learning-related KM practices improve innovation performance by increasing access to collegial tacit and explicit knowledge, consequently the quality of performance is improved. By legitimizing vicarious learning, an organization can increase the employee motivation to share and create knowledge, then it will improve organizational innovation performance. In addition, providing opportunities for learning by doing will help employees share, build and develop knowledge for organizational benefits.

2.6 Information technology practices

Technological advances have become a critical factor in fostering any learning activity (Sianipar and Yudoko, 2014). Those advances should be treated as the center of systems and processes in any organization (Bennett and O'Brien, 1994; Dahiyat, 2015; Dhewanto *et al.*, 2015; Johnson, 2002; Santa, 2015; Sianipar and Yudoko, 2012). The broad development of IT has penetrated all aspects of human activities, and this makes the use of information technology become one of KM enablers (Susanty *et al.*, 2016). The development of IT allows more and more processes to be automated. The development of internet technology with various applications in it has become the main base of KM tool developments. The main purpose of using IT in KM is for knowledge distribution. The use of IT in KM also plays a role in executing various processes and/or KM cycles such as knowledge capture or acquisition, knowledge codification, knowledge maintenance, knowledge security and knowledge usage monitoring (Tobing, 2007).

According to Inkinen *et al.* (2015), practices related to the utilization of technologically mediated information systems are another important means for improving the leverage of knowledge in a company. Several IT practices for KM influence innovation performance (Gloet and Terziovski, 2004). First, IT allows a better and quicker access to a vast amount of electronic information including social media; this has opened up possibilities to use new sources of information for decision-making. Second, IT offers broader possibilities for knowledge codification which turns tacit knowledge into explicit knowledge (Inkinen *et al.*, 2015; Gloet and Terziovski, 2004). Third, IT provides the users with tools for storing the knowledge, so that the data can be stored safely and longer for the organization to be used again anytime in the future (Inkinen *et al.*, 2015; Huang *et al.*, 2016). Furthermore, Inkinen *et al.* (2015) argue that IT practices can also contribute greatly to systematic knowledge analysis, knowledge combination from various sources, virtualization of knowledge, seamless access to knowledge and information within the organization and beyond and the addition of tools and channels for collaboration and interaction among the organization's experts. Finally, IT also enables more rapid implementations of knowledge through workflow automation.

2.7 Work organization

According to Inkinen *et al.* (2015), practices for organizing work have something to do with organizational design as it facilitates the utilization of knowledge in the organization. Decision must be made concerning the distribution of works, responsibilities and the coordination system. For example, the distribution of power and rights to make decision for knowledge workers has been highly suggested to speed up organizational activities and promote innovation in the company. Furthermore, the establishment and utilization of cross-functional teams may stimulate knowledge creation. Whereas, hierarchical structure slows down knowledge flows. The legitimization of various practice and interest communities tends to create powerful knowledge development forums which are likely to uphold innovation performance. Hernaus and Mikulić (2014) reveal that enriching social characteristics related to positive and socially oriented work behaviors can leverage knowledge-based activities because the coordination between superiors and subordinates takes place through interactions, collaborations and information exchanges.

According to Tobing (2007), currently, there has been a change in the world of industry from manufacturing to service industry which has implications to the characteristics of work, particularly in public sector whose nature is to serve public at large scale. In public sector, employee actions are unique which require complex decision-making based on the insights and knowledge of the employees. Organizations with knowledge workers are

organizations with well-managed customer knowledge bases. Customer knowledge should be easily accessible to help the employees provide the best service. Furthermore, Tobing (2007) reveals that the alignment among the organizations implementing KM needs to be done. The purpose is to make the structural position titles should be identical to the structure or position as the knowledge source.

2.8 Impact of knowledge management practices on innovation performance

According to the pioneering studies on knowledge-based companies, performance differences among organizations accrue due to their different stocks of knowledge and different capabilities in using and developing knowledge. The role of knowledge spillovers is strongly related to the improvement of the company performance (Ramadani *et al.*, 2017; Acs *et al.*, 2012; Hashi and Stojcic, 2012). This means that the more an organization uses management practices aimed to support efficient and effective management of knowledge for organizational benefit, the more likely it is to achieve high-business performance. Innovation performance is one of the corporate success factors in which the process encompasses various aspects including social and environmental impacts of operational processes, stimulates employee's creativity and partnerships with suppliers, customers and other business partners in designing and developing innovative products and services (Rexhepi *et al.*, 2013b).

According to Inkinen *et al.* (2015), several empirical studies have examined the influence of different aspects of knowledge-based assets and KM on innovation performance. One stream of study has revealed that generic knowledge processes – such as knowledge creation and sharing, knowledge sharing, application and storage and knowledge creation, documentation and storage, sharing and acquisition have positive impacts on a company's innovation performance. Another avenue of research has focused more on the knowledge-based assets and how the possession of those assets is associated with corporate innovation, such as the institutionalized knowledge and codified experience (i.e. organizational capital) and the interaction-based knowledge among individuals and their networks (i.e. social capital) mediate the relationship between HRM practices and incremental innovative capability, whereas social capital acts as a mediator between HRM practices and radical innovative capability. Another research discovers that highly creative, skilled and experienced employees (i.e. human capital) supplemented with well-structured networks of the company's clients (i.e. customer capital) are the key ingredients in achieving a high degree of innovation performance. The same stream of research states that employees' skill levels and the relative organizational learning capabilities (i.e. human capital), the codified knowledge embedded in the processes and information systems (i.e. structural capital) and the degree of internal and external integration with suppliers and customers (i.e. social capital) constitutes an important antecedent for product innovation. Also, other researchers have found organizational culture to be an important enabler of knowledge-related behavior at work.

In sum, researchers have provided substantial information on the relationship between knowledge processes and innovation performance, as well as on the influence of knowledge assets such as intellectual capital on innovation performance. What seems to be lacking is empirical evidence of the relationship between the conscious and systematic managerial activities, the KM practices and corporate innovation performance (Inkinen *et al.*, 2015). Andreeva and Kianto (2011) examined the combined impact of HRM practices and information and communication technology (ICT) practices on company competitiveness outcomes including innovativeness. They noted a direct relationship between ICT and innovation performance, as well as a mediated link between HRM practices and innovation performance (Andreeva and Kianto, 2011). Furthermore, Inkinen *et al.* (2015) stated that empirical literature has provided evidence that innovation performance can be facilitated by

means of IT support, knowledge strategy, knowledge protection and leadership behavior. However, these examples are quite a rarity among the body of literature. Tiwari and Buse (2007) developed a model, known as the BCF model (better, cheaper and faster) which means that innovation allows the company produce better products and services (B-better), with lower costs (C-cheaper) and faster (F-faster). A study by Ramadani *et al.* (2017) shows that investments in R&D, knowledge spillovers, age, direct export and skilled workers are significant and positively related to corporate innovation activities, and have positive and significant relationship on performance.

Based on the argumentation above, and referring to Inkinen *et al.* (2015) study, it is posited that KM practices increase effective and efficient performance of knowledge-intensive tasks, and also the innovation performance of an organization. Specifically, this hypothesis can be broken into smaller parts, each representing a particular set of KM practices. Here are the hypotheses:

H1. Leadership is positively and significantly associated with organization's innovation performance with location and employee's age as the control variable.

H2. Strategic management of knowledge and competence (strategic KM) is positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H3. Knowledge-based recruiting practices are positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H4. Knowledge-based training and development practices are positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H5. Knowledge-based performance appraisal practices are positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H6. Knowledge-based compensation practices are positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H7. Learning mechanisms are positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

H8. IT Practices are positively and significantly associated with the organization's innovation performance with location and employee's age the as control variable.

H9. Work organization is positively and significantly associated with the organization's innovation performance with location and employee's age as the control variable.

Compared to Inkinen *et al.*'s (2015) study, the difference of this research is in its object of study. Inkinen *et al.*'s (2015) study business sector, whereas this research focuses on public sector. This study also excludes knowledge protection from Inkinen model, as the object of this study has not yet implemented knowledge protection.

3. Methods

The Centre of Research and Training for Government Apparatus in Indonesia is a government institution conducting studies and innovations in the field of government administration. It conducts education and training for the apparatus, and executes the development of information systems in its field of duty, in accordance with the policies established by the Head. The agency has representatives in Bandung, Makassar, Samarinda and Banda Aceh covering all areas in Indonesia. Thus, the purpose of this study is to examine the relationship between the KM practices on the innovation performance of the Centre of Research and Training for Government Apparatus in Indonesia. The research uses a quantitative method. Creswell (2009) has defined a quantitative research as an attempt to explain a phenomenon by gathering data to be analyzed using a mathematical or statistical method/test. In this study, data are gathered through an explanatory survey method by including some variables under investigation, i.e. leadership, strategic KM, knowledge-based recruiting practices, knowledge-based training and development practices, knowledge-based performance appraisal practices, knowledge-based compensation practices, learning mechanisms, IT practices, work organization and innovation performance. The data are distinguished as primary and secondary ones. Primary data were obtained through a set of questionnaires as a measuring instrument, while secondary data were taken from literature and other supporting documents.

3.1 Sample and data collection

The hypotheses were tested with survey data collected through structured surveys using key informant techniques. The initial population stems from the number of employees at the Government Apparatus Research and Training Center in Indonesia in four cities of Indonesia covering Bandung, Makassar, Samarinda and Banda Aceh. These four areas include the head quarter and all regional representatives of the Government Apparatus Research and Training Center in Indonesia. The sampling technique uses total sampling. The total employees are 243 people. The questionnaire was delivered to 243 employees and received 230 responses. This represents a 95 per cent response rate. To get a high response rate, researchers worked together with the people in charge in each area and provide them with the opportunity to collect the data for a month in each area. The response rate from Bandung was 88 out of 91 employees (96.7 per cent), Makassar was 62 out of 68 employees (91.2 per cent), Samarinda was 34 out of 40 employees (85 per cent) and Banda Aceh was 42 out of 44 employees (95.5 per cent). Most of the respondents were male (59.7 per cent) with a bachelor degree in education (39.8 per cent) with age below 35 (49.6 per cent).

3.2 Measures

This study uses SEM analysis techniques to measure organization performance, the data are processed using PLS. This study is made up of independent variables, dependent variables and control variables. *Independent variables*: KM practices are measured using primary scales developed from Inkinen *et al.* (2015). All of the measures are based on five-point Likert scales (1 – strongly disagree, 5 – strongly agree). *Dependent variables*: The scale of

innovation performance is also developed from Inkinen *et al.* (2015). The scale (Likert scale from 1 – very bad to 5 – excellent) consisted of five items in which respondents were asked to compare their organization's success with the competitors' in terms of creating innovations and new operating methods. *Control variables*: Two variables (i.e. respondent's age and the location) are used as control variables to eliminate any possible effect taking place on innovation performance. The age of employees is measured by the level of innovation in individuals based on the generation (baby boomers, gen X and gen Y).

3.3 Statistical methods

Data collected from the structured survey were analyzed in several steps using various statistical methods. First, the internal consistency was analyzed to determine whether the measures used were applicable to measure the chosen constructs. The internal consistency was evaluated by two measures of discriminant validity and convergent validity. Convergent validity was assessed by the value of communality, strength and statistical significance of the factor loadings, as well as with the value of the average variance extracted (AVE). Second, the discriminant validity of the constructs in this study was tested. Discriminant validity indicates whether the constructs are completely different from each other. The discriminant validity was assessed by comparing the AVE with the individual constructs and the shared variance between a given construct and the other constructs in the model. The shared variance was calculated as the squared correlation between the two constructs, in this study, it was calculated by squaring the correlation between each pair of constructs. Finally, structural equation modeling was used for statistical testing of the hypothesized relationships. The authors focus on the signs of path estimates, the statistical significance and strength of the path estimates and the number of independent variables used (i.e. KM practices) are able to explain the dependent variable (i.e. innovation performance). One direct effect model was estimated including all of the independent variables, two control variables (i.e. employee's age, the location of organization) and the dependent variable.

4. Results and discussion

A model built on a logical theoretical basis was constructed to test the hypothesized relationships between KM practices and innovation performance. PLS software version 2 was used for the analysis. The first step was to assess the reliability and validity of the measurement model. After that, a structural model was used to test the hypotheses.

4.1 Result

4.1.1 Correlation analysis. Table I presents the mean values, standard deviations and correlation matrixes for KM practices and innovation performance. The matrixes show a significant correlation between independent variables (i.e. KM practices) and dependent variable (i.e. innovation performance). These findings demonstrate and support the authors' expectations about the inter-correlation between KM practices and innovation performance.

4.1.2 Measurement models. To test the measurement models, the internal consistency and the discriminant validity were assessed. Measures of composite reliability (CR) and convergent validity represent internal consistency. CR test results show that all constructs have values above the generally accepted threshold of 0.7 (Abdillah and Jogiyanto, 2015). In the test for convergent validity, CR, the factor loadings and AVE were examined. First, it was found that all the items have high and statistically significant loadings. This result tells us that all items related to their specific constructs verify the assumed relationship between

the indicators and the constructs. Second, the average variance extracted (AVE) measures exceeded the cut-off point of 0.50 (Abdillah and Jogiyanto, 2015) in all constructs of this study. Thus, referring to all the criteria for convergent validity, it appeared that the prepared steps could be applied.

The test for discriminant validity indicates the extent to which the constructs differ from each other. To show discriminant validity, the AVE of the construct should be greater than the variance shared between that construct and the other constructs in the model (i.e. the squared correlation between two constructs) (Abdillah and Jogiyanto, 2015). All constructs in this study have met this condition; in particular, the diagonal elements (AVEs) are greater than the non-diagonal elements in the corresponding rows and columns (Table II).

In short, the model assessments have shown good evidence of validity and reliability for the operationalization of the concepts.

4.1.3 Testing the research models. The direct effect model for KM practices is able to explain 53.13 per cent of the variance in the innovation performance (Figure 1).

To test the hypothesis, the structural model (inner model) is used as seen in Figure 2 below:

The path estimates from IT practices and Work Organization are as hypothesized. Thus, *H8* and *H9* of this study are supported. On the other hand, the path estimates of leadership,

Variables	Mean	SD	Correlation matrix
Leadership (L)	3.86	0.799	4.47
Strategic KM (SKM)	3.80	0.746	6.71
Knowledge-based recruiting (KBR)	3.61	0.762	13.07
Knowledge-based training and development (KBTD)	3.43	0.878	9.74
Knowledge-based performance appraisal (KBPA)	3.48	0.862	12.74
Knowledge-based compensation (KBC)	3.45	0.860	−14.5
IT practices (ITP)	3.93	0.688	13.17
Learning mechanisms (LM)	3.61	0.767	12.89
Work organizations (WO)	3.78	0.725	31.85
Innovation performance (KI)	3.80	0.715	4.08

Table I. Mean values, standard deviation

Variable	ITP	KBC	KBPA	KBR	KBTD	KI	L	LM	LO	SKM	U	WO
ITP	1	0	0	0	0	0	0	0	0	0	0	0
KBC	0.5082	1	0	0	0	0	0	0	0	0	0	0
KBPA	0.4564	0.6228	1	0	0	0	0	0	0	0	0	0
KBR	0.563	0.5534	0.5448	1	0	0	0	0	0	0	0	0
KBTD	0.5218	0.5957	0.5691	0.6564	1	0	0	0	0	0	0	0
KI	0.5622	0.4334	0.4747	0.5726	0.5414	1	0	0	0	0	0	0
L	0.4963	0.4446	0.3595	0.4917	0.5566	0.438	1	0	0	0	0	0
LM	0.6322	0.576	0.5737	0.6423	0.5737	0.5483	0.4243	1	0	0	0	0
LO	0.0553	0.0686	−0.0038	0.0356	−0.0258	0.1503	0.047	0.1187	1	0	0	0
SKM	0.5762	0.4631	0.5185	0.6486	0.5201	0.5052	0.4615	0.5627	−0.0356	1	0	0
U	0.0296	0.1159	0.1094	0.0553	0.0494	0.0983	0.0792	0.061	0.0546	0.0619	1	0
WO	0.5845	0.5352	0.38	0.5353	0.548	0.5879	0.477	0.4594	0.01	0.4279	0.0651	1

Notes: LO (Location); U (Employee's age)

Table II. Latent variable correlation

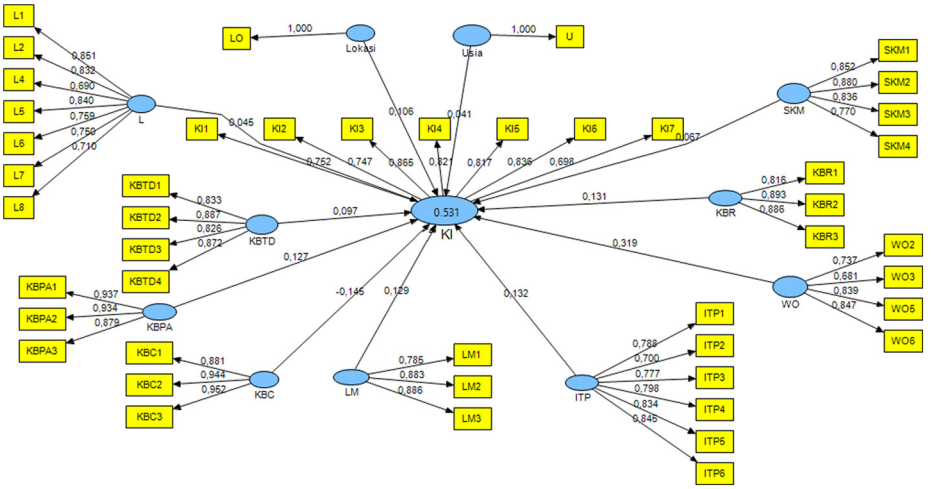

Figure 1.
Measurement model/ outer model

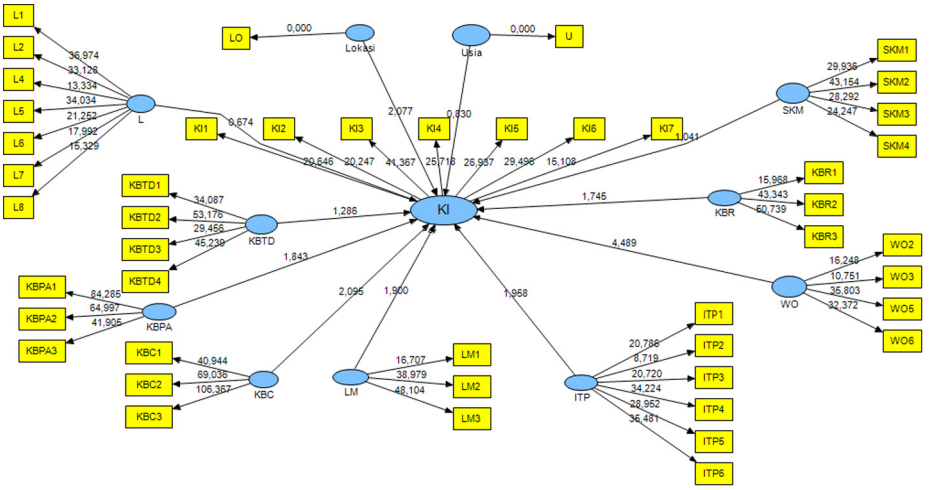

Figure 2.
Structural model (inner model)

strategic KM, knowledge-based recruiting knowledge-based training and development, knowledge-based performance appraisal and learning mechanisms are contrary to *H1*, *H2*, *H3*, *H4*, *H5* and *H7*. The remainder of the posited relationships is statistically insignificant, and thus the hypotheses were rejected. Second, the path estimates of knowledge-based compensation is significant but in negative way. It means that in this research, if the knowledge-based compensation increases then the innovation performance will decrease. The path estimates of the employee's age as control variable is insignificant but organization's location as control variable is significant. Thus, organization's location (Bandung, Makassar, Samarinda and Banda Aceh) has a significant influence on the performance of organizational innovation. This may be related to the age of the

Path	Path coefficient (β)	t-statistics
Independent variables		
Leadership → innovation performance	0.0447	0.6736
Strategic KM → innovation performance	0.0671	1.0407
Knowledge-based recruiting → innovation performance	0.1307	1.7451
Knowledge-based training and development → innovation performance	0.0974	1.2862
Knowledge-based performance appraisal → innovation performance	0.1274	1.843
Knowledge-based compensation → innovation performance	−0.1448	2.0954*
Learning mechanisms → innovation performance	0.1289	1.8996
IT practices → innovation performance	0.1317	1.9579*
Work organization → innovation performance	0.3185	4.4894*
Control variables		
Employees age → innovation performance	0.0408	0.8301
Location → innovation performance	0.1063	2.0773*
R2	53.13%	

Note: *Significant at α 0.1

Table III.
Testing the research models for KM practices and innovation performance

H1	Leadership is positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H2	Strategic management of knowledge and competence is positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H3	Knowledge-based recruiting practices are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H4	Knowledge-based training and development practices are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H5	Knowledge-based performance appraisal practices are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H6	Knowledge-based compensation practices are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H7	Learning mechanisms are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Not supported
H8	KM supportive IT practices are positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Supported
H9	KM supportive work organization is positively and significantly associated with the organization's innovation performance with location and employee's age as control variable	Supported

Table IV.
A Summary of the findings

organization, the character of employees in each region and the role of management in cultivating innovation. Thus, it appears that the location of the organization will affect innovation performance, but the age of the employees does not affect the organization's ability to innovate (Tables III and IV).

4.2 Discussion

Based on the result of structural model, in some variables, this study has the same findings as Inkinen *et al.* (2015). In term of IT practices, both studies show a positive and significant influence toward innovation performance. And concerning leadership, knowledge-based recruiting, knowledge-based training and development, knowledge-based performance appraisal and learning mechanism, both studies show no significant influence toward innovation performance. Whereas, strategic management and work organization have the opposite results. In this study, strategic management has no significant influence, while Inkinen *et al.* (2015) find it significant. Otherwise, work organization in this study has a positive and significant influence, while Inkinen *et al.* (2015) find it insignificant. Surprisingly, according to Inkinen *et al.* (2015) knowledge-based compensation has a positive and significant influence on innovation performance; meanwhile, this research show that based-knowledge compensation is negatively significant. Three variables supporting the hypothesis are described in Section 4.2.1, Section 4.2.2 and Section 4.2.3.

4.2.1 IT practices. According to the results of this study, IT practices are positively and significantly associated with the organization's innovation performance. The findings of the structural model suggest that innovation performance tends to be higher in organizations which consider the implementation of information and technology as an enabler in making innovation. These findings reaffirm the prevailing understanding of how IT practices can positively affect the performance of organizational innovation as they can be used to analyze knowledge for making better decisions and IT can also be used to optimally gather stakeholder-related knowledge. In KM processes, IT can be used ranging from knowledge acquisition, knowledge storage/documentation and knowledge sharing to knowledge creation which will ultimately lead to organizational innovation.

Furthermore, IT practices supported by KM can be an influential factor in the performance of organizational innovation. This finding is in line with Yang *et al.* (2009) as disclosed by Inkinen *et al.* (2015) that IT supports for collaboration, communications, information search, real-time learning, simulations and predictions are highly beneficial for a corporate innovation.

Similarly, in line with findings by Andreeva and Kianto (2012), who wrote that ICT practices directly support corporate performance, including innovation performance, and also mediate the impact of HRM practices. Furthermore, Alavi and Leidner (2001) as revealed by Inkinen *et al.* (2015) have stated that IT provides a great help to modern knowledge workers when used in the search and discovery of information, and in building new and efficient communication channels between corporate internal and external stakeholders.

4.2.2 Work organization. According to the results of this study, work organization has a significant relationship with innovation performance. In an effort to improve the performance of organizational innovation, research and training center in Indonesia must improve its work organization both internally and externally. So far, this research and training center has no innovation units and/or parties specifically responsible for KM within the organization. The research and training center has only an innovation laboratory as a medium to deliver innovation performance. An innovation unit is needed by any organization to perform their functions effectively so that there is no knowledge gap in every organizational element and the unit is also able to create a good KM system.

Meanwhile, there is no formal cooperation related to innovation between each research and training center in Indonesia. In fact, cooperation is needed to build an integrated innovation system so that the innovation performance of each organization can increase. Through a good work organization, it is expected that commitment of the organization members can increase which will ultimately improve the performance of the organization.

In addition, the research and training center should provide sufficient opportunities for the decision-making process and provide sufficient space for the individual decision-making process within the organization. Otherwise, this will hinder the innovation process of a person in completing hihe/sher task. Giving certain authority to someone will bring up innovative ways to accomplish everyday tasks such as Inkinen *et al.* (2015).

4.2.3 Knowledge-based compensation. Another KM practice that is likely to be an influential contributor for corporate innovation performance is knowledge-based compensation. This HRM practice encourages employees to engage in intensive knowledge activities through reward and promotion systems to appreciate their involvement in knowledge processes such as knowledge sharing, knowledge creation and knowledge utilization. According to previous research, knowledge-based compensation has a positive effect on innovation performance (Inkinen *et al.*, 2015). Contrary to the result of this study revealing that knowledge-based compensation has a statistically significant negative correlation with organizational performance innovation. Although this finding is surprising and contradictory to the existing empirical evidence, but it is explainable. This means that employees of the apparatus research and training centers in Indonesia do not expect any compensation (financially) associated with the resulting innovation. Thereby, the compensation provided by the research and training center for their employees is non-financial, in the form of providing opportunities for competency development through short courses, scholarships for continuing education, training and so on. However, based on interviews with some employees, it was found that such non-financial compensation systems were deemed inadequate because they still considered it an additional task beyond the basic tasks.

4.2.4 Other knowledge management practices. The additional six KM practices in this research model do not show statistically significant association with organizational innovation performance. Four of the six KM practices which have no significant effect on innovation performance illustrate human resource management practices. They are knowledge-based recruitment, training and development, performance appraisal and learning mechanisms. These facts also occur in Inkinen *et al.* (2015) research conducting similar studies in the business sector. While other scholars argue that strategic human resource management shows a relationship with innovation performance (Aryanto; *et al.*, 2015). These conflicting findings require more attention and in-depth study.

In another perspective, this result can be partially explained by the theoretical contribution of Kianto *et al.* (2014) suggesting that improvements in corporate performance outcomes can be derived from the combined effects of knowledge assets (i.e. intellectual capital) and systematic and deliberate managerial activities (i.e. KM practices). Thus, there is a fundamental potential interaction effect in terms of moderation and mediation which cannot be detected by simply focusing on KM practices and company performance outcomes. To improve understanding about knowledge assets and innovation performance, the research path raising from this argument should be the subject of future research.

5. Conclusion and recommendation

Overall, this study adds a better understanding of how knowledge should be managed for organizational benefit. It contributes to the knowledge-based view of organization by utilizing empirical data with large sample sizes to show the most efficient management mechanisms to improve innovation. Furthermore, the division of KM practices into nine types and the provision of validated measurement scale adds to the general understanding of KM as a field of theory and practice, and offers the avenues for further research with the same instruments. The study also adds to the innovation management literature by demonstrating the impact of KM as a managerial tool to advance innovation.

The results of this study increase the understanding of the most effective KM practices that may improve the performance of corporate innovation because it serves as a guideline for managers. The findings in this study are valuable for managers because they are obtained by examining the effect of actual managerial practices on innovation performance. Thus, this study deals with the daily work of managers that can spark interest and action between them. Work organization and IT practices as a major component seem to be positively and significantly linked with organizational innovation. At the practical level, work organization is about building an organization that supports innovation. The establishment of innovation units and/or parties specifically responsible for KM is expected to be an enabler in innovation performance within the organization. ICTs can also be used to make a difference in innovation performance. Nowadays, the amount of information available to organizations is enormous. It can be seen as either a threat or an opportunity. Companies which are able to see the positive side of the situation will leverage IT support in searching, gathering and analyzing information to support their decision-making and innovation performance. IT can also assist in open innovation by providing a platform for joint innovation with external parties, as well as building a variety of communication channels for the internal and external stakeholders. Thus, managers should consider IT not only as a support system but also as a facility to achieve improved innovation and company performance.

The findings of this study, however, indicate that organizations are potentially better through performance-wise innovations if they use other incentive/compensation systems based on knowledge. When traditional economic figures are replaced with indicators such as knowledge creation, sharing and utilization, employees will be more likely to engage with such activities and will improve the innovation performance of the entire organization.

This study has some limitations due to the design and research context chosen which can also serve as a basis for further research direction. First, this study examines the relationship between KM practices and innovation in public sector organizations in Indonesia related to apparatus training. Knowledge-intensity and innovation management vary widely among public sector organizations. Thus, comparative studies of KM practices and innovation performance between different public sectors and/or the private sectors can be interesting to do. In the future studies, this phenomenon should also be examined in other contexts. Second, the current study is a one-time correlational study conducted in a cross-sectional study setting. However, to examine the causal relationships between independent and dependent variables, a longitudinal study should be performed. Collecting time-series data will allow researchers to gain a greater understanding of the causal and longitudinal nature of KM practice effects on innovation performance.

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