



The relationships between knowledge creation processes, organizational learning, and innovation capability in Indonesian automotive parts suppliers

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Abstract

Previous studies on the relationship involving knowledge creation process, organizational learning, and innovation capability among manufacturing companies gave mixed results. In addition, there is little empirical research examining how the influence of knowledge creation processes contributes to innovation. In particular, research focusing on the role of mediation variable in relation to the influence of the knowledge creation process on innovation capability is also limited. The purpose of this study is to examine the role of organizational learning as a mediating variable in the relationship between knowledge creation process and innovation capability. The sample of the study is 82 Indonesian automotive parts suppliers. All the companies are categorized as small and medium enterprises and are located in Banten and Jakarta Province of Indonesia. The results of this study indicate that the knowledge creation process has a positive effect on organizational learning and innovation capability. In addition, the study found that organizational learning also significantly mediates the relationship between knowledge creation process and innovation capability.

Keywords: knowledge creation, organizational learning, innovation capability

1. Introduction

Recent years, the business environment has become increasingly global characterized by increased competition among companies as well as market and environmental changes (Wang and Wang, 2012)^[27]. Under such conditions, Raymond and St-Pierre (2010)^[23] claimed that continuity and development of company business will be largely influenced by firm ability to adapt its strategies in response to environmental changes and market conditions. In line with this statement, Forsman (2011)^[7] argues that continuous innovation is the key to cope with market and environmental changes and maintain a firm competitive advantage (Forsman, 2011)^[7].

In order to develop innovation capability, every company is required to acquire and utilize available resources to constantly seek, create and utilize new knowledge that enables them to develop new ideas concerning company products or services, technology or production procedures, organizational practices, and marketing methods (Gunday *et al.*, 2009). This is in line with Raymond and St-Pierre (2010)^[23] who argue that one of the main challenges of companies is to innovate sustainably. In addition, gaining new knowledge is also an important approach the company needs to apply. Specifically, Wang and Wang (2012)^[27] states that sharing knowledge process, whether in the form of tacit or explicit knowledge, is intrinsically related to innovation and quality speed.

Review of the literature indicates that the relationship between knowledge creation and innovation capability has been explored by many researchers. Some of these studies conclude that knowledge creation is a determinant of innovation capability (Nonaka, 1991^[18]; Nonaka and Takeuchi, 1995^[16];

Nonaka *et al.*, 2006; Wang and Wang, 2012)^[27]. In particular, Nonaka (1991)^[18] and Nonaka and Takeuchi (1995)^[16] state that a company possessing some degree of creating knowledge capability will be successful in the marketplace. Based on their research on how the knowledge creation process within Japanese companies taking place, they compile a theory concerning knowledge conversion called as SECI model. In essence, this theory is built on the four forms (modes) of knowledge conversion: Socialization, Externalization, Combination and Internalization. In this perspective, Nonaka (1991)^[18] and Nonaka and Takeuchi (1995)^[16] asserted that the key to business success of Japanese companies lies in their capability to create and utilize new knowledge on an ongoing basis, not because of their technological mastery and financial ability. This study focuses on the process of knowledge creation as set out in the SECI model. This model has been recognized by many experts as an important contribution to the development of knowledge management science (Garcia-Morales *et al.*, 2008^[9]; Schulze and Hoegl, 2008)^[25].

Some scholars have examined the relationship between the four modes of knowledge creation (socialization, externalization, combination and internalization) and innovation capability. The results of these studies turned out to be diverse. For example, Binbin *et al.* (2012)^[3] confirmed that knowledge socialization, externalization, combination and internalization positively contribute to innovation capability within Chinese companies. According to the authors, out of the four modes of knowledge creation, there is only two modes of knowledge creation positively contribute to innovation capability: knowledge externalization and combinations. Meanwhile, Schulze and Hoegl (2008)^[25] found

that knowledge externalization mode negatively associated with the generation of product ideas. With the diverse empirical findings from previous studies, it is interesting to examine the relationship between knowledge socialization, externalization, combination and internalization and innovation capability within the context of Indonesian manufacturing SMEs.

While many studies focusing on the influence of knowledge creation process on innovation capabilities have been taken place, there is little empirical research examining how knowledge creation processes contribute to enhanced innovation capability. In addition, study examining the impact of mediation variables particularly in relation to the influence of the knowledge creation process on innovative reliability is also limited. This study proposes organizational learning as a mediating variable in the relationship between knowledge creation process and innovation capability. In particular, previous studies have shown that knowledge creation, transfer and application have a positive effect on organizational learning which in turn contributes to the enhancement of business innovation (Ramirez and Kumpikaite, 2012) [22]. Popadiuk and Choo (2006) [21] also found that how knowledge is built, stored, exchanged, transferred, rebuilt is affecting organizational learning process, which in turn impacts on innovation process enhancement. The purpose of this study is to examine the relationship between knowledge creation process, organizational learning, and innovation capability in the context of SMEs automotive parts suppliers in Indonesia. In particular, the main purpose of this study is to examine [1] the influence of the knowledge creation process on innovation capability and [2] the mediation effect of organizational learning in the relationship between knowledge creation process and innovation capability.

2. Literature Review and Hypothesis Development

2.1 Knowledge Creation

This study uses SECI model developed by Nonaka (1991) [18] and Nonaka & Takeuchi (1995) [16] to build a theoretical framework in analyzing knowledge creation process residing in the company. Nonaka (1991) [18] argues that innovation capabilities of many Japanese companies are based on their unique approach in managing new knowledge creation. Nonaka and Takeuchi (1995) [16] stated that new knowledge can be created and shared through four interaction processes: knowledge socialization, externalization, combination and internalization (SECI). According to the SECI model, the first stage of knowledge creation process is knowledge socialization. In this perspective, knowledge socialization is defined as new tacit knowledge creation through tacit knowledge sharing among individuals. Tacit knowledge can be created and shared through social interaction between individuals and experts through observation, imitation and practice (Nonaka, 1991) [18]. Companies are able to absorb tacit knowledge through interaction with their customers or suppliers. This form of knowledge creation can also take place during brainstorming programs where creative discussion and experience sharing take place to solve problems and to generate new ideas (Nonaka and Takeuchi, 1995) [16].

The second stage of knowledge creation process is knowledge externalization. Knowledge externalization refers to the

process of converting tacit knowledge into explicit knowledge. In this perspective, knowledge is transferred from individual knowledge to group knowledge. The use of analogy and creative dialogue can help individual to articulate tacit ideas and create explicit new product concepts (Nonaka & Takeuchi, 1995) [16]. The third stage of knowledge creation process is knowledge combination. Nonaka (1991) [18] states that knowledge combination refers to a combination of explicit knowledge that generates new explicit knowledge and is shared among the organization members. Process of knowledge combinations can occur through meetings, conversations, documents and computer communication networks.

Lastly, the fourth stage of knowledge creation process is knowledge internalization. According to Nonaka and Takeuchi (1995) [16], knowledge internalization refers to the conversion of organizational explicit knowledge into individual tacit knowledge. At this stage, individuals acquire organizational explicit knowledge and transform it into new tacit knowledge by implementing it in their working practices. Process of knowledge internalization can take place through a variety of ways: e.g., training programs, experimentation, reading and using documents on job duties, and job rotation. Nonaka *et al.* (2000) convey an idea that employees can convert explicit knowledge into new tacit knowledge using work procedure manual, which lists explicit experiences of other employees. New spiral of knowledge creation process will start again when knowledge internalization is complete.

Literature extensively states that company ability to innovate is an important factor for survival and enhancement of its competitiveness. In particular, previous studies has identified several factors driving innovation, suggesting that company capacity to acquire and use knowledge is a key driving force for innovation (Nonaka and Takeuchi, 1995 [16]; Popadiuk and Choo, 2006 [21], Ramirez and Kumpikaite, 2012) [22].

Innovation can be referenced as execution success of creative ideas, tasks, or procedures. These creative ideas are generated through social interactions that enables knowledge creation and sharing. Innovation can also be understood as new knowledge embedded into products, processes or services (Nonaka and Takeuchi, 1995) [16]. Nonaka and Takeuchi (1995) [18] provide a similar argument, stating that [1] knowledge can be understood as an essential component of innovation process, [2] the level of knowledge use has a positive effect on innovation capability, [3] the amount of new knowledge gained and applied determines the level of innovation, [4] both tacit and explicit knowledge contribute to innovation speed and quality.

Nonaka and Takeuchi (1995) [16] emphasize that knowledge creation, spread, and application within organization is an important driving factor of corporate innovation. Popadiuk and Choo (2006) [21] describes that innovation will take place on the ongoing knowledge creation process. This process allows the company to recognize the opportunities and generation of new ideas. In this perspective, the ideas novelty is dependent on two types of knowledge created and used, namely tacit and explicit knowledge. Individual tacit knowledge will be realized and communicated to other individuals through socialization and externalization process. Nonaka and Takeuchi (1995) [16] emphasize that both types of

knowledge creation are the basis of the creation of new concepts.

Furthermore, Schulze and Hoegl (2008) ^[25] suggests that knowledge socialization process is positively related to the novelty of product ideas. According to the authors, direct and informal interaction between individuals, with each diverse perspective, will generate new product ideas. This interaction can occur inside or outside the company, especially with consumers. This interaction can lead to the creation of new products that meet the needs of consumers. In addition, the authors also pointed out that knowledge internalization process also has a positive effect on the novelty of product ideas. Both scholars argue that internalization will increase the absorption level of existing knowledge, which in turn allows individuals to create new knowledge and ideas.

2.2 Organizational Learning

Organizational learning has become the main focus of much research. The literature on organizational learning shows the two main approaches to defining organizational learning, namely behavioral and cognitive approaches. Behavioral approach conceptualizes organizational learning as a result of linkage of stimuli and responses that change behavior. At the organizational level, organizational learning occurs when the company faces environmental change and adjusts its behavior (e.g., Liao *et al.*, 2008). Meanwhile, according to the cognitive approach, organizational learning is defined as the modification of organizational knowledge state and interpretation ways in which influences organizational change (Liao *et al.*, 2008).

Referring to Skerlavaj *et al.* (2010), two types of learning are available, namely one loop learning and two loop learning. According to the scholars, one loop learning (also called as adaptive learning) refers to the minor adaptation of behavior focusing on error correction without reflecting on relevant strategies and actions. Meanwhile, two loop learning (also called as generative learning) leads to deeper changes. Generative learning takes place when challenges arise to routine and new mental models.

Organizational learning is also could be referenced as changes in organizational behavior. These changes arise due to knowledge acquisition, distribution, interpretation, and storage. Organizational learning is the result of cognitive and behavioral changes. The SECI model essentially combines the two dimensions of learning: cognitive and behavioral learning. Socialization and internalization are related to behavioral learning whereas combination and externalization are associated with cognitive learning (Nonaka and Takeuchi, 1995) ^[16].

Several previous studies have explored the relationship between knowledge creation the process and organizational learning (e.g. Garcia-Morales *et al.*, 2012 ^[8]; Nonaka & Takeuchi, 1995) ^[16]. Some of these studies confirm that organizational learning is dependent on the exploitation of knowledge resources, both internal and external sources. Knowledge creation and transfer, resulting from interaction among individuals, is an important variable in which organizational learning takes place. Other studies asserted that in a company where activities related to knowledge creation

be held more frequently, cognitive and behavioral changes will emerge. In general, previous studies claims that the presence of knowledge socialization, externalization, combination and internalization is important characteristics of organizational learning (Garcia-Morales *et al.*, 2012 ^[8]; Nonaka & Takeuchi, 1995) ^[16]. Following the discussions, this study put forwards the following hypothesis.

H1: Knowledge creation has a positive impact on innovation capability

H2: Knowledge creation has a positive impact on organizational learning

Furthermore, literature suggests that organizational learning is an important factor of innovation process. In this perspective, Liao *et al.* (2008) argued that knowledge possessed by the company will encourage corporate learning culture in order to keep innovating. In addition, innovation is closely related to the learning processes resulting in the generation of new products, production techniques, organization forms, and marketing methods. In similar, Nonaka and Takeuchi (1995) ^[16] proposed that organizational learning positively associated with the generation of innovative ideas. In particular, organizational learning will enables the company to design new products to meet consumer needs and introduce new products to the market successfully. The literature also suggest that internal and interactive learning between companies and institutions in the wider business environment are mutually reinforcing one another and bringing the optimal results in terms of innovation performance. In this perspective, scholars widely suggested that organizational learning positively correlates with the level of innovation capability (Garcia-Morales *et al.*, 2012 ^[8]; Skerlavaj *et al.*, 2010). Following the discussions, this study put forwards the following hypothesis.

H3: Organizational learning has a positive impact on innovation capability

As noted in the previous discussion, the literature emphasizes the role of knowledge creation process as a driving force for organizational learning, which in turn contributes to the level innovation capability. In this regard, Jimenez-Jimenez and Sanz-Valle (2011) ^[13] emphasized that knowledge creation influences organizational learning as well as an important factor for innovation. Such a condition suggests that organizational learning is a mediator in the relationship between knowledge creation process and innovation capability. Following the discussions, this study put forwards the following hypothesis.

H4: Organizational learning significantly plays a role as mediator in the relationship between knowledge creation process and innovation capability

3. Research Methodology

3.1 Research model

Following the results of literature review described in the previous section, this study builds a research model as shown in Figure 1. This model postulates that knowledge creation through knowledge socialization, externalization, combination, and internalization has a direct influence on product and process innovation capability. Knowledge creation process also has a direct influence on organizational learning; which in turn will affect the innovation capability.

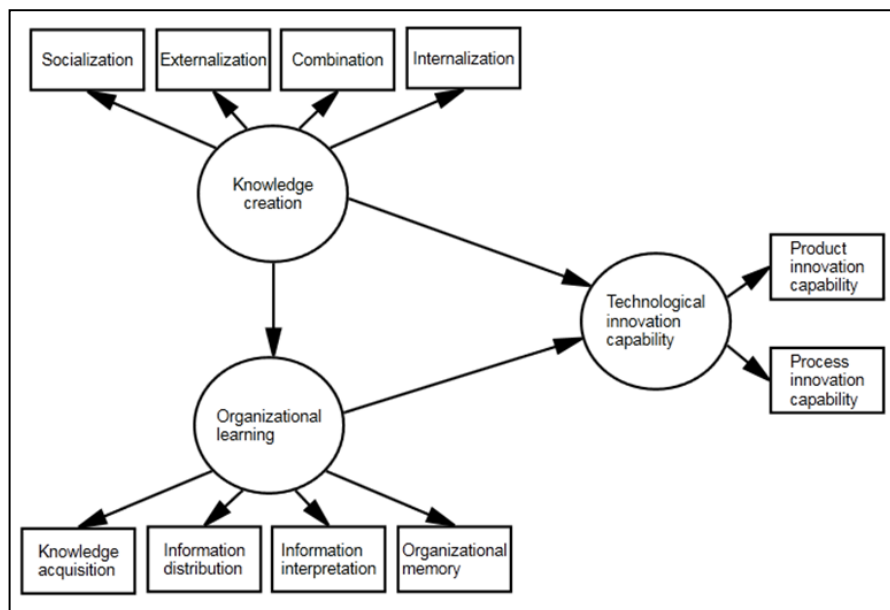


Fig 1: Conceptual framework of this study

3.2 Sample and data collection

This study applied a survey method to collect data concerning the variables being investigated. The data was administered by using structured questionnaire forms distributed to 400 sample firms located in the Banten and Jakarta Province of Indonesia. A total of 82 questionnaires were returned: representing a response rate of 23%. The received questionnaires have been valid for further analysis. For the purpose of this study, all items required five-point Likert responses ranged from 1 (strongly disagree) through 5 (strongly agree).

3.3 Variable measurement

Knowledge creation process

Following Nonaka (1994)^[17], this study considers knowledge creation process as multidimensional constructs: socialization, externalization, combination, and internalization. A total of 16 items developed by Sabherwal and Becera-Fernandez (2003)^[24] was utilized to measure the construct of knowledge creation process. In this perspective, four items measured socialization, five items measured externalization, four items measured combination, and three items measured internalization.

Organizational learning

Referring to Perez *et al.* (2004)^[20], this study includes four dimensions to assess organizational learning construct. These four dimensions are knowledge acquisition, information distribution, information interpretation, and organizational memory. A total of 16 items adopted from Perez *et al.* (2004)^[20] work was utilized to measure the construct of organizational learning. In this perspective: three items measured knowledge acquisition, three items measured information distribution, three items measured information interpretation, and four items measured organizational memory.

Innovation capability

This study focuses on technological innovation capability.

This study considers that technological innovation capability is a multidimensional construct consisting of two dimensions: product and process innovation capabilities (OECD, 2005). A total of nine items adopted from Camison and Lopez, (2010)^[20] work was utilized to measure the construct of technological innovation capability. Product innovation capability consists of four items and process innovation capability comprises five items.

3.4 Data Analysis Method

All variables being investigated in study, i.e., knowledge creation, organizational learning, and innovation capability, were treated as latent variables. This study applied a structural equation modeling (SEM) to assess the structural model representing the relationship among variables. In particular, this study applied the two-stage approach to examine the proposed model (Anderson and Gerbing, 1988)^[1]. Firstly, this study conducts a confirmatory factor analysis to assess the adequacy of the measurement model in relation to its reliability, validity, and dimensionality of scales. Secondly, this study examines the proposed hypotheses on the structural relationships among variables being investigated. To this end, this study runs AMOS 5 with maximum likelihood estimation techniques. Following Fornell and Larcker (1981)^[6], this study applies five statistics to assess the model fit: the Chi-square (χ^2), goodness-of-fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSA).

4. Result and Discussion

4.1 Measurement Model Analysis

Individual item reliability

Following previous studies, this study applies factor loadings to evaluate the individual reliability of the items. To this end, this study applied a principal component analysis (PCA) to generate factor loadings of the items. According to Hair *et al.* (1995), factor loadings of 0.5 or 0.6 may be considered acceptable. Table 1, Table 2, and Table 3 show the factor

loadings of all the constructs being investigated in this study. As can be seen in these three tables, all the factor loadings are above the minimum value required.

Construct reliability

Furthermore this study calculates Cronbach alpha to ensure the internal consistency of all the indicators. According to

Hair *et al.* (1995), factor loadings of 0.6 or 0.7 may be considered acceptable. To this end, this study applied a reliability analysis to generate Cronbach alpha of the construct being investigated. The results presented in Table 1, Table 2, and Table 3 confirm a good internal consistency of all the indicators.

Table 1: Validity and reliability results for innovation capability

Dimensions	Items	Factor loading	Cronbach alpha
Product innovation	Inov11	0.77	0.87
	Inov12	0.76	
	Inov13	0.73	
	Inov14	0.71	
Processinnovation	Inov21	0.82	0.88
	Inov22	0.75	
	Inov23	0.67	
	Inov24	0.79	
	Inov25	0.84	

Table 2: Validity and reliability results for knowledge creation process

Dimensions	Items	Factor loading	Cronbach alpha
Socialization	Creat11	0.85	0.79
	Creat12	0.69	
	Creat13	0.71	
	Creat14	0.74	
Externalization	Creat21	0.85	0.87
	Creat22	0.86	
	Creat23	0.77	
	Creat24	0.82	
	Creat25	0.89	
Combination	Creat31	0.73	0.89
	Creat32	0.65	
	Creat33	0.83	
	Creat34	0.74	
Internalization	Creat41	0.71	0.83
	Creat42	0.86	
	Creat43	0.69	

Table 3: Validity and reliability results for organizational learning

Dimensions	Items	Factor loading	Cronbach alpha
Knowledge acquisition	Soc 01	0.85	0.87
	Soc 02	0.69	
	Soc 03	0.71	
	Soc 04	0.74	
Information distribution	Ext 01	0.85	0.83
	Ext 02	0.86	
	Ext 03	0.73	
	Ext 04	0.82	
	Ext 05	0.89	
Information interpretation	Com 01	0.87	0.84
	Com 02	0.79	
	Com 03	0.86	
	Com 04	0.74	
Organizational memory	Int 01	0.87	0.76
	Int 02	0.73	
	Int 03	0.84	
	Int 01	0.87	

4.2 Structural Model

This study applied a structural equation modeling (SEM) to assess causal relationships between knowledge creation, organizational learning, and innovation capability. For the purpose of study, several fit indices were applied to verify the full structural models fit. Referring to Hu and Bentler (1999) [11], this study is required to determine that the Chi-Square value per degrees of freedom is ≤ 3 , the Goodness-of-fit index (GFI) value is ≥ 0.90 , the Tucker Lewis Index (TLI) value is > 0.95 , and that the Root Mean Square Error of Approximation (RMSEA) value is ≤ 0.08 . The result presented in Table 4

confirms that the model has an excellent adjustment to the data.

Table 4: Fit indices of model tested

Fit indices	Level of acceptance	Model tested
X2/df	≤ 3	1.928
GFI	> 0.90	0.964
TLI	> 0.90	0.943
RMSEA	< 0.08	0.061

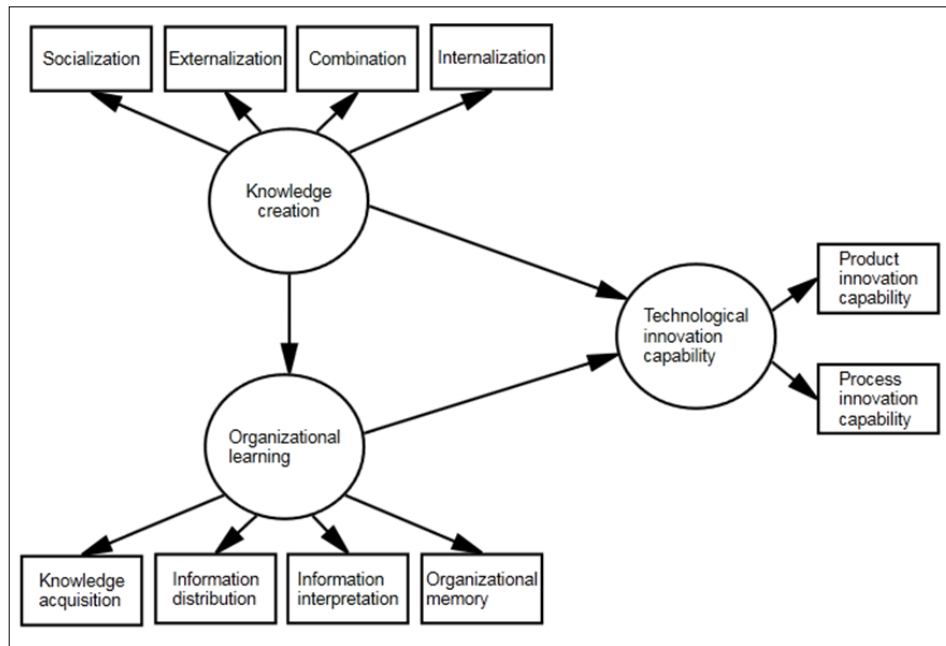


Fig 2: Structural model between the creation of knowledge, organizational learning, and innovation capability

The first hypothesis was associated with the relationship between knowledge creation and innovation capability. This research hypothesized that knowledge creation would provide a positive effect on innovation capability. The results presented in Figure 1 indicated that knowledge creation provides a positive effect on innovation capability ($\beta = 0.64$; $p < 0.01$). Therefore, Hypothesis 1 is supported. The second hypothesis was associated with the relationship between knowledge creation and organizational learning. This research hypothesized that knowledge creation would provide a positive effect on organizational learning. The results presented in Figure 1 indicated that knowledge creation provides a positive effect on organizational learning ($\beta = 0.51$; $p < 0.01$). Therefore, Hypothesis 2 is supported. The third hypothesis was associated with the relationship between organizational learning and innovation capability. This research hypothesized that organizational learning would provide a positive effect on innovation capability. The results presented in Figure 1 indicated that organizational learning provides a positive effect on innovation capability ($\beta = 0.57$; $p < 0.01$). Therefore, Hypothesis 3 is supported. The fourth objective of this study is concerned with knowledge creation and innovation capability with organizational learning as mediating variable in the

relationship. This research hypothesized that organizational learning mediates the effects of knowledge creation on innovation capability. Following the method suggested by Baron and Kenny (1986), this study developed two separate structural models. The purpose of the first model was to examine the direct effects of knowledge creation on innovation capability. The purpose of the second model was to test the effects of knowledge creation on innovation via organizational learning. Comparing the results of Models 1 and 2, it is found that the positive effect of knowledge creation on innovation capability in Model 1 ($\beta = 0.64$; $p < 0.01$) becomes lower in Model 2 ($\beta = 0.42$; $p < 0.05$). Therefore, Hypothesis 4 is supported: meaning that organizational learning mediates the effects of knowledge creation on innovation capability. The main objective of this study is to examine the influence of knowledge creation processes (socialization, externalization, combination and internalization) on the capability of innovation. The analysis provides empirical evidence for the notion of a direct relationship between knowledge creation and innovation capability; supporting the results of previous studies concerning knowledge creation processes and innovation (Nonaka & Takeuchi, 1995 [16]; Popadiuk & Choo, 2006 [21]; Ramirez & Kumpikaite, 2012) [22]. Knowledge

creation is determinant of firm's innovation, as Nonaka & Takeuchi (1995) ^[16] emphasized

The findings of this study imply that knowledge socialization, defined as the creation of new tacit knowledge via knowledge sharing and direct experience, has a particular influence on innovation capability. The importance of knowledge sharing and the creation of new tacit knowledge in enhancing innovation has been confirmed by previous studies (Hutchings and Weir, 2005; Popadiuk and Choo, 2006) ^[21]. Furthermore, this study found that knowledge externalization also has a positive impact on innovation capability. The findings reinforce previous findings, especially the findings of Popadiuk and Choo (2006) ^[21], which confirm that knowledge socialization and externalization are the two main processes of knowledge creation that enable the creation and sharing of tacit knowledge take place. These two processes have a significant impact on the creation of new concepts.

In addition, the results of this study also indicate that knowledge internalization is positively correlated with innovation capability. In line with Schulze and Hoegl (2008) ^[25] thinking, individuals are able to generate new ideas through the application of their explicit knowledge which enable them to innovate. Lastly, this study shows that knowledge creation has a positive impact on organizational learning; supporting the finding of previous studies (Nonaka and Takeuchi, 1995) ^[16]. The results of this study confirm empirically about the important role of knowledge creation as a driver of organizational learning improvement.

5. Conclusion

The main objective of this study is to examine the relationship between knowledge creation, organizational learning, and innovation capability. The findings of this study confirm the importance role of organizational learning for the enhancement of innovation capability. In general, the finding of this study support the notion stated in the previous studies. Organizational learning is determinant of innovation capability. Organizational learning is one of the important factors contributing to innovation. The findings of this study indicate that the positive influence of knowledge creation process on innovation capability is directly or indirectly take place. Specifically, the findings of this study identified the importance of knowledge socialization, externalization, and internalization activities for organizational learning.

This study contributes to the development of theoretical research concerning knowledge creation processes, organizational learning, and innovation capabilities by building an integrated model that highlights the relationship between the three constructs. Through literature review, this study considers to integrate organizational learning as a mediating variable in the relationship between knowledge creation process and innovation capability. In addition, this study highlights the importance role of knowledge creation as a driving factor for innovation capability in the context of Indonesian SMEs. The findings of this study imply that managers need to focus on improving knowledge creation process through strengthening knowledge socialization, externalization, combination, and internalization; while enhancing effective organizational learning within the company.

6. References

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