Linking Innovation Orientation to Operational Performance: The Supply Chain Integration Mediating Effect

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ABSTRACT
This study addresses four research questions: 1) Does Innovation orientation become an antecedent of Supply chain integration (SCI)? 2) Does SCI affect on Operational performance (OP)? 3) Does Innovation orientation (IO) directly affect OP? 4) Is the relationship between IO and OP mediated by SCI? Accordingly, theoretical perspectives were used to advance a conceptual model and devised hypotheses using the Resource base view and Dynamic capabilities view. This study offered relationships among IO, SCI, and OP and direct relationships between IO and OP. A model was examined and developed examining these relationships in general in the strategic defense industry consisting of state own and non-state own enterprises; including joint ventures, foreign investment and family businesses enterprises established particularly in Indonesia. This research employed a quantitative approach through surveys during the pandemic of Covid-19. Questionnaires were used to collect primary and secondary data from various sources. Through a census of 41 organizational units classified as companies producing defense and security equipment of strategic defense industry groups in Indonesia, 80% of the companies have contributed to the surveys. Data was analyzed using PLS SEM and SPSS to analyze and determine the relationships and effects among variables. Findings show that: (1) IO as an antecedent effect significantly and positively on SCI; (2) Supply chain integration has positive and significant effect on Operational performance; (3) IO effects positively and significantly on OP; (4) IO effects effect on OP through SCI positively and significantly. IO's effect as resource and SCI as vigorous capability improves OP significantly. The strategic operations SCI model is able to advance OP with IO as antecedent.

Keywords: *Dynamic Capabilities View, Supply Chain Integration, Innovation Orientation, Operational Performance, Resource Based View.*

1. INTRODUCTION

There has been a shift of rivalry among organizations to SCs in today's competitive market. Consequently, an organization's competitive position and Operational performance (OP) depend on its SC capabilities. SC Management (SCM)'s success is shown when particular organization fit in numerous functions as in the organization. This combination is effective in linking activities performed by external distributors, suppliers, and customers, promoting OP competitiveness and improvement.

Limited studies on Supply chain integration (SCI)'s effect on OP with Innovation orientation (IO) as antecedent point to an essential research gap requiring more investigation. Researcher of the recent study recommends examining the effect of IO on company's OP through the effect of SCI. This study explores an IO enabling partnerships and collaborations within and across supply chain organizations by using SCI to improve quality, reduce costs, turnaround times and flexibility, thereby improving the company's OP.

The objective of this study is a Strategic Defense Industry (SDI) particularly in Indonesia, where the research was conducted during the COVID-19 pandemic. SDI is a National Defense Development Policies aimed at meeting the needs of defense, security equipment and supporting the

national economy. Following DCV, SCI is an organization's strong ability [1] and its assisting influence on IO – OP relationship is motivating to be investigated as, in literature, the suggested relationships have not yet been studied. This study empirically analyzes IO's effect on OP, and then observes SCI's intervening effect. In particular, a company's attainment measure in reaching goods an OP that has been set up as an outcome variable because of a strong correlation between SCM and OP's enhancement from the operation management's perspective.

2. REVIEW OF LITERATURE AND HYPHOTESIS DEVELOPMENT

The theories of RBV and DCV perspectives are adopted and represented complementarily in this study.

2.1. RBV and DCV

RBV theory shows capitals as a basis of company capabilities becoming the competitive advantage's central source [2]. [3] stated that capability is "the capacity of a firm to use resources, usually in combination, through organizational processes to influence the desired goals". RBV is the main theoretical perspective used to examine the critical role of IO to Performance [4], [5].

DCV theory put forward that companies are required to advance new organization capabilities to recognize prospects and react to changes business environment's changes rapidly, to endure in a highly competitive and forceful setting [6]. Moreover, [7] explain DC as "the ability of an enterprise to integrate, build, and reconfigure internal and external competencies to cope with rapidly changing business environments."

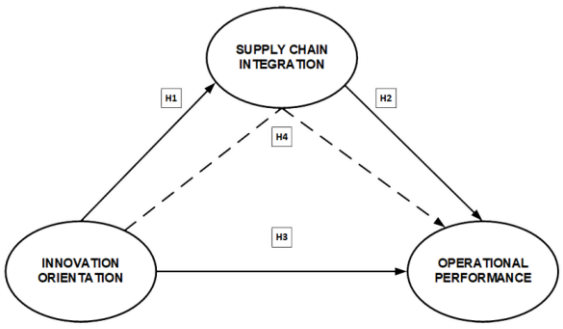

Figure 1. Conceptual model

2.2. Innovation orientation

IO refers to resources, new skill, management, and technique adoption, organizing well through new processes, better creativity, and a tendency to make changes [8]. Innovation-oriented companies can forestall and respond to customer necessities faster than their competitors and obtain better or more outstanding benefits [9]. In addition, IO, as strategic orientation, can mark improvement in organizations [10] where companies can create an innovation-oriented atmosphere by stimulating organizations to be inventive and involve in investigation [9].

2.3. Supply chain integration

In a greatly vigorous competitive environment to survive, companies need the ability to create an aligned and integrated SC through outside and inside cross-functional incorporation with SC associates [11] [12]. [13] view SCI based on "the extent to which a company can strategically collaborate with its supply chain partners and collaboratively manage intra-organizational and inter-organizational processes to achieve an effective and efficient flow of products and services, information, money, and decisions to deliver maximum value to customers at a low cost and fast time".

2.4. Operational performance

Measuring performance means determining the quantification of the effectiveness and efficiency of a particular process or function. According to [14], total Effectiveness is a level of fulfillment of customer needs, while efficiency is the monitoring of how much a company's resources are used when achieving or providing a predetermined of customer satisfaction level following the target [15].

2.5. Innovation orientation and Supply chain integration

Companies increasingly need and become reliant on suppliers, customers, and even competitors as sources of information and initiators for product and process improvements and as sources for creating new ideas [16]. Adopting innovations oriented towards improving SCI is important. Accordingly, the first proposed hypothesis is:

H1: IO effects positively and significantly on SCI.

2.6. SCI and OP

In improving firm performance, SCI's significance in literature has been discussed theoretically and empirically, and many researchers have recognized it well. Effective collaboration among numerous functional departments (including manufacturing, R&D, marketing, and purchasing departments) is able to support companies in quickly becoming accustomed to fluctuating consumer demands and assist OP consisting of quality, cost, flexibility, and delivery [1], [17], [18].

According to an increasing evidence, it seems that SCI effects positively and significantly on OP including flexibility, quality, delivery, and cost [12] Therefore, the second proposed hypothesis is:

H2: SCI effects positively significantly on OP.

2.7. Innovation Orientation and Operational Performance

Intra-organizational relationships taking place in company including teamwork implementation and continuous improvement, and inter-organizational relationships that include procedures or new organizational structures outside the company's limitations such as cooperation with suppliers, are some examples related to activities oriented towards generating purposeful innovation to improve OP [19]. Studies investigating firm performance and innovation prove that innovation indicates higher performance achievements. The third proposed hypothesis is:

H3: IO has positive and significant effect on OP.

2.8. Innovation orientation and Operational performance mediated by Supply chain integration

Using DCV to investigate to what extent and how IO benefits OP through developing SCI abilities covering building external, internal incorporation and forming intentional businesses with SC associates [12], [20] SCI means vigorous capability which is able to change and develop according to the market and afford a competitive response to enable the company to achieve superior OP. It is proposed that IO has indirect effect on OP in SC context attained over SCI development. Thus fourth hypothesis proposed is:

H4: Mediated by SCI, IO has positive and significant effect on OP.

3. DATA AND RESEARCH METHOD

3.1. Measures and Data Collection

Survey was completed in January 2021 and there are 41 Organizations of industry member drawn from Indonesia's Strategic Defense Industry directory. The respondents are well-informed about their own organizations in order to confirm the data quality.

There are 33 organizations consisting of single respondent including Director, VP/GM, Quality Manager, Supply Chain Manager, Operations / Production Manager, Sales and Marketing Manager, Program Manager and Assistant Manager experiencing at least 6 years in related field as displayed in table below.

Table 1. Respondent profile

No.	Demographic of respondents		Frequency (n=33)	Percent (%)
1.	Education	Bachelor's degree	23	70
		Postgraduate	10	30
2.	Position / Qualification	Director	2	6
		GM/VP	5	15
		Manager	21	64
		Assistant manager	5	15
3.	Managerial function	Engineering / Technology / R&D	7	21.2
		Production & Services	7	21.2
		Program	2	6.1
		Quality	1	3.0
		Sales & Marketing	8	24.2
		Supply chain/Procurement/ Purchasing/ Logistic	8	24.2

4.	Years of working	<5 Years	8	24.2
		6-10 Years	12	36.4
		11-15 Years	6	17.2
		>15 Years	7	21.7

Some items of previous studies which have been slightly modified and developed were used in the questionnaire. Table 2 below shows the sources and measurements. Five-point Likert scales were employed to examine the items, while the questionnaire was tested to 30 respondents.

Table 2. Summary of Operational Research Variable

No.	Variable		Measurement instrument	Related research
1.	IO	IO1	Focusing on innovation.	[21] and [22]
		IO2	Stresses innovation for development necessities.	
		IO3	Efforts have been made by the company on the necessity for growth through the utilization of available resources.	
		IO4	Management actively looks at innovation ideas.	
		IO5	Always creative in adopting new technology for developed products and fulfilling customer desires.	
		IO6	Carries out product innovation in collaboration with suppliers to fulfill customer desires.	
		IO7	Focuses on developing new ideas based on customer suggestions to meet superior products in the market.	
		IO8	Innovating to cooperate with suppliers and customers to produce superior products in the market.	
		IO9	Updates technology on products, anticipating customer needs in the market.	
		IO10	Internal focus emphasizes the development of innovation based on opportunities that exist in the market.	
2.	SCI	SCI1	Provides easy access to integrated data between internal functions in the Company.	[12] and [23]
		SCI2	Ideas are shared among various departments within the company.	
		SCI3	Formed a functional team between departments to support the product development process (Product Development).	
		SCI4	Obtains market opportunity information from customers	
		SCI5	Completing a work contract (Purchase Order) according to customer requests.	
		SCI6	Provides after-sales service for products that have been purchased by customers.	
		SCI7	Shares information with suppliers through meetings	
		SCI8	Suppliers contribute in fulfilling the company's product design phase.	
		SCI9	Provides information related to production plans, demand plans and the status of the	

			availability of goods/materials to suppliers.	
3.	OP	OP1	Modify changes related to products according to customer requests.	[18]
		OP2	Seeks to complete / meet customer demand products quickly.	
		OP3	Committed to completing orders according to customer requests in accordance with applicable Quality standards.	
		OP4	Efforts to reduce production costs.	

3.2. Descriptive statistics

Table 3. Result of Descriptive statistics

No.	Variable		Min.	Max.	Mean	S.D.
1.	IO	IO1	3.00	5.00	4.5667	0.62606
		IO2	3.00	5.00	4.4000	0.67466
		IO3	3.00	5.00	4.2000	0.66436
		IO4	3.00	5.00	4.2667	0.58329
		IO5	3.00	5.00	4.3333	0.66089
		IO6	3.00	5.00	4.3667	0.66868
		IO7	2.00	5.00	4.2333	0.72793
		IO8	2.00	5.00	4.1333	0.73030
		IO9	2.00	5.00	4.3667	0.71840
		IO10	2.00	5.00	4.3667	0.76489
2.	SCI	SCI1	2.00	5.00	4.2000	0.92476
		SCI2	3.00	5.00	4.3333	0.71116
		SCI3	3.00	5.00	4.4000	0.62146
		SCI4	2.00	5.00	4.5000	0.68229
		SCI5	2.00	5.00	3.9000	1.15520
		SCI6	2.00	5.00	3.8333	0.83391
		SCI7	2.00	5.00	4.3000	0.79438
		SCI8	2.00	5.00	4.3000	0.74971
		SCI9	2.00	5.00	4.3333	0.71116
3.	OP	OP1	2.00	5.00	4.2667	0.73968
		OP2	2.00	5.00	4.5000	0.93772
		OP3	2.00	5.00	4.4667	0.68145
		OP4	2.00	5.00	4.3333	0.75810

3.3. Reliability and Validity

3.3.1. The Measurement Model Evaluation

Reflective model were used as models of all measurement in this study including needed to evaluate, internal consistency reliability, discriminant and convergent validity. Discriminant validity required assessment involving dormant variables were used to prevent multicollinearity subjects [24].

Table 4. Result of Factor Loading, CA, CR, and AVE

No.	Variable		Factor Loading	CA	CR	AVE
1.	IO	IO1	0.818	0.923	0.937	0.652
		IO2	0.806			
		IO3	0.829			
		IO4	0.877			
		IO5	0.758			
		IO8	0.777			
		IO9	0.776			
		IO10	0.811			
2.	SCI	SCI1	0.760	0.912	0.930	0.656
		SCI4	0.826			
		SCI5	0.749			
		SCI6	0.792			
		SCI7	0.849			
		SCI8	0.860			
		SCI9	0.823			
3.	OP	OP1	0.849	0.863	0.907	0.711
		OP2	0.854			
		OP3	0.905			
		OP4	0.758			

Table 5. Result of Cross loading

No.	Variable		IO	SCI	OP	SE	P-value
1.	IO	IO1	**0.818**	0.577	-0.526	0.118	<0.001
		IO2	**0.806**	0.466	-0.387	0.119	<0.001
		IO3	**0.829**	-0.511	0.177	0.118	<0.001
		IO4	**0.877**	0.066	0.082	0.115	<0.001
		IO5	**0.758**	0.144	-0.484	0.122	<0.001
		IO8	**0.777**	0.345	0.122	0.121	<0.001
		IO9	**0.776**	-0.639	0.718	0.121	<0.001
		IO10	**0.811**	-0.448	0.293	0.119	<0.001
2.	SCI	SCI1	-0.424	**0.760**	**0.877**	0.121	<0.001
		SCI4	-0.130	**0.826**	0.315	0.118	<0.001
		SCI5	-0.445	**0.749**	-0.034	0.122	<0.001
		SCI6	-0.039	**0.792**	-0.386	0.120	<0.001
		SCI7	0.451	**0.849**	-0.420	0.116	<0.001
		SCI8	0.295	**0.860**	-0.147	0.116	<0.001
		SCI9	0.191	**0.823**	-0.137	0.118	<0.001
3.	OP	OP1	0.328	0.171	**0.849**	0.116	<0.001
		OP2	-0.204	0.028	**0.854**	0.116	<0.001
		OP3	0.245	-0.322	**0.905**	0.113	<0.001
		OP4	-0.429	0.160	**0.758**	0.122	<0.001

Table 6. Result of Fornell Lacker criterion

No.	Variable	IO	SCI	OP
1.	IO	**0.764**	0.842	0.792
2.	SCI	0.842	**0.753**	0.828
3.	OP	0.792	0.828	**0.843**

Result of multicollinearity test indicated that AVIF = 4,673 and AFVIF = 3,653. Value for VIF is acceptable if < = 5, Ideally < = 3.3, suggesting that multicollinearity was not a serious concern.

3.3.2. Structural Model Evaluation

The inner model evaluation result was examined in the Fit and Quality Indices model.

Table 7. Fit and Quality Indices

No.	Fit index	Suggest of indicators	Result
1.	Average path coefficient (APC)	P<0.05	0.574, P<0.001
2.	Average R-squared (ARS)	P<0.05	0.720, P<0.001
3.	Average adjusted R-squared (AARS)	P<0.05	0.706, P<0.001
4.	Average block VIF (AVIF)	Acceptable if <=5 Ideally <=3.3	4.673
5.	Average full collinearity VIF (AFVIF)	Acceptable if <=5 Ideally <=3.3	3.653
6.	Tenenhaus GoF (GoF)	Small>=0.1, Medium>=0.25, Large>=0.36	0.696
7.	Sympson's paradox ratio (SPR)	= 1.000, Acceptable if >=0.9, Ideally = 1	1.000
8.	R-squared contribution ratio (RSCR)	= 1.000, Acceptable if >=0.9, ideally = 1	1.000
9.	Statistical suppression ratio (SSR)	= 1.000, Acceptable if >=0.7	1.000
10.	Nonlinear bivariate causality direction ratio (NLBCDR)	= 1.000, Acceptable if >= 0.7	1.000

Table 8. Variable coefficients (R^2)

No.	Variable coefficients	OI	SCI	OP
1.	R^2 (R-Squared)	-	0.730	0.710

4. RESULT AND DISCUSSION

4.1. Result

The relationship effects among variables are described in the research conceptual model and hypotheses testing. Criteria for model goodness of fit indices suggested [25] and in the table 7 indicate that all of the fit indices for the research are satisfying the cut off values.

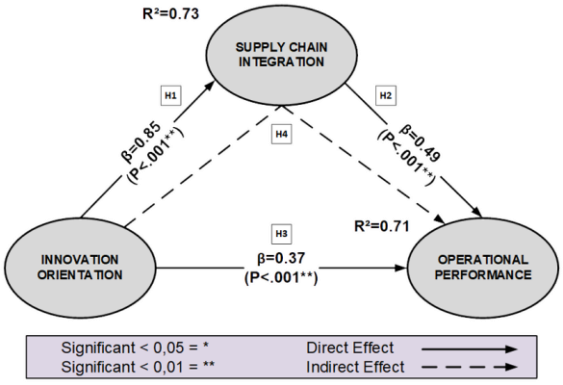

Figure 2. Result of conceptual model

Table 9. Result of hypotheses

No.	Direct effect		Path coefficient value (β)	P-value	Analysis of results	Conclusion
1.	H1	IO → SCI	0.855	<0.001	Support	Significant Positive
2.	H2	SCI → OP	0.493	<0.001	Support	Significant Positive
3.	H3	IO → OP	0.374	<0.001	Support	Significant Positive
	In-direct effect		Path coefficient value (β)	P-value	Analysis of results	Conclusion
4.	H4	IO → SCI → OP	0.422	<0.001	Support	Significant Positive

In Figure 2, IO has positive effect on SCI (β = 0.855, P-value = <0.001) and on OP (β = 0.374, P-value = <0.001) respectively supporting hypothesis 1 and 3. SCI effects positively on OP (β = 0.493, P-value = <0.001) supporting Hypothesis 2. In hypothesis 4 SCI's indirect effect significantly effects on the relationship between IO and OP (β = 0.422, P-value = <0.001) indicating that IO explain 73% of SCI' variance, while IO and SCI explained other 71% variances in OP.

According to [26], regarding mediation analysis to find out whether the mediation variable is Partial Mediation or Full Mediation, the calculation of the path coefficient value by using SCI variables was β = 0,422, P-value = < 0.001 and without using SCI variables was β = 0,81, P-value < 0.001. As an effect is facilitated partially when the mediated effect is smaller and of the same sign as the direct effect, this supports that SCI mediates the relationship between IO and OP partially.

4.2. Discussion

4.2.1. Theoretical Implications

First, examining empirically the correlation among OI, OP, and SCI has significantly contribute to literature. The impacts of SCI as a mediated effect on OP add new argument to SCI literature and further spread out the impact of IO on OP. Second, IO creates the basis upon that SCI is advanced. IO's prominence in emerging SCI is supported and additionally extended to firm's new context. Third, this research offers the partial SCI mediation effect on IO and OP's relationship.

4.2.2. Managerial Implications

First, managers have to recognize the prominence of IO efforts when pursuing collaboration with SCI. IO is the foundation for building SCI and OP. Second, managers have to be aware that IO is principal in giving contribution to SCI responsibilities essential to increase OP. Deprived of proper IO format, plans might be powerless in reaping their efforts' full benefits on OP, *i.e.* they may not attain high OP, even if they are greater on SCI. Well-performed IO and effective SCI administration should be the main goals of managers. They need to pay greater attention to investment in SCI to ensure their exertions on IO coordination which can be potentially transformed into high OP. This is consistent with the trend to join forces with their customers and suppliers closely. Third, managers have to maintain the information, communication and coordination with in internal and external organization effectively even though it is in the pandemic time.

5. CONCLUSIONS AND LIMITATIONS

First, it was confirmed that the development of integration within the organization and external with the supplier and customer, information sharing, collaboration in supply chains become serious factors to establishing SCI. SCI is strongly related to each other. Second, IO positively effects on SCI and OP. Information sharing, collaboration, and incorporation with providers and clients in a SC positively affects the quality, cost, flexibility, and delivery improvement. In specific, the impact on SCI by IO is greater than that on OP. Thus, IO is important in improving SCI. Third, SCI has positive effect on OP and mediates the relationship between IO and OP. Even though IO directly influences OP, SCI as a mediator suggests that improvement in OP via SCI is desirable.

This applied evidence is only limited to one sector of typical industry and generalization might not be possible, especially in other sectors of industry. As single respondents in organization become the central source of data, bias response indicates another limitation.

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