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Technological Learning, Technological Capability, And Innovation Performance In Indonesia's Manufacturing Industry

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ABSTRACT

In this era of knowledge-based economy, it has been recognized that industrial competitiveness is determined by the presence of technology-intensive industries so as to produce high value-added products through innovation activities. Meanwhile, transformation of the economic structure in Indonesia has set out its manufacturing industry as a pillar of the national economy. Unfortunately, Indonesia's manufacturing industry output is dominated by low technology intensity industries. Considering the importance of technological learning and technological capability to improve innovation performance, using structural equation modelling, this research attempts to model the relationship of technological learning, technological capability, and innovation performance of Indonesia's manufacturing industry. The empirical model obtained indicates that Indonesia's manufacturing firm's innovation performance is not mainly determined by the whole comprehensive process of technological learning. Innovation performance is also not derived mainly from technological capability building. The technological learning activities are not intended to increase firm's technological capability but more directly to increase innovation performance. Nevertheless, further study is needed to improve the empirical model and obtain stronger justification

1. Introduction

Transformation of the economic structure in Indonesia has set out its manufacturing industry as a pillar of the national economy. The manufacturing industry began to shift from contribution of agriculture to the economy since oil boom in 1973-1981. At that time, the manufacturing industry had the highest contribution to Indonesia's economic growth compared to other sector. Data over the last 12 years also shows that manufacturing industry is a sector with highest contribution to the economy. The great contribution makes the sector as one of the main economic engine of Indonesia. This means that Indonesia's economic growth can be encouraged by the development of its manufacturing industry.

In this era of knowledge-based economy (KBE), it has been recognized that industrial competitiveness is determined by the presence of technology-intensive industries so as to produce high value-added products. Unfortunately, data of science and technology (S&T) indicators suggest that Indonesia's manufacturing industry output is dominated by low technology intensity industries. Output of manufacturing products with low technological content grew by an average of 14.7% per year, which achieved the highest growth in 2007, amounted to 24.16%. In fact, the increase in products with low technological content tends to rise until 2007 (Meiningsih et al., 2009). In terms of trade, Indonesia's exports are still dominated by industries with low technology intensity. Even the trade balance data showed that its value from low tech industries tend to increase while the high tech industry's trade balance actually decreased and tended to be deficit. Meanwhile, based on data from Industrial Development Report UNIDO of 2009, the condition of other countries such as South Korea, Thailand, Philippines, India and China showed an increase in the contribution of exports of medium and high-tech manufacturing industries to total manufacturing exports. These conditions have great impact on the rapid economic growth of these countries. Technological capability is believed to have always been a key component of economic growth and prosperity (Archibugi and coco, 2008). At the corporate level, World Bank stated that technological capability is the source of a company's competitive advantage. Meanwhile, in an effort to enhance the technological capability, technological learning has a fundamental role. This is due to the presence of cycles connecting between technological learning, technological capabilities, engineering changes, and production capabilities (Albu, 1997).

As mentioned earlier, Indonesia's economy is inclined to be supported by low-tech manufacturing industries. Therefore, if Indonesia desired to boost up its economy and win the global competition, it is important for this country to improve the competitiveness of the industry. Therefore the country needs to improve its technological capability to drive innovation performance in the manufacturing sector by speeding up the technological learning process. This condition is expected to improve the performance of the national economy through the creation of higher value added in the manufacturing industry. Therefore, it is necessary to have a empirical picture about the condition of technological learning occurred in Indonesia's manufacturing industry in relation with technological capability and innovation performance.

Meanwhile, research results by Rianto et al (2005) showed that the process of technological learning in automotive component SMEs is poorly supported by their interactions with external parties. The results of other studies (Rianto et al, 2009) also showed that technological learning in Indonesia's manufacturing

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industry is not yet optimum, especially for local companies in electronics subsector. The local companies have not been able to obtain optimum use of its relationship and cooperation with MNC associated with the application of high technology. In fact, the process greatly affecting the technological capability, because the capability is the accumulation of technological learning (Kim, 1990). Technological learning is the process by which firms acquire technology from external and accumulate technological capabilities in order to enhance the company's competitiveness (Hobday, 1995). Meanwhile, technological capability has been widely believed and proven to have an important role on the performance of the company's innovation. Technological capability is proven not only to encourage creativity to produce new products but also to facilitate increased speed of product development (Moorman and Slotegraaf, 1999). This study attempts to model the relationship oftechnological learning, technological capability, and innovation performance of companies in Indonesia's manufacturing industry.

2 Review of Literature and Hypotheses Development

2.1 Technological Learning, Technological Capability, and Innovation Performance

Technological learning is a conscious, purposive, and incremental effort to gather new information, to try new attempt, to create new skills and operational routines, and to build a new external relations (Kim and Nealson, 2000). This process will eventually accumulate to encourage technological capabilities (Hobday, 1995; Kim, 2001). Technological capabilities can be defined as the ability to make effective use of technological knowledge in production, engineering, and innovation aimed at the sustainability of price competitiveness and quality (Kim, 2001). By appropriate technological capability, companies can assimilate, adapt and develop technologies.

Meanwhile, many studies have also demonstrated the importance of technology and innovation capabilities. Cohen and Levinthal (Cohen and Levinthal, 1990) argued that the ability of the technology will drive organizational learning and improve product innovation. Moorman and Slotegraaf (1999) also found that technological capability doesnot only encourages creativity to produce new products but also to facilitate increased speed of product development. Using its technological capabilities, the company can develop new technologies, products or processes as a response to economic change. Thus, according to World Bank, it can be said that technological capability is the source of company's competitiveness. The better a company's technological capability, the more likely the company innovate, and the more powerful the company's competitiveness. Based on the description it is clear that technological learning is closely related to technological capabilities and innovation performance.

Related to the relationship among technological learning, technological capabilities, and innovation performance, Chen, Pu, and Shen (2009) have developed a model that links among these three variables particularly for China's manufacturing industry. In the model, technological learning is seen from five dimensions, which includes the technological source, content, agent, levels, and the environment. These dimensions is hypothesized to have positive effect on technological capability and innovation performance. Based on the models, technological capability becomes intermediate variable that takes into account the effect of technological learning on the innovation performance through technological capabilities. This study draw several conclusions: (1) The source of technological learning has a positive influence on innovation performance, but it doesn't influence the technology capability; (2) The content of technological learning has a positive influence on both technology capability and innovation performance, and the latter is the most significant one; (3) The agent of technological learning has a positive influence on both, but neither is significant; (4) The level of technological learning has a relatively distinct positive influence on both; (5) The environment of technological learning has positive influence on technology capability, but it's unclear if it influences the innovation performance; (6) Technology capability has positive influence on innovation performance, it is sound to be placed as the intermediate variable; (7) The factors with most significant influence on innovation performance are the learning content, learning levels and learning sources.

The conceptual model from Chen, Pu, and Shen (2009) is used to be an analytical framework in this research. Nevertheless, in our model we add factor of government support as shown in Figure 1. This factor is considered to have significant role in technological learning (Albu, 1997; Carayannis et al, 2006). Thus, in this study technological learning is viewed from six dimensions, namely the source, content, agent, levels, environment, and government support. These elements describe the internal and external learning activities that are important in the process of technological learning (Lall, 2001).

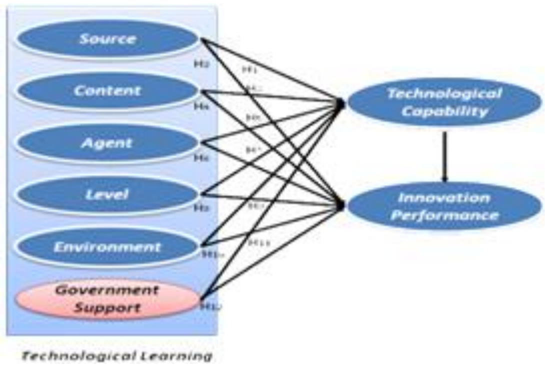

Fig 1. Conceptual model

Technological Learning Source

Based on the model developed by Chen, Pu, and Shen (2009), the dimensions of source includes source of knowledge, technology, and information that allows companies to begin technological learning activity. The sources include internal and external sources of learning. Companies must integrate all of technical information so as to encourage continuous technological learning, and therefore innovate through existing technologies. In this study, technological learning source will include the external sources that include business partners, ie customers, suppliers, distributors, and competitors, as well as universities and R & D institutions. In addition it also reviewed internal sources, which include the company's management team, R & D department and engineering department, marketing department, as well as production, quality control (QC) and the PPIC department. Based on the explanations, the hypotheses to be proven in this research are:

H1: Technological learning source has a positive influence on technological capability.

H2: Technological learning source has a positive influence on innovation performance

Technological Learning Content

The dimensions of the technological learning content include scientific knowledge, technologic knowledge, experiential knowledge, and know-how (Chen, Pu, and Shen, 2009). Scientific knowledge refers to systematical-theoritical knowledge, or closely related to infrastructure. Technologic knowledge refers to knowledge of particular technologies, ie the specific knowledge applications. Experiential knowledge and know-how is tacit knowledge as a result of the experience and knowledge from practices carried out in previous years. The focus of technological knowledge itself is on tacit knowledge. Tacit knowledge plays an important role in the activity of technological learning, as it is a source of competitiveness of the company. Tang and Zhou (Tang, Zhou, and Liu, 2004) stated that the absorption of tacit knowledge will directly influence the outcome of technological learning activities. Know-how refers to knowledge that is often kept secret, information that seemed deliberately closed and it is associated with things such inventions which are not patented, formula, design, lay out design, procedures and methods, along with the accumulation expertise and experience. This is often done by companies to individuals who obtain trust from the company. These individuals are the ones who can help parties who have license of the products in the production process and use it to build its competitive advantage. Based on these explanations, the hypothesis to be proven in this study are:

H3: Technological learning content has a positive influence on technology capability

H4: Technological learning content has a positive influence on innovation performance

Technological Learning Agent

Agent of technological learning includes individual actors, teams, and entire organizations. Individualized learning refers to the process by which individual in a company seeking knowledge and expertise. Learning activities at the team level is a process where the whole team get to and improving the knowledge and know-how through communication and interaction within the team. The process of organizational learning is a continuous process, in which, different types of knowledge and information effectively processed, interpreted and responded. Organization is the actor who is able to learn, process information, ever repeat the experience gained as to maintain the amount of knowledge, expertise and specialization. However, it is generally restricted to the sub-systems such as the structure, procedures, corporate culture and the ability of technology. In order to encourage learning technologies in the enterprise, it is necessary to encourage each type of learning agent, especially the communication and interaction of each actor in order to establish an internal environment that is conducive for learning in the organization (Chen, Pu, and Shen, 2009).

For individual actors, learning by doing often becomes an effective way to improve tacit knowledge (von Hippel and Tyre, 2005). However, training programs and talent search may be an effective way to encourage tacit knowledge and explicit knowledge for new employees. Knowledge sharing and self-organizing is very useful for new employees to enhance tacit and explicit knowledge. Furthermore, self-organizing team can trigger organizational learning by accelerating the creation of implicit views through sharing process of tacit knowledge and conceptualize implicit perspectives among actors towards sustainable dialogue among members (Nonaka, 1994). Grant (1996) placed a firm as an institution for the applications of knowledge. In this regard, the main task of a learning organization which is able to do learning is to understand the mechanisms and processes to become a company that is able to access and utilize existing knowledge from individuals in the company, and adapt the mechanisms to create effective and efficient knowledge applications (Chen and Qu, 2003). Based on the explanations, the hypotheses to be proven in this study are:

H5: Technological learning agent has a positive influence on technological capability

H6: Technological learning agent has a positive influence on innovation performance

Technological Learning Level

The dimensions of technological learning levels can be explained by three variables, namely the operational level, tactical level and strategic level (Chen, Pu, and Shen, 2009). The three levels are part of hyperlearning stage (Carayannis, 1999). Operational learning or learning from experience illustrates redundancy in technological learning mode, which shows variable reaction to strategic opportunities and threats that arise. Learning from experience enables an enterprise through employees to continue to learn from mistakes. Every time there is a fault known, the company will attempt to find out what to do to fix it. Another variable is the tactical level. This variable indicates learning how to learn from experience.This demonstrates the diversity of reactions to strategic opportunities and threats that arise, and predict its occurence. This is possible by documenting data or information to indicate errors or failures that have been experienced. Therefore, it can be seen likely to emerge in the future. The third variable shows the level strategic learning to learn how to learn from experience. This variable has the highest level compared to the previous two variables, because this variable not only shows the reaction to opportunities, strategy, and threats and predict them, but also to create them. It is possible, for example by adopting new methods or approaches, which periodically evaluated and modified to be able to perform accurate and updated diagnosis on opportunities for improvement. Evaluation and modification of the plan can be said as a tool or a way to have learning to learn how to learning from experience.Based on these explanations, the hypotheses to be proven in this study are:

H7: Technological learning levels have a positive influence on technological capability

H8: Technological learning levels have a positive influence on innovation performance

Technological Learning Environment

Chen, Pu, and Shen (2009) described the dimensions of technological learning environment in 3 variables: executive support, funding, and motivation. Executive support demonstrated managerial behavior and what they thought of the significance of technology on corporate strategy (Carayannis and Alexander, 2002). Managerial support may include support for the effort to solve technology problems in planning and implementing technological learning for example in technology strategy, way of learning, and the establishment of appropriate organizational structure. Top management have important role in improving the performance for its role is attributed to superior knowledge from the executive compared to the employees, and the ability of the executive to create rules and structures to execute a plan based on their knowledge (Carayannis, 2000). The second variable, motivation, also influences technological learning. Motivation can be at the individual level then to be drawn to the level of the group and or organization. Here, the motivation to implement new ways is a crucial aspect which determines technological learning process. The third variable which related with funding can be seen from company's investment level in technology development, including funding for efforts to encourage technology development, or training to develop employees with high qualifications. Based on these explanations, the hypotheses to be proven in this paper are:

H9: Technological learning environment has a positive influence on technology capability

H10: Technological learning environment has a positive influence on innovation performance

Government Support for Technological Learning

Government has a role in encouraging innovation through technological learning, especially through technology policies issued. Related to this role, Carlsson and Stankiewicz (1991) defined technology-specific innovation system (TSIS) as a network of actors that interact in a particular technology in institutional infrastructure and involved in the creation, diffusion and use of technology. In TSIS, there are policies, technological learning, and performance as shown in Figure 2. Policy is activity of planning, selecting and acting of one or more authorities which aims to manage the community development. Technological learning can be seen as a process whereby actors acquire knowledge in order to improve performance of TSIS (Smit, Junginer, and Smits, 2007).

Fig 2. Model of *Technology-Specific Innovation System* TSIS)

Using categorization based on Alic (2002), government technology policies in Indonesia can be divided into three groups as follows:

1) Direct Funding

In Indonesia, the existing policy of direct financing are in form of soft loans for business development (e.g purchasing new machinery, etc.) as well as the cost-sharing for R&D activities.

2) Indirect support for technology development and direct or indirect support for commercialization and production

Government policy for the second group may include the provision of facilities such as fiscal and non-fiscal incentives, and other conveniences to industry to conduct R&D and innovation; industry who conduct technology transfer activities based on Presidential Decree No. 28/2008) and the import tariff dispensation for the certain capital goods according to Regulation of the Minister of Finance Number 80/PMK.011/2011.

3) Policies related with information and learning

The third types of policies can be in form of Training / HR capacity development (for example engineering, marketing, management capability, etc.), organizing exhibition, implementation of standards particularly national standard of Indonesia (SNI) and prioritization of the use of domestic products or high local content.

Based on these explanations, the hypotheses to be proven in this study are:

H11: Government support for technological learning has a positive influence on technology capability

H12: Government support for technological learning has a positive influence on innovation performance

Technological Capability dan Innovation Performance

In the model of technological learning developed by Chen, Pu, and Shen (2009), technology capability becomes an intermediate variable, which takes into account the direct effect of technological learning on the innovation performance and indirect effects caused by the technology capability. In this case, technological capability is represented by variable R & Dcapability (including R & D ability and R & D expenditure), production capability (technology abilities, tools, problem- solving skills of production),marketing capability (the ability to identify the customer, the ability to deliver offers to consumers, the ability to coordinate marketing and sales), and human resource capability (the sheer number of S & T engineers, training of workers per year, and engineering capabilities of workforce).

The model in Figure 1 also shows that technological capability will have an effect on innovation performance. Based on the model of Chen, Pu, and Shen (2009), the innovation performance is seen from new products, patents and technology know-how. However, in this study the innovation performance is seen based on the concept of innovation in the OECD Oslo Manual (OECD, 2005). Innovation is divided into two categories, namely technological innovation and non-technological innovation. Technological innovation includes new or significant changes in products, services, methods of production or production process. In the other hand, non-technological innovation is the application of new marketing method or methods for organizing the company. Based on the explanations, other hypothesis to be proven in this study is:

H13: Technological capability has positive influence on innovation performance

Modification of the model developed by Chen, Pu, and Shen (2009) used to identify the model of technological learning that occurs in Indonesia's manufacturing industry in accordance to technological learning and innovation performance. The variables used in this research are shown in Table 1 and 2.

3. Research Method

This study examines the manufacturing industry with focus on industrial subsector based on the intensity of the manufacturing industry with medium-high and high-technology intensity, and allegedly occurred technological learning. Based on the OECD classification, manufacturing subsectors classified as having medium-high and high technological intensity cover several subsectors. They are aircraft, computer, radio, television and communication devices, pharmaceuticals, instrument, motor vehicles, chemicals, electrical machinery, railroad equipment and transport equipment, and machinery and equipment. Meanwhile, the identification of suspected industrial sectors technological learning is based on the classification of the company according to Pavitt's technology trajectory in Archibugi (2001). Based on this classification, technological learning is thought to occur on the scale of supliers intensive firms and specialized firms. Thus, the industrial sector which is analyzed in this research cover the subsectors of radio, TV and communication devices, instruments, motor vehicles, electrical machinery, Railroad equipment and transport equipment, and machinery and equipment industry.

TABLE 1
TECHNOLOGICAL LEARNING INDICATOR

DIMENSION	VARIABLE	REFERENCES
Technological Learning Source(TLS)	• Business partner: customer, supplier, distributor, competitor • University and R&D institution, • Management team • R&D & Engineering department • Marketing department, • Produksi, QC, and PPIC department	Chen, Pu, and Shen (2009)
Technological Learning Content (TLC)	• *Science Knowledge,* • *Technique Knowledge,* • *Experiential Knowledge,* • *Know How*	Chen, Pu, and Shen (2009); Tang and Zhou (2004)
Technological Learning Agent (TLA)	• Individual, • Team • Organization	von Hippel and Tyre (1995); Nonaka (1994); Grant (1996); Chen and Qu (2003)
Technological Learning Level (TLL)	• Operasional Level • Tactical Level, • Stratejik Level	Chen, Pu, and Shen (2009); Carayannis (1999)
Technological Learning Environment (TLE)	• Management support • Funding, • Motivation	Carayannis and Alexander, (2002); Carayannis (2000)
Government Support for Technological Learning(GSTL)	•Direct funding •Indirect support for technology development and direct or indirect support for commercialization and production •Policies related with information and learning	Alic (2002)

TABLE 2
INDICATOR OF TECHNOLOGICAL CAPABILITY AND INNOVATION PERFORMANCE

DIMENSION	VARIABLE		REFERENCES
Technological Capability	R&D capability	*R&D ability*	Chen, Pu, and Shen (2009)
		R&D expenditure;	
		Proportion of R&D personel	
	Production capability	Level of technology used	
		Equipment	
		Ability to solve production problem	
	Marketing capability	Ability to identify customer	
		Ability to give offering for customer	
		Ability to coordinate marketing and sales	
	Human resources capability	Number of S&T engineer	
		Number of training per year	
		Technical ability of employees	
Innovation Performance	Technological innovation	Product innovation	Oslo Manual (2005)
		Process innovation	
	Non-technological innovation	Marketing innovation	
		Organizational innovation	

TABLE 3
DESCRIPTION OF VARIABLE IN TECHNOLOGICAL LEARNING MODEL

Code	Variable Name	Code	Variable Name
X1	Management	X20	Direct funding
X2	Engineering, R&D department	X21	Indirect support
X3	Marketing dep.	X22	Information and learning policy
X4	Production, PPIC, QC dep.	Y35	Product innovation
X5	Research institution/universities	Y36	Process innovation
X6	Business partner	Y37	Marketing innovation
X7	Basic science	Y38	Organizational innovation
X8	Applied knowledge	Y41	R & D ability
X9	Experience	Y42	Marketing capability
X10	IPR	Y43	Production capability
X11	Individual	Y44	Human resources capability
X12	Team	TLS	*Technological Learning Source*
X13	Organization	TLC	*Technological Learning Content*
X14	Operational	TLA	*Technological Learning Agent*
X15	Taktical level	TLL	*Technological Learning Level*
X16	Strategic level	TLE	*Technological Learning Environment*
X17	Management support	GVS	*Goverment support*
X18	Funding	INP	Innovation performance
X19	Motivation		

The selection of sample only consider the medium and large enterprise based on the number of employee. Besides, we only choose the domestic investment and joint venture as type on enterprise investment.

Based on the database derived from Indonesia's Statistical Beurau, it appears that more than 90% of the company which is the object of research is in the area of Java and Riau Islands. Therefore, this study focuses on the region. Samples were taken randomly and proportionally for each sector under review. The distribution of populations and samples are proportional which results in 200 number of valid sample. Based on the type of investment, most of the sample is domestic investment (73%) and market their product only in local (68%). Data obtained from the samples are used to model the relationship among technological learning, technological capability, and innovation performance using structural equation modeling (SEM).

4. Results and Discussion

Empirical model in this study use input data derived from the survey results with 200 number of sample. This number meets the minimum value (five times of observed variables) to make an analysis of SEM. The model was constructed based on the conceptual model as shown in Figure 2. Tested models include the variables in Table 1 and Table 2. Statistical test results showed that the data meets the assumption of normal and multikolinearity. Nevertheless, the value of LISREL estimates with maximum likelihood estimation techniques shows that there are several variables that are less reliable. However, considering the result of Goodness of fit and coefficient of determination, we do not delete the variables from the model due to lower results of Goodness of fit. The model which meets satisfactory can only be reached only when adding some fictious variable to technological capability variable. The final optimum modification of the model is shown in Figure 3. Description of variables used in the model is shown in Table 3.

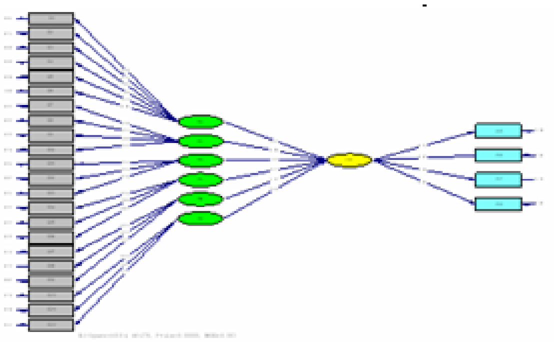

Fig 3. Technological Learning Model

Evaluation of Goodness of Fit results shows that the construct used to form a model of research on the process of confirmatory factor analysis is sufficient to meet the criteria established although essentially still unsatisfactory. This can be said as the weaknesses of this model. The complete Goodness of fit evaluation results are shown in Table 4.

Table 4
Evaluation of goodness of fit

Criteria	Results	Cut off value	Model Evaluation
Chi-square	660.84	Minimum	Marginal
Probability	0.00006	≥ 0.05	Not very good
RMSEA	0.083	≤ 0.08	Nearly good
GFI	0.80	≥ 0.80	Good
CFI	0.88	≥ 0.90	Nearly good
AGFI	0.74	≥ 0.80	Nearly good
NFI	0.81	≥ 0.90	Nearly good

The regression equations derived from the model is shown in Equation 1.

INP = 0.42*TLS -0.38*TLC+1.29*TLA+0.17*TLL -1.12*TLE+0.48*GVS, Errorvar.= 0.40 (1)

(0.32)	(0.44)	(0.96)	(0.28)	(1.02)	(0.38)
1.31	-0.87	1.35	0.60	-1.10	1.27

The coefficient of determination obtained for the above model is 60%. This value indicates that it is a reliable model. In addition, the value also indicates that 60% of innovation performance variance can be explained by the variables in the model while the remaining 40% is explained by other variables that are not explained in the model. This indicates that factors other than the presence of TLS, TLC, TLA, TLL, TLE, and GSTL that also affect the innovation performance of manufacturing industry in Indonesia.

Based on the regression model, by significance level of 10% (critical value = 1.285) there are two variables which significantly influence innovation performance. The variables are TLS and TLA. Therefore, there are only 2 hypotheses which can be proven. Compared with the initial model, we obtain quite different model as shown in Figure 4.

Based on the empirical model, TLS has no relationship with technology capabilities. It also indicates that TLS does not affect technological capability. In this context, the broader or the more parties used by a company as source of technological learning will not significantly improve company's technological capability. Nevertheless, TLS has positive effect on innovation performance. In this context, it can be said that the vaster the technological learning source, the more the company is able to enhance its innovation performance.

TLC does not affect technological capability. In this case, the broader or the more TLC which is mastered by the company, it will not significantly increase the company's technological capabilities. TLC also has no significant effect on innovation performance. This indicates that the increased of absorption of TLC had no significant impact on improvement of innovation performance.

Based on the empirical model obtained, TLA does not have any relationship with technological capability. In this case, the interaction of the actors in technological learning will not affect on the increased technological capabilities. Eventhough, TLA has a positive impact on innovation performance. In this case it can be said that by strengthening the interaction between different agents, it can significantly encourage greater innovation performance.

TLL is not related or even affects technological capability. This means that the more comprehensive learning in different levels or the company does not have any significant impact for company's technology upgrades. TLL also has no significant effect on the innovation performance. In this context, it can be interpreted that the emphasis on comprehensive learning on all levels, from the operational level, tactical to strategic level in fact have no real impact in improving innovation performance. To be able to generate innovations, a company doesnot have to implement a comprehensive learning for all levels.

The model obtained also shows that TLE have no influence to technological capabilities. Here it can be said that the improvement of the environment of technological learning environment will not help encouraging technological capability. From the regression model, it appears that TLE does not have a significant impact on innovation performance, or it can be said that the improvement of the technological learning environment does not play a significant role in helping to encourage innovation performance.

GSTL is not related to the technology capability. This shows a lack of influence of government support for technological learning in a technological boost capability. Looking at t-value obtained in the regression model, it can be concluded that GSTL does not have a significant impact on innovation performance. This indicates that government support for technological learning is not significantly help boost innovation performance.

Empirical model obtained also shows no relationship between technological capability and innovation performance. This indicates that increasing technological capabilities will not significantly affect company's innovation performance.

5. Conclusion

Empirical model shows that firm's innovation performance in Indonesia's manufacturing industry is affected by TLS and TLA. Other variables including TLL, TLE, TLC, and GSTL donot have significant effect to innovation performance. Technological capability also has no influence to innovation performance. These indicate that firm's innovation performance is not mainly determined by the whole comprehensive process of technological learning. Innovation performance is also not derived mainly from technological capability building. Nevertheless, to encourage innovation performance, it is still possible to increase technological learning or the use of other alternative way such as technology adoption, without the occurrence of technological capability building or R&D activities.

However, empirical model obtained in this study still has drawbacks, mainly related to the very minimum amount of sample. This may have implications on the variables that have a significant effect in the model, as well as the fulfillment of the criteria Goodness of fit. Therefore, similar studies need to consider the amount of a larger samples, not only the amount of 5 times the number of variables is observed but should be close to 10 times the number of observed variables.

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