Innovativeness as an Antecedents to Firm Supply Performance: The Mediating Role of Innovation Performance and Supply Chain Integration

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Abstract- **The study is planned to examine the impact of innovation on the SC performance of Indonesian manufacturing firms. Addition to that the study has examined the mediating role of innovation performance and SC performance in the relationship between the innovation ad SC performance of Indonesian textile manufacturing firms. 63.7% response rate was obtained for this survey. The influence of innovativeness on SC integration and SC performance has been empirically tested. The concept of innovativeness has emerged over some recent years and not much applied in the SC context. Therefore, there is a need for manufacturers to focus on innovativeness for improving SC integration and SC performance. There is rare evidence about the direct influence of innovativeness on SC performance. Innovativeness is an ability, which is based on action. Therefore, it cannot directly influence the performance of the SC. There is a need for carrying out practical operations, including SC integration for improving SC performance. This research is first of its nature in trying to explore the relationship in an integrated manner. Managers in the SC are assisted through innovativeness to improve information development and latest technologies. In this way, effectiveness of services and efficiency can be improved using innovation in business operations.**

Keywords; *Supply Chain, Indonesia, innovation*

1. Background

It is being realized by organizations that their long-term survival and strategic success is based on the level of innovativeness in the SC. The organizations must possess ability to effectively respond towards the market changes and achieve sustainable competitive edge irrespective of the uncertainty of technology in the external environment [1, 38-39]. Innovativeness is regarded as the satisfaction of customers with the adoption of new ideas, technologies, products, and processes in response to technology and environmental uncertainty. Several empirical and conceptual studies have analyzed the salient attributes of innovativeness that reinvigorate management of SC [1]. Innovativeness is required by the changing organizations in the development of SC integration and performance of the SC. As the organization develops inter-relationships with the customers and suppliers, innovativeness is improved. Moreover, the organization can create an efficient SC through internal integration and using state-of-the-art systems. By increasing the level of innovativeness, the organization can manage its operations and flow of material effectively within the SC [2]. The basic component of competitive advantage is management of SC. This involves the improvement of profitability and productivity of an organization through the integration of internal processes, customers, and suppliers. When there is no close relationship with the partners in the SC, organizations cannot effectively respond to the external changes [3].

Moreover, higher management of the SC could be achieved through incorporation of core practices. The core practices include exchange of knowledge and information, management of demand and supply, integrated production systems, shared demand forecasts, management of transport and inventory to fulfil the requirements of customers with low cost. The relation between integration and performance has been analyzed by researchers to confirm its benefits. However, the results are conflicting based on contingency approach because of the uncertainty of technology, environment, and demand [4].

The determinants of SC integration are not much known except integrated information technology and implementation of information technology. It has been revealed by a number of studies that there is lack of systematic analysis on the influence of SC innovativeness on SC integration (I) and performance (P) [5]. The influence of innovativeness on overarching performance measures of a firm has been analyzed by most of the

research studies. Unintended results could be achieved by these multifarious measures as these can be influenced by several other determinants other than innovativeness [6]. This study has tried to resolve this confusion through an empirical analysis of these associations. When there is no direct influence of innovativeness on performance, the influence could be done through integration in the SC.

Therefore, the relation is not clear in literature. This research aims at highlighting the inter-relationships and analyzes the indirect influences created on performance by innovativeness. For this, a survey has been conducted among the manufacturers of Indonesia [7]. The sample has been chosen based on modern technologies and crucial role of Indonesiaan manufacturers across the world. Previous studies have not worked on Indonesiaan manufacturers.

The relevant literature has been reviewed in the next section. The hypotheses have been formulated and a conceptual model has been developed. The next section involves description of research methodology, analysis, and results. At the end, the managerial and theoretical implications of the results have been discussed along with research limitations.

2. Formulation of hypotheses

Innovativeness is used to determine the level of newness of innovation. The concept of innovativeness has a key role in improving performance and quality [8]. Innovativeness was defined by [8] as the openness to innovative ideas in the culture of an organization. A proactive willingness is inferred by innovativeness to change old patterns of working through incorporation of new ideas and exploring new opportunities instead of relying on existing strengths [9]. Innovativeness from a micro perspective was defined by [10] as the ability of a new idea/innovation to influence the existing skills, strategy, capabilities, marketing, technological resources of the firm. The competitive position of the firm is strengthened through innovativeness when there is quick change in the demands of customers and limited differentiation. Innovativeness supports flexibility in selection, development, building, and use of different strategies by a firm.

New ideas are introduced and executed in innovativeness, which is regarded as an action-based ability of a firm. Organizations are forced by innovativeness to transform opportunities into organizational processes [11]. The level of innovativeness is based on the extent of managers' acquisition and working on market intelligence. Moreover, it can be regarded as the level of a strong innovative culture possessed by a firm, which promotes innovative behavior. Lack of innovativeness in organizations results in loss of time and resources to investigate markets. These organizations cannot transform knowledge into practical approaches. Similarly, innovativeness has been improved by modern organizations internally by motivating teams, employees, and executives to adopt new ideas, products, behaviors, processes, and services [12].

Manufacturers are forced to increase technological integration because of dynamic environment, fast flow of information and material. The current business environment is driven by knowledge and technology. By technological integration, firms can develop innovation capability through expansion of knowledge in their SCs for achieving and sustaining competitive advantage. A foundation is provided by technologies to share information across SCs. Factors including knowledge, technology, and relationship networks are linked with innovation [13]. With the generation of new knowledge from the acquired information, knowledge development and its diffusion could be done by knowledge development across the organization and its SCs. The SC relationships can be used effectively through innovation capabilities, which are based on expansion of knowledge[14]. The knowledge can be transferred across and within the organizations. Integration of internal operations could be enhanced by an organization through relationship development with SC partners. Moreover, innovation is driven by technologies as communication is improved. Information communication becomes a key driver for innovation that fosters collaboration. Some major capabilities were identified by [15] which contribute in SC innovation, i.e. information management, knowledge management, accommodation of abilities, management of technologies, and collaborative operations. A tendency is introduced by new processes through SC innovativeness for using integrated information systems. The partners in SC work towards an integrated SC to improve SC performance [16].

It has been agreed by scholars that firms can achieve higher performance through innovativeness. It was asserted by [17] that the performance and effectiveness of a firm is improved through innovativeness in its processes. It was argued by [20] that change is the organization can be resulted by innovation within the organization, which ultimately influences its performance. It was noted by [18] that openness to unique and new ideas, which improve the efficiency of administration and result in the adoption of innovative technologies within the SC, enhances the SC performance.

Managers become able to resolve business issues through innovativeness. It offers a base for the success of corporation. The performance of the corporation is influenced by its ability to innovate. Generally, innovativeness has become an important condition for the survival and success of a firm [19]. A strategic mean is offered by innovativeness through which internal and external changes of environmental can be dealt by firms. Some positive outcomes of innovativeness were identified

by [20] such as quality of the product, reduced time cycles, new processes, and approaches for distribution, efficiency, and effectiveness of an organization.

When more ways are sought by businesses to innovative, the focus is shifted from manufacturing units to the relationships in the SC [21]. By increasing the relational exchange, close collaboration with partners, and innovativeness, the performance of the SC could be improved[22].

The interaction between suppliers and manufacturers as well as customers and manufactures are influenced by the adoption of new processes and changes. It was found by [23] in logistics that use of latest technology has a positive influence on the SC performance. It was pointed by [24] within the SC context that generation of innovation results in the transformation of services, products, processes that reduce costs and improve efficiency. As a result, customers are increasingly satisfied. The following hypothesis has been formulated in this respect:

H1: INNO ha sisgnfciat imapct on the SCHP

In manufacturing industries, managers adopt new techniques including just in time (JIT), total quality management, enterprise resource planning, and lean production methods, for managing their SCs [25]. The integration of inter and intra processes of the organization is represented by strategic integration [26]. It involves the level of collaborative working among the partners in the SC to achieve mutual benefits. Integration (INT) is used by organizations to develop sustainable business value [27]. The objective of integrating processes is to achieve efficient and effective product/services movements, cash, information, and decision, information exchange for giving highest value to the customer at a low price and reduced time. Serious issues can be experienced by firms when they do not integrate their processes [28]. These problems may include high inventory cost, low quality of the product, delayed procurement, inaccurate forecasts of product. All these issues can influence the organization and its partners in the SC by negatively affect the customer satisfaction level.

Managers in the SC are assisted through innovativeness to improve information development and latest technologies. In this way, effectiveness of services and efficiency can be improved using innovation in business operations. The organization could be transformed in relation to the external or internal changes through innovativeness [29].

Firstly, the business processes are innovated by organizations to improve integration and considering the processes of partners in the SC. Organizations have been pressurized by suppliers and customers to adopt improved technologies [30] that enhance the SC innovativeness. Resultantly, integration is improved through innovativeness. The integration of knowledge could be shaped through use of innovativeness in development and diffusion of knowledge through sharing of information and resources and collaboration with SC partners [1].

Openness to new behavior patterns and ideas into organizational culture could be involved in inter-organizational relationships. The exchange of relations improves the level of innovativeness. Innovation can be generated through SC collaboration [3]. Innovativeness is generated and matured when relationships are developed with the partners in the SC. Therefore, it was contended by [5] that the way in which innovation is undertaken by firms had been changed by the focus of integration.

It is imperative to grasp strategic innovation to develop suitable collaboration level with the partners in the SC. Moreover, the adoption of innovativeness in a collaborative way result in network externalities in which innovation benefits are received by network partners [31].

The collaborative practices and SC relationships influence the level of innovativeness. However, the integration in the organization and SC (internal and external) is improved. When high innovativeness is possessed by a SC as compared with another, it can adapt new strategic actions, including integration to manage the variations in demand and supply for fulfilling the needs of customers. It was proposed by [6]that an interaction process could be supported by innovativeness between customers and suppliers. It was pointed by [7] that innovativeness is a critical element in the context of SC management in increasing investments into new processes and systems. It was contended by [8] that greater integration could be acquired in SC by innovative process. SC processes could be improved through innovativeness by using new ideas, integration, and collaboration with partners. Therefore, the following hypothesis has been developed:

It has been acknowledged by previous research studies that integration of SC can result in improved SC performance. However, different contingency effects have been posed by some recent studies, which make the relationship conflicting. It was found by [9] that the influence of cross-functional integration is accepted when demand variability is high. However, in case of low variability, it is useful to have formal control. In a similar way, it was noted by [10] that integration in the relationship between buyers and sellers is linked with improved performance when supply complexity is high. This is regarded as the process complexity where the orders of buyers are switched to the manufacturing orders of suppliers. Moreover, lack of contingency approach in an empirical research yields inconsistent results about the relation of performance and INT. For instance, the findings of [11] revealed a negative relation among INT and P. However, it was found by [12] that increase in supplier integration may not influence performance. Moreover, it was argued that an optimal combination of integration practices exists. Thus, it has been hypothesized

that performance is positive influenced by INT. the higher the integration, the greater is the performance in SC management and mainstream logistics [13]. The following hypothesis has been formulated in this respect:

H2: INNO has sisgnfciat imapct on the SCHINT.

H3: SCHINT has sisgnfciat imapct on the SCP.

H4: SCHINT mediates the relationship between the INNO and SCHP

A crucial role is played by innovativeness in improving performance. However, innovativeness may not result in expected outcomes even if it can introduce and implement new ideas in the organizational process [15]. It was pointed by [16] that innovations are of various types including administration innovations. Administrative innovations improve the internal activities, which may not create a direct influence on performance. The relation between performance and innovativeness is mediated through another variable. A considerable percentage of association between endogenous and exogenous variable is accounted by a mediated variable [17]. Therefore, it has been proposed that the relation between SC performance and innovativeness is mediated through integration. It suggests that integration can act as an alternative method for increasing SC innovativeness. In order to examine the existence of the mediating effect, the study hypothesized that influence of innovation of SC performance is mediated by INT. When integration is accelerated by innovativeness, performance could be improved.

From the firm's information processing perspective, the processes of a firm are executed by using information. For satisfying the information processing requirements of a firm, there is a need to match the processing mechanisms of information [32]. Using this aspect in the SC context, the information processing needs of a SC is represented by the execution of activities and processes in the SC. The focal firm is enabled through information systems within the SC to process information for supporting these activities. The alignment of abilities and needs of processing are required to identify the potential advantages of using information systems within the SC. The role of application of technology in the integration of SC, procurement, and supplier relationships has been examined by literature. The specific requirements of information processing and the way these are supported by information systems has not been explained by literature studies. It has been theorized that Strategy A directs towards two requirements of information. The first is about the information access on trends of the market, preferences of customer, and competitive action required to respond towards the demand changes through the introduction of innovative products [19]. The second requirement is the coordination and collaboration between the SC partners for exchange of information including schedules, inventory, lead time, delivery, and designing of products. Moreover, it involves carrying out inter firm process in an effective manner. A portfolio of IS applications can be used to address the requirements of information, which must have abilities for understanding market intelligence, sharing of information within the organization, coordination, and communication[33]. These have been regarded as 'IS capability for agility'. It is the level with which firms apply IS, which supports information sharing with the suppliers, customers, support searching and monitoring of market. Moreover, it supports planning of scenario and introduction of innovation products/services. It has been suggested that benefits received from three practices could be improved by IS capability for agility [34]. This is done by aligning the needs and abilities of information processing. The role of practices as a mediator between strategy A and performance could be enhanced by IS capability for agility. The following hypothesis has been formulated in this respect:

H5: INNO has sisgnfciat imapct on the INPC.

H6: INPC has sisgnfciat imapct on the SCP.

H7: INPC mediates the relationship between the INNO and SCHP

3. Methodology

In present research, a quantitative approach was employed, and data was collected by formulating a structured questionnaire. A convenient sampling technique was employed to select samples from the targeted population, which is the SMEs in Indonesia. The convenient sampling technique was chosen since the results of this study cannot be generalized beyond this sample. The managers, business partners, business owners and executives who are associated to the SMEs in Indonesia are the important informers in this study. In addition, the door-to-door survey was also conducted to collect effective and useful data [33].

In present study, the researcher distributed 580 questionnaires, from which only 370 usable questionnaires were received, since 18 questionnaires were incomplete and omitted from the study, as suggested by [34]. Therefore, 63.7% response rate was obtained for this survey.

PLS-SEM, a multivariate statistical technique, which stands for the Partial Least Square Structural Equation Modeling. It observes the multivariate linkage among the study's latent and observed variables. PLS-SEM is beneficial because it has a capability of simultaneously observing multiple dependent variables and independent variables, making effective predictions, and effective dealing of multi-collinearity issue.

4. Results

The researcher discussed the PLS-SEM analysis in this section, which includes two approaches. The first is the outer model or measurement model approach.

Measurement model measures the association between latent variables and their measuring indicators. This model has sub-models, i.e. formative and reflective models. Outer model determines each item or component of all the constructs, which in turn indicate that how well items of the constructs load theoretically on their constructs. Putting differently, measurement model analysis confirms that items measure those constructs which they are actually supposed to measure, thereby indicating validity and reliability of the outer model.

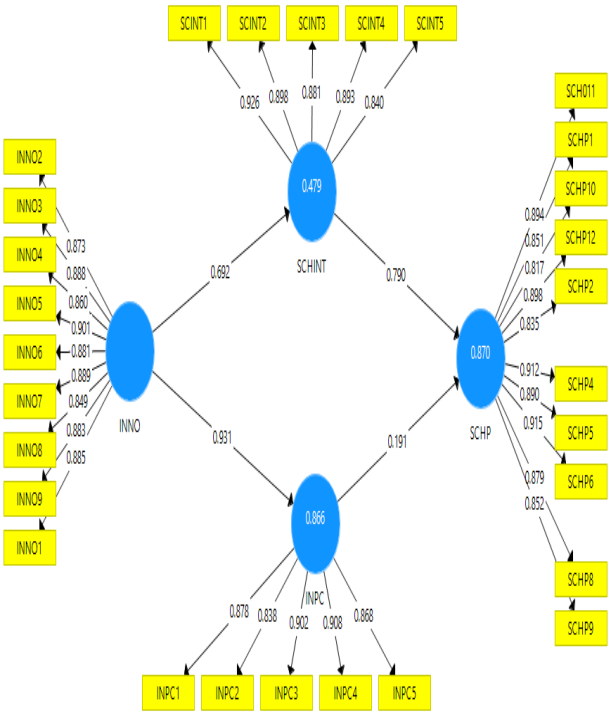

Figure 1. Measurement Model

Table 1. Outer Laodings

	INNO	INPC	SCHINT	SCHP
INNO2	0.873			
INNO3	0.888			
INNO4	0.860			
INNO5	0.901			
INNO6	0.881			
INNO7	0.889			
INNO8	0.849			
INNO9	0.883			
INPC1		0.878		
INPC2		0.838		
INPC3		0.902		
INPC4		0.908		
INPC5		0.868		
SCH011				0.894
SCHP1				0.851
SCHP10				0.817
SCHP12				0.898
SCHP2				0.835
SCHP4				0.912
SCHP5				0.890
SCHP6				0.915
SCHP8				0.879
SCHP9				0.852
SCINT1			0.926	
SCINT2			0.898	
SCINT3			0.881	
SCINT4			0.893	
SCINT5			0.840	
INNO1	0.885			

In PLS-SEM analysis, validity and reliability serve as key measures for evaluating the measurement model [35]. Thus, in current research, we examined Composite reliability and Cronbach alpha values. Table 5.8 shows that the CR and Cronbach alpha values for each construct turned out as significant, since all are above 0.70 threshold level. The range for CR was found as 0.83- 0.91, that indicates measurement model's reliability.

Table 2. Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
INNO	0.963	0.964	0.968	0.772
INPC	0.926	0.927	0.944	0.773
SCHINT	0.933	0.934	0.949	0.789
SCHP	0.966	0.967	0.970	0.765

The validity and reliability test were assessed for analyzing the measurement model. The validity and reliability test determine the measurement model's ability and the nature of relationship among the indicators that are involved in this study for measuring the constructs. According to [36] next to validity and reliability assessment is the convergent validity, which is defined as the extent that measures of the same construct which are related to each other theoretically, are actually found to be related. Thus, [37] suggest that adequate convergent validity is established when there is high correlation among other tests for estimating a similar concept. Thus, in order to identify convergence element during construct measurement, the average variance extracted (AVE) is generally employed and whose value must be equal or above 0.50 to become adequate.

After convergent validity, the discriminant validity criterion was observed to measure the extent that a construct under study is distinct from other constructs. Putting differently, discriminant validity shows that the items that are measuring the construct are theoretically unrelated[32] . In this regard, a conventional and widely used criterion is the Fornell-Larcker criterion. Cross-loading criterion is another method, which is more liberal because it is expected to integrate more constructs. [33]

suggest that multicollinearity among the explanatory variables must also be detected before structural model estimation.

Tabae 3. Validity

	INNO	INPC	SCHINT	SCHP
INNO	0.889			
INPC	0.831	0.879		
SCHINT	0.792	0.795	0.888	
SCHP	0.705	0.740	0.722	0.875

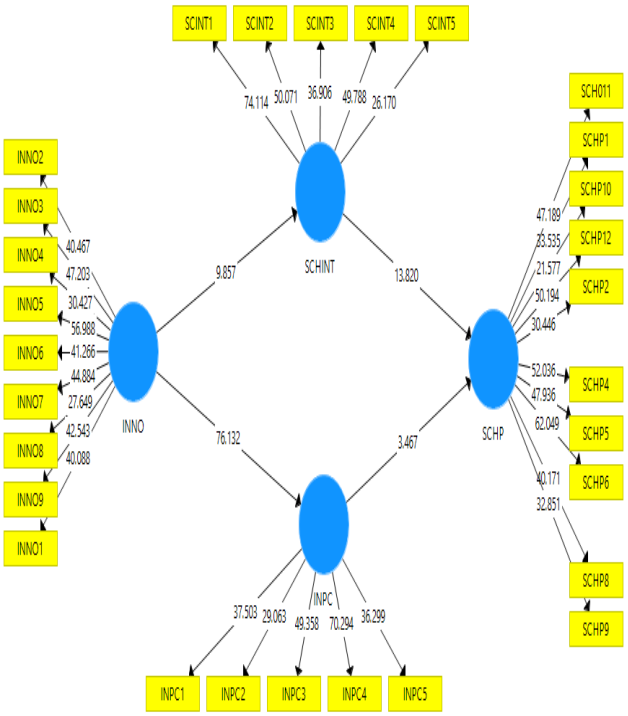

Figure 2. Strutural Model

Thus, in order to get a clear picture of the data analysis outcomes and to comprehensively test the H1-H5 hypotheses, the structural model was systematically analyzed. The structural model or inner model in the PLS-SEM analysis was examined by estimating the direct association among the dependents and independents in this research. For measuring the path-coefficients' size and relationship significance, the PLS-SEM algorithm and bootstrapping method were used, respectively, using Smart-PLS 3.0.

Table 4. Reliaility

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
INNO -> INPC	0.931	0.931	0.012	76.132	**0.000**
INNO -> SCHINT	0.692	0.692	0.070	9.857	**0.000**
INNO -> SCHP	0.724	0.724	0.063	11.560	**0.000**
INPC -> SCHP	0.191	0.200	0.055	3.467	**0.000**
SCHINT -> SCHP	0.790	0.781	0.057	13.820	**0.000**

The indirect mediation effect may allow to develop a relationship among the independent and the dependent variables, which is also an important requirement for achieving significant relationship among variables. Basically, it describes how independent variable influences the mediator, which in turn effect the model's dependent variable. According to [35] if the independent variable insignificantly affects the dependent variable, through mediator, it explains no effect of a mediator.

Table 5. Mediation

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
INNO -> INPC -> SCHP	0.178	0.186	0.051	3.508	**0.000**
INNO -> SCHINT -> SCHP	0.546	0.538	0.041	13.275	**0.000**

According to [35], coefficient of determination or R-square is the most common criteria for conceptual model assessment. [36] suggested R^2 = 0.13, 0.02, and 0.27 as moderate, weak and fair values, respectively. In PLS-SEM analysis, the structural model can also be assessed by measuring the predictive relevance of the structural model. Afterwards, the predictive relevance (Q^2) ability of the structural model is assessed through Stone-Geisser's (Q^2) test, by carrying out the blindfolding method. Therefore, to estimate Q^2 value for each latent construct, blindfolding procedure was performed to estimate the cross-validated redundancy measure.

Table 6. R-square and Q-square

	R Square	Q-square
INPC	0.866	0.432
SCHINT	0.479	0.231
SCHP	0.870	0.452

5. Conclsuion

The influence of innovativeness has been empirically analyzed on the relation of SCI and SCP. The relation has been analyzed by focusing on the role of CI as a mediator

between innovativeness and SC performance. Irrespective of the significance of innovativeness, a limited number of researches have worked on analyzing the relation in the context of SC. Therefore, this research has tried to analyze the influence of innovativeness within the SC context. The study has found many crucial results. The influence of innovativeness on SCI and SCP has been empirically tested. The concept of innovativeness has emerged over some recent years and not much applied in the SC context. Therefore, there is a need for manufacturers to focus on innovativeness for improving SCI and SCP [22]. There is rare evidence about the direct influence of innovativeness on SCP. Innovativeness is an ability, which is based on action. Therefore, it cannot directly influence the performance of the SC. There is a need for carrying out practical operations, including SCI for improving SCP. This research is first of its nature in trying to explore the relationship in an integrated manner. Moreover, the study has highlighted the association between variables (innovativeness and SCP) in the context of SC management, which was not done by previous research studies [24]. Irrespective of the extensive attempts of corporate to related SCI and SCP, the determinants are not clear.

The influence of innovativeness on performance has been addressed by previous research studies. However, they have worked on broad performance measures. The identification of specific influence of innovativeness on specific outcomes including SCP was denied by[25] . The way in which continuous innovation is promoted by SC collaboration was clarified by [26] through the use of multiple qualitative case studies. The study involved 10 Australian and Singaporean logistics firms. The results of the study indicated a positive influence of innovativeness on SCI using a sample of Korean manufacturing firms. The nature of study was different from the work of [28].

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