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The Role of Industrial Clustering and Manufacturing Flexibility in Achieving High Innovation Capability and Operational Performance in Indonesian Manufacturing SMEs

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ABSTRACT

This study aims to examine the effects of industrial clustering and manufacturing flexibility on innovation capability and operational performance. This study follow a survey method to collect data pertaining to the phenomena of industrial clustering, manufacturing flexibility, innovation capability, and operational performance by utilizing a single respondent design. A total of 124 Indonesian manufacturing SMEs are taken to test the proposed theoretical model by utilizing covariance-based structural equations modeling approach. It was found that both industrial clustering and manufacturing flexibility was positively associated with operational performance and innovation capability as well. In addition, innovation capability may account for the effects of industrial clustering and manufacturing flexibility on operational performance. This implies that manufacturing SMEs have to reorient their production and operation perspectives, including agglomerate with other similar or related SMEs to develop and utilize their own resources. The SMEs also need to possess some degree of manufacturing flexibility in respond to the uncertain environment and market changes. In addition, the SMEs should put a greater emphasize to use industrial cluster and manufacturing flexibility benefits to generate innovation capability to achieve high performance.

Keywords: Industrial clustering, manufacturing flexibility, innovation capability, operational performance, manufacturing SMEs

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1. INTRODUCTION

Small and medium scale enterprises (SMEs hereafter) have an important role in supporting industrialization process and national economic development (Oke, 2007). SMEs account for the majority of economic activities in the ASEAN region, including Indonesia. More than 95% of firms in ASEAN member states are SMEs which contribute over 95% of total employment (Hayashi, 2002). In recent years, many manufacturing organizations, including SMEs, have to cope with the increasing local and international competitive pressures. Such a condition has put increasing pressure upon manufacturing organizations to search for new production and operation methods and strategies in order to improve their operational performance. Some of the challenges faced by manufacturing organizations include increasing their operational (Cousens *et al*., 2009; Karuppan, 2004; Raymond and St-Pierre, 2005). Gunday *et al*. (2011) highlight the important role of the operational performance as a source of competitive advantage. It is assumed that the operational performance would lead to the increased of overall company performance. Developing innovation capability is also widely cited as one effective response to cope with the increasing competitive and global market. It is argued that manufacturing organizations with high innovation capability would be able to cope with the increasing competition and global market changes (Forsman, 2011; Jimenez-Jimenez *et al*., 2008; Panayides, 2006). A number of studies on innovation and performance in SMEs have been conducted; providing some empirical findings pertaining to determinants for SMEs innovation and performance enhancement (e.g. Karaev *et al*., 2007; Petroni and Bevilacqua, 2002).

The first factor proposed as determinant of operational performance, therefore was being investigated in this study, is industrial clustering. Industrial clustering is referenced as the geographical concentration of similar or interrelated industries (Porter, 1998). Industrial clustering has been widely conceptualized as a strategic option for manufacturing SMEs to overcome their production and operation constraints (Karaev *et al*., 2007). Despite the wide attention has been paid to the clustering as an importance source to improve the clustered company's performance (Karaev *et al*., 2007; Porter, 1998), there are still many unresolved questions regarding the clustering concept itself and its effect on the performance (Hendry and Brown, 2006). Literature also suggests the clustering could serve as sources for the development of innovation capability of the cluster members (Baptista and Swann, 1998; Morosini, 2004; Porter, 1998). However, little is known regarding factors of the clustering that give rise to innovation capability (Chiu, 2009). Muscio (2006) highlight innovation dimensions and activities in industrial clusters have not been fully explored.

The second factor proposed as driving force behind the improvement of company's performance is manufacturing flexibility (Cousens *et al*., 2009). Manufacturing flexibility is referenced as the ability to manage and utilize the existing resources effectively in response to the environmental changes while maintaining high performance (Zhang *et al*., 2003). However, while manufacturing flexibility has captured the interest of many researchers, as Beskese *et al*. (2004) noted, manufacturing flexibility is still not clearly understood and utilized. In addition, prior studies provide mix-results regarding the effects of manufacturing flexibility on company's performance. Several studies demonstrate a positive relationship between manufacturing flexibility and operational performance (Camison and Vilar-Lopez, 2010; Hallgren and Olhager, 2009). Other studies, however, confirm that the relationship between manufacturing flexibility and operational performance is not significant (Chang, 2003; Pagell and Krauses, 2004). Furthermore, given the importance of a greater combination of manufacturing flexibility and innovation capability in improving company's performance, yet, there is still a lack of research addressing how the two constructs work together to achieve a higher performance (Camison and Vilar-Lopez, 2010). The relationship between manufacturing flexibility and innovation capability is still not clearly understood (Oke, 2011).

As for innovation capability, there is still a lack of consensus among academics and industrial practitioners regarding the factors that give rise to innovation capability (Hult *et al.,* 2004; Zawislak *et al*., 2012). It is also reported that both positive and negative effects of innovation capability on firm performance might arise (Rosenbusch *et al*., 2011). As Zeng *et al*. (2010) highlight, there is still a lack of study which provides a comprehensive explanation regarding innovation capability in SMEs.

To address these issues, this study attempt to provide empirical evidence by examining the contribution of industrial clustering and manufacturing flexibility in achieving high innovation capability and operational performance in manufacturing SMEs. This study is significance, considering the existing literature often examines separately the impact of industrial clustering and manufacturing flexibility factors on innovation capability and operational performance. Little effort has been put to investigating the simultaneous effect of the two factors on innovation capability and operational performance, particularly in the context of manufacturing SMEs. Figure 1 presents a conceptual framework of this study. The framework postulated that manufacturing SMEs need to increase their innovation capability and operational performance to survive and remain competitive. Toward this end, manufacturing SMEs need to develop some degree of manufacturing flexibility and search for the way to obtain external resources by clustering in a certain region. Both manufacturing flexibility and industrial clustering could be directed to speed up innovation capability and operational performance.

The remainder of this paper is organized as follows. Section 2 presents a review of the relevant literature that underpins the theoretical conceptualizations and the de-

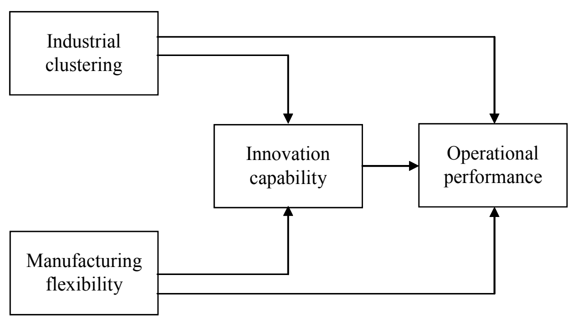

Figure 1. Conceptual framework of this study.

velopment of the research hypotheses that are put forward. This is followed by Section 3 with a description of the research methodology employed to carry out the empirical work. Section 4 comprises the results of analysis, and finally, the conclusions of the study are presented in Section 5.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Industrial Clustering

Porter (2000) defines an industrial cluster as a geographically proximate group of inter-connected companies and associated institutions in a particular field, linked by commonalities and complementarities. Altenburg and Meyer-Stamer (1999) refer an industrial cluster to a sizable agglomeration of firms in a spatially delimited area[3] which has a distinctive specialization profile and in which inter-firm specialization and trade is substantial. Meanwhile, Morosini (2004) gives another definition by stating an industrial cluster as a socioeconomic entity characterized by a social community of people and a population of economic agents localized in close proximity in a specific geographic region.

Despite there is no generally accepted definition of industrial cluster, the advantages of the cluster is recognized. Altenburg and Meyer-Stamer (1999) argued that industrial clustering would enable firms, especially SMEs, to develop more easily. SMEs may achieve a high performance if a high degree of interfirm specialization and their proximity to other firms performing complementary functions offset the disadvantages of being small. Morosini (2004) argue that within an industrial cluster, both the social community and the economic agents work together in economically linked activities, sharing and developing a common stock of product, technology and organizational knowledge in order to generate superior products and services in the marketplace. Dayasindhu (2002) contend that the positive effects of industrial clusters might arise due to the existence of cost reduction as a result of increased market demand, the presence of specialized industries, and shared physical infrastructure. Meanwhile, Lin *et al*. (2006) assert that specific mechanisms of industrial clustering enable the clustered companies to increase the availability of production resources, improving product quality, reducing production and operational costs. Therefore, this study formulates the following working hypothesis.

Hypothesis 1: Industrial clustering is positively associated with SME operational performance.

Furthermore, literature also link industrial clustering to the ability to perform innovation (e.g., Baptista and Swann, 1998; Muscio, 2006; Porter, 1998). It is argued that industrial cluster mechanism would create both formal and informal interactions among the cluster members. This contributes to the existence of knowledge share and spillover as the knowledge tends to be geographically localized. Accordingly, the clustered companies are very likely to gain a better access to knowledge residing in the cluster. This in turn, would enrich the collective knowledge that is required to perform innovation (Gnyawali and Srivastava, 2013; Kesidou and Szirmai, 2012). Therefore, this study formulates the following working hypothesis.

Hypothesis 2: Industrial clustering is positively associated with SME innovation capability.

2.2 Manufacturing Flexibility

Manufacturing flexibility has been conceptualized in different ways. For instance, manufacturing flexibility could be referenced as ability of manufacturing organizations to adapt quickly to any changes in relevant factors such as product, process, workload, or machine failure (Tsubone and Horikawa, 1999); capability to manage and utilize the existing resources effectively in response to the internal and external environmental changes (Petroni and Bevilacqua, 2002); or capability to produce a variety of products in response to the customers need while maintaining high performance (Zhang *et al*., 2003). Despite of different concepts exist, manufacturing flexibility has been cited as a means for improving operational performance such as cost, quality, and delivery speed (Vokurka and O'Leary-Kelly, 2000).

A number of studies have been conducted to investigate the performance implication of manufacturing flexibility, providing empirical evidence regarding the positive relationship between manufacturing flexibility and performance. For instance, Chang *et al*. (2003) confirmed that product flexibility is significantly associated product quality and net profit improvement, while volume flexibility positively increases the sales growth. Cousens *et al*. (2009) revealed that volume flexibility is positively related to manufacturing lead time performance and customer service level. Meanwhile, Hallgren and Olhager (2009) provide evidence regarding the positive impact of volume and product flexibility on operational performance improvement. Therefore, this study formulates the following working hypothesis.

Hypothesis 3: Manufacturing flexibility is positively associated with SME operational performance.

In addition, literature suggests manufacturing flexibility also play an important role in supporting innovation capability. It is argued that manufacturing organizations could achieve a flexibility state without having to be innovative; however, to be innovative, they need to be flexible (Camison and Vilar-Lopez, 2010; Oke, 2011).

Innovation capability is essential for manufacturing organizations with a view to the improvement in performance (Llorens, 2005; Sher and Yang, 2005). Accordingly, as Camison and Vilar-Lopez (2010) noted, flexible manufacturing organizations are very likely to place a greater emphasis on innovation capability as their primary distinctive competence for gaining competitive advantage. Sanchez *et al*. (2009) propose that the ability to perform innovation, in some extent, rely on the extent to which the companies seek to develop and utilize their resources to be more flexible. Oke (2011) have attempted to link mix and labor flexibility to product innovation; confirming that these two types of flexibilities and innovation are positively related. Camison and Vilar-Lopez (2010) demonstrate that manufacturing flexibility is positively related to product, process, and organizational innovations. Therefore, this study formulates the following working hypothesis.

Hypothesis 4: Manufacturing flexibility is positively associated with SME innovation capability.

2.3 Innovation Capability

Stimulating innovation in SMEs is a very important matter (Humphrey and Schmitz, 1996; Keizer *et al*., 2002). Literature has conceptualized innovation in different ways. For instance, innovation could be referenced as the adoption of an idea pertaining to a product, process, or service that is new to the adopting organization (Damanpour *et al*., 1989) or the development and implementation of new ideas within an organizational (Yesil *et al*., 2013). Following OECD (2005), this study refers innovation as the implementation of a new and significantly improved product (good or service), or a process, a new marketing method, or a new organizational method in business practice, workplace organizations or external relations. Also, literature has introduced several typologies of innovations. For instance, innovation is separated between administrative versus technical innovations; product versus process innovations; technological versus architectural innovations; radical versus incremental innovations; or major versus minor innovations (Forsman, 2011; Massa and Testa, 2008; Yesil *et al*., 2013).

Despite there is no generally accepted definition of innovation, there has been a significant interest among researchers on the important role of innovation capability in developing SMEs performance (e.g., Keizer *et al*., 2002; Rosenbusch *et al*., 2011). Innovation capability is the capacity to develop and implement successful innovation (Guan and Ma, 2003). According to researchers such as Forsman (2011), Guan and Ma (2003), and Sher and Yang (2005), manufacturing organizations need to possess some degree of innovation capability as a primary distinctive competence. It is argued that SMEs with high innovation capability would be able to gain a competitive advantage against their competitors; providing them a greater opportunity to achieve a high performance. Damanpour and Wischnevsky (2006) underline that SMEs operating under the present conditions of global and regional competition must perform innovation continually in order to grow and even to survive. According to (OECD, 2005), innovations could be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products. Therefore, this study formulates the following working hypothesis.

Hypothesis 5: Innovation capability is positively associated with SMEs operational performance

3. METHODOLOGY

3.1 Sample and data Collection

This study follows a survey method to collect data pertaining to the phenomena of industrial clustering, manufacturing flexibility, innovation capability, and operational performance in manufacturing SMEs. The survey method was chosen because, as Panayides (2006) noted, it allow the researchers to obtain a large number of respondents efficiently, in addition that the data required could be obtained by the use of a mail-administered or direct-distributed questionnaire. Meanwhile, the use a single respondent design is reasonable and has been widely applied in an operational and management research, particularly when the study is dealing with investigating several phenomena across different industries (Raymond and St-Pierre, 2005).

A purposive sampling method was employed to select the sample. The sample was selected according to two criteria: employment size and location. The targeted sample was obtained by two main different sources: Indonesia Manufacturing Directory provided by the Indonesia State Board of Statistics (ISBS) and the Province SMEs Association Directory. ISBS defines SME as a business entity that employs fewer than 100 employees. Data of this study are collected from the clustered manufacturing SMEs operating in three provinces: Jakarta province, West Jawa Province, and Central Jawa Province. For the purpose of this research, SMEs' owner or managers were targeted as respondents to survey in companies. A total of 382 structured questionnaires were directly distributed to companies with 124 questionnaires among of them were received: representing a response rate of 32%. It consisted of 32.3% of companies operating within the electrical parts sector, 28.2% in machining, 21.0% in automotive parts, and 18.5% in plastic/paper products. There is still no general agreement regarding the sample size should be included in a survey research. According to the Structural Equation Modeling (SEM) convention, the minimum sample size ranged from 100 to 200 (Iacobucci, 2010).

3.2 Variables Measurement

3.2.1 Industrial Clustering

This study considers industrial clustering (CLUST) as a multidimensional construct consisting of the local network, the presence of related industries, the government support, and the local advantage dimensions. This study adopted Porter's (1998) definition of industrial cluster to develop a specific measurement scale for industrial clustering construct. This study also considers the work of other researchers (Antonioli *et al*., 2010; Kesidou and Szirmai, 2012; Lin and Sun, 2011; Muscio, 2006) to capture the industrial clustering factors. A total of 16 items were utilized to assess these four dimensions. As applied in Guerrieri and Pietrobelli (2004) work, this study focuses on assessing the industrial clustering effects, namely the extent to which the industrial clustering is perceived as important factor by manufacturing SMEs in improving their performance. Five-point Likert scale, anchored with 1 = (not at all important) to 5 (very important), were used to measure the scales of industrial clustering.

3.2.2 Manufacturing Flexibility

To address the multidimensionality of manufacturing flexibility construct (FLEXI), five types of manufacturing flexibility were taken into account, i.e. machine flexibility, product flexibility, volume flexibility, routing flexibility, and labor flexibility. The items for manufacturing flexibility were adopted from Zhang *et al.* (2003) and Das (2001). A total of 29 items was utilized to assess the five dimensions of FLEXI. In the survey, respondents were asked to indicate the extent of their agreement with each of the items on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.2.3 Innovation Capability

To address the multidimensionality of innovation capability construct (INOV), this study distinguishes four types of innovation: i.e., product innovation, process innovation, organization innovation, and marketing innovation. The items for the four types of innovation capability were adopted from OECD (2005), Camison and Vilar-Lopez (2010), and Guan and Ma (2003). A total of 20 items was employed to capture the four dimensions. In the survey, respondents were asked to indicate the extent of their agreement with each of the items on a five-point Likert-type scale ranging from 1 (Much worse) to 5 (Much better).

3.2.4 Operational performance

While the extant literature provides various dimensions of operational performance (Alegre-Vidal *et al*., 2004; Chen, 2008), this study focuses on three measures of operational performance: quality, cost, and delivery. These three measures of performance are the most popular indicators employed to measure the operational performance in the manufacturing environment (Chen, 2008). Importantly, Indonesian manufacturing SMEs are familier with the measures. A total of 11 items, adopted from Alegre-Vidal *et al*. (2004), were employed to capture the three dimensions of operational performance. Perceptual measures were applied to measure these three operational performance dimensions. In particular, operational performance was measured by having respondents' rate of their companies' performance relative to that of their principal competitor. Five-point Likert scale was applied, ranging from 1 (Much worse) to 5 (Much better).

3.3 Data analysis Method

This study employed various data analysis methods to achieve the research objectives. The methods were applied to various purposes, including the reliability analysis, independent sample t-test, and confirmatory factor analysis (CFA). The CFA, as Hair *et al*. (2006) explained, allow the researcher to examine the relationships among constructs simultaneously and assess the direct and indirect relationship between one or multi independent variables and one or multi dependent variables. The reliability analysis was applied as all items included in the research instrument were adopted from the extent literature. To assess the existence of non-response bias, accordingly, an independent sample t-test was applied to examine whether or not the early and late responses have a significant difference in term of the mean and standard deviation values (Pagell and Krause, 2004). In particular, this study applied the two-stage approach in analyzing the proposed model: the measurement model assessment and the structural model assessment (Anderson and Gerbing, 1988).

4. RESULTS

4.1 The Measurement Model

This study applied the reliability analysis to assess the validity and reliability of the scales, as measured by the corrected item-total correlation (CITC) and Cronbach's alpha values. In this regard, an item would be removed if it does not contribute to the alpha value. Table 1 to Table 4 presents the results of the validity and reliability test. The calculated CITC values indicate that all items included in the industrial clustering construct are significant. In this regard, the CITC generates factor loadings of ≥ 0.50 for all items. The reliability analysis provides Cronbach's alpha values of ≥ 0.70. The CITC values for five manufacturing flexibility items, three innovation capability items, and two operational performance items are substantially < 0.50. Following Hair *et al*. (2006) recommendation, these items have been removed. After purification, the reliability analysis pro-

Table 1. The results of reliability analysis (industrial clustering construct)

Dimensions	Coding	Items	CITC
Local network (0.877)	Clust11	New market	0.826
	Clust12	Production sharing	0.808
	Clust13	Resources interdependency	0.669
	Clust14	Access to business information	0.896
Related industries (0.798)	Clust21	Suppliers	0.777
	Clust22	Distributors	0.811
	Clust23	Core industries	0.757
	Clust24	Complementarities industries	0.774
Government support (0.829)	Clust31	Technical issues	0.900
	Clust32	Managerial issues	0.892
	Clust33	Policies and regulation	0.877
	Clust34	Infrastructure development	0.862
Local advantages (0.876)	Clust41	Access to raw material	0.834
	Clust42	Skilled labour	0.850
	Clust43	Local demand	0.811
	Clust44	Customers connection	0.860

Table 2. The results of reliability analysis (operational performance construct)

Dimensions	Coding	Items	CITC	
			1	2
Manufacturing cost (0.849)	Perfo11	Material cost reduction	0.745	
	Perfo12	Labor cost reduction	0.757	
	Perfo13	Overhead cost reduction	0.659	
Quality (0.881)	Perfo21	High performance products	0.695	0.777
	Perfo22	Consistence quality with low defects	0.691	0.782
	Perfo23	Durable products	0.716	0.743
	Perfo24	After sales support	0.256	
	Perfo25	Work condition and safety	0.621	0.667
	Perfo26	Environment friendly products	0.238	
Delivery (0.771)	Perfo31	Dependable delivery	0.552	
	Perfo32	Fast delivery	0.552	

vides CITC values of ≥ 0.50 for all items. The reliability analysis generates Cronbach's alpha values for each scale that exceed the threshold point of 0.70.

This study then performed discriminant validity to assess the extent to which industrial clustering, manufacturing flexibility, innovation capability, and operational performance constructs differ each other. In other words, each of these four constructs shares more variance with its corresponding measures than it shares with other constructs (Fornell and Larcker, 1981). Toward this end, this study calculates the average variance extracted (AVE) of reflective indicators and compare it with the correlations of the constructs. The results, presented in Table 5, indicate that the square roots of the AVE are higher than the correlations between these four constructs. In addition, this study also conducted a second-order analysis to assess the dimensionality of constructs being investigated (Table 6). The results confirm industrial clustering as a construct consists of four significant dimensions: local network, the presence of related industries, government supports, and local advantages. Manufacturing flexibility as a construct made up of the five dimensions: machine flexibility, product flexibility, volume flexibility, routing flexibility, and labor flexibility. Four dimensions are verified as valid to reflect innovation capability construct: product, process, organizational and marketing innovation capability. Three dimensions are valid to reflect operational performance construct: product quality, manufacturing cost, and delivery.

4.2 The Structural Model

In terms of overall fit, the results provide the Chi-

Table 3. The results of reliability analysis (manufacturing flexibility construct)

Dimensions	Coding	Items	CITC	
			1	2
Product flexibility (0.864)	Flexi11	Time required to introduce new products	0.626	0.669
	Flexi12	Cost of introducing new products	0.698	0.745
	Flexi13	Time required to accommodate minor design changes	0.685	0.714
	Flexi14	Cost of accommodating minor design changes	0.664	0.698
	Flexi15	Extent of new parts required in minor design changes	0.218	
	Flexi16	Number of new operations required in minor design changes	0.636	0.596
Machine flexibility (0.891)	Flexi21	A typical machine can perform many types of operations	0.752	0.784
	Flexi22	A typical machine can effectively use many different tools	0.749	0.787
	Flexi23	Machines often become obsolete when new operations are required	0.693	0.728
	Flexi24	Machine tools can be changed quickly	0.292	
	Flexi25	Machine set-up can be done quickly	0.694	0.748
	Flexi26	Machine set-ups are easy	0.687	0.633
Volume flexibility (0.876)	Flexi31	We can operate efficiently at different levels of output	0.733	0.773
	Flexi32	We can operate profitably at different production volumes	0.308	
	Flexi33	We can economically run various batch sizes	0.678	0.738
	Flexi34	We can quickly change the quantities for our products produced	0.603	0.706
	Flexi35	We can vary aggregate output from one period to the next	0.695	0.723
	Flexi36	We can easily change the production volume a manufacturing process	0.724	0.601
Routing flexibility (0.866)	Flexi41	A typical part operation can be routed to different machines	0.670	0.719
	Flexi42	A typical part can use many different routes	0.676	0.736
	Flexi43	The system has alternative routes in case machines break down	0.649	0.713
	Flexi44	The operating sequence through which the parts flow can be changed	0.264	
	Flexi45	Machine visitation sequence can be changed or replaced quickly	0.204	
	Flexi46	Route changeovers are easy	0.565	0.701
Labor flexibility (0.862)	Flexi51	Workers can perform many types of operations effectively	0.782	
	Flexi52	A typical worker can use many different tools effectively	0.671	
	Flexi53	Cross-trained workers can perform effectively	0.690	
	Flexi54	Workers can operate various types of machines	0.699	
	Flexi55	Workers can be transferred easily between organizational units	0.571	

square statistic = 110.30, p = 0.058, d.f. = 91, which indicates a reasonable fit. The model fit indices GFI = 0.949, TLI = 0.986 are good. In addition, the absolute fit measure is acceptable (RMSEA = 0.042). Given the satisfactory fit of the model, the hypotheses proposed in this study were evaluated by examining the standardized regression weight (SRW) and the critical ratio (CR). The results are reported in Table 7. As can be observed in Table 7, industrial clustering has a positive effect on operational performance (SRW = 0.368; CR = 4.70) and innovation capability (SRW = 0.732; CR = 8.46); supporting H1 and H2 respectively. Likewise, manufacturing flexibility positively affects operational performance (SRW = 0.128; CR = 4.61) and innovation capability (SRW = 0.289; CR = 4.44). Therefore, H3 and H4 are supported. Also, innovation capability is found to have a

Table 4. The results of reliability analysis (innovation capability construct)

Dimensions	Coding	Items	CITC 1	CITC 2
Product IC (0.880)	Inov11	Ability to replace obsolete products	0.703	
	Inov12	Ability to extend the range of products	0.705	
	Inov13	Ability to develop environmentally friendly products	0.716	
	Inov14	Ability to improve product design	0.725	
	Inov15	Ability to reduce the new product development time	0.720	
Process IC (0.881)	Inov21	Ability to master the key manufacturing technologies	0.731	0.749
	Inov22	Ability to develop programs to reduce production costs	0.708	0.723
	Inov23	Ability to manage production facility	0.650	0.697
	Inov24	Ability to assigns resources to the production department	0.796	0.803
	Inov25	Ability to integrate production management activities	0.103	
Org. IC (0.909)	Inov31	Ability to develop employees competence	0.163	
	Inov32	Ability to improve employees retention	0.775	0.799
	Inov33	Ability to use inter-functional working groups	0.644	0.699
	Inov34	Ability to cooperate with suppliers	0.809	0.838
	Inov35	Ability to cooperate with customers	0.788	0.845
Marketing IC (0.912)	Inov41	Ability to introduce new products	0.736	0.768
	Inov42	Ability to develop distribution channels	0.752	0.794
	Inov43	Ability to use sales agents	0.246	
	Inov44	Ability to explore new potential market	0.759	0.815
	Inov45	Ability to create promotion programs	0.804	0.821

Table 5. The results of second-order measurement test

Fit indices	Industrial clustering	Manufacturing flexibility	Innovation capability	Operational performance
Chi-square	118.327	268.190	129.687	32.529
Degrees of freedom	99	236	109	23
Probability level	0.090	0.074	0.086	0.090
GFI	0.978	0.959	0.948	0.941
TLI	0.980	0.975	0.975	0.979
RMSEA	0.040	0.033	0.039	0.058

Table 6. The results of discriminant validity test

Constructs	Industrial clustering	Manufacturing flexibility	Innovation capability	Operational performance
Industrial clustering	***0.895***			
Manufacturing flexibility	0.266	***0.777***		
Innovation capability	0.778	0.498	***0.876***	
Operational performance	0.380	0.512	0.339	***0.915***

positive influence on operational performance (SRW = 0.576; CR = 6.18); leading to support H5.

5. CONCLUSIONS

The main purpose of this study is concerned with investigating the simultaneous effects of industrial clustering and manufacturing flexibility towards innovation capability and operational performance of manufacturing SMEs. This study followed a survey methodology involving Indonesian manufacturing SMEs to collect data and applied SEM to test the hypotheses developed in this study. The findings confirm that both industrial clustering and manufacturing flexibility positively affects innovation capability and operational performance of manufacturing SMEs.

5.1 Theoretical Contribution

This study contributed to literature advancement in three ways. First, this study empirically examines the effects of industrial clustering (four dimensions) on operational performance (three dimensions) and innovation

Table 7. The structural model test

Relationship			SRW.	CR.
Industrial clustering	→	Operational performance	0.368***	4.700
Industrial clustering	→	Innovation capability	0.732***	8.463
Manufacturing flexibility	→	Operational performance	0.128**	4.616
Manufacturing flexibility	→	Innovation capability	0.289***	4.447
Innovation capability	→	Operational performance	0.576***	6.186
Industrial clustering	→	Clust1	0.845	
Industrial clustering	→	Clust2	0.923	
Industrial clustering	→	Clust3	0.811	
Industrial clustering	→	Clust3	0.911	
Manufacturing flexibility	→	Flexi1	0.870	
Manufacturing flexibility	→	Flexi2	0.855	
Manufacturing flexibility	→	Flexi3	0.735	
Manufacturing flexibility	→	Flexi4	0.668	
Manufacturing flexibility	→	Flexi5	0.738	
Innovation capability	→	Inov1	0.798	
Innovation capability	→	Inov2	0.860	
Innovation capability	→	Inov3	0.934	
Innovation capability	→	Inov4	0.907	
Operational performance	→	Perfo1	0.933	
Operational performance	→	Perfo1	0.920	
Operational performance	→	Perfo3	0.867	
Chi-square	=	110.30		
Degrees of freedom	=	91		
Probability level	=	0.058		
GFI	=	0.949		
TLI	=	0.986		
RMSEA	=	0.042		

Note: significant at ** $p < 0.05$; *** $p < 0.01$.

capability (four dimensions). While previous studies conceptually proposed industrial clustering as important source for developing performance and innovation of the clustered companies (Baptista and Swann, 1998; Porter, 1998), little is so far known as regards its effect on operational performance (Kesidou and Szirmai, 2012). The results of this study contribute towards un-derstanding about the simultaneous effects of local network, the presence of related industries, government support, and local advantage on product quality, manufacturing cost, and delivery performance based on empirical data. The results also provide more insights regarding the simultaneous effects industrial clustering on product, process, organization, and marketing innovation capability. As noted by Casanueva *et al*. (2012), literature has yet provided a comprehensive understanding regarding the effects of industrial clustering on innovation types and activities residing in an industrial cluster. This study has identified that industrial clustering directly and indirectly affects operational performance. Second, this study evaluates the effects of manufacturing flexibility (five dimensions) on operational performance and innovation capability. Studies focusing on manufacturing flexibility and innovation relationship are limited, as Oke (2011) stated. In addition, previous studies mostly put a greater emphasize on the effect of manufacturing flexibility on financial-based performance (Halgreen and Olhager, 2009). The results of this study contribute towards understanding about the simultaneous effects of machine flexibility, product flexibility, volume flexibility, routing flexibility, and labor flexibility on operational performance and innovation capability based on empirical data. While the relationship between manufacturing flexibility and innovation capability is still not clearly understood (Camison and Vilar-Lopez, 2010; Oke, 2011), the result of this study confirm that more flexible a manufacturing system is equivalent to higher innovation capability. Third, this study has examined the effect of innovation capability towards operational performance as two different constructs. The empirical findings contribute towards understanding about the simultaneous effects of product, process, organization, and marketing innovation capability on operational performance as measured by product quality, manufacturing cost, and delivery. Researchers such as Camison and Vilar-Lopez (2011) and Gunday *et al*. (2011) underlined that studies addressing the effects of innovation types on firms' performance are limited. Therefore, this research provides more comprehensive analysis on innovation and performance relationship based on empirical data.

5.2 Practical Implications

The findings give several practical implications as follows. To begin with, the SMEs owners or managers should be aware that high operational performance is a prerequisite condition to compete successfully in the marketplace. For this reason, SMEs need to reorient their production and operation perspectives, including agglomerating with other similar or related SMEs to establish a cluster. In this sense, four factors should be taken into account: the local network, the presence of related industries, the government support, and the local advantage. Also, the SMEs owners or managers should be aware that SMEs need to possess some degree of manufacturing flexibility. The premise is that SMEs operational performance is influenced by the extent to which their capability to adapt in response to the uncertain demand and consumer preferences. For this reason, they need to identify and determine what type of manufacturing flexibility in accordance with their business strategies. Furthermore, the SMEs owners or managers should put a greater emphasize to foster their innovation capability. This type of capability is found to have a positive influence on operational performance. To achieve this, the SMEs owners and managers need to develop and utilize their own resources, in addition to search for the external resources required to perform innovation.

5.3 Limitation and Future Research

The study has several methodological and theoretical limitations that could be noted to point to lines for future research. First, this research was conducted by using cross-sectional sample design. The design does not allow in concluding the causality among the four constructs being investigated. Second, this study used a single respondent approach to collect data. The most desirable procedure to collect data in a survey research is a multiple sources design. Third, the sample involved in this study is derived from single developing country, namely Indonesia. This limits the generalisability of the findings; considering SMEs in different countries might have different characteristics and have different operational performance measures.

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