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The Mediating Role of Supply Chain Integration on the Relationship among Learning, Agility and on Firm Performance: Evidence from Indonesia

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Abstract- **The investigation aims to identify the association in learning, agility, organization's performance and supply chain. Data for the research was collected from Indonesia and is comprised of 350 public limited companies registered in Indonesian Stock Exchange (ISE). The results reveal that learning either it is internal or external is influenced significantly by the supply chain integration. Moreover, organizational performance and agility were not influenced by supply chain integration. While internal learning has not influenced agility but influenced firm performance. On the other hand, external learning has influenced organizational performance that is not statistically significant.**

Keywords; *Supply chain management (SCM), firm performance (FP), internal learning (IL), external learning (EL), supply chain agility (SCA)*

1. Introduction

At the end of great depression, consumers have become more demanding and their expectations are increasing. Resultantly, firms are reshaping their visions, strategies and priorities to meet the customer demands [1]. In current situation, it is acknowledged that agility is a significant sustainable element for firms.

Diversified consumer requirements have complicated the supply chain activities and increasing complexities in supply chains are obvious. These complexities can lead to short term shutdowns in manufacturing firms and can harm this sector. Multiple techniques including back-up sourcing, safety stock and agile supply chains, are adopted to counter these complexities and their impacts in SCM [2]. Worldwide, the firms are in dire need of SCA to achieve the FP and to meet the specified dates to deliver the goods. For the survival in global markets, firms need to adopt the essentials of SCA including flexibility, speed and quality [3, 4]. To fulfill the needs of worldwide consumers, firms have to adopt SCA. In an environment where demands are volatile, SCA is a basic need for firms.

Moreover, SCA positively effects in an environment where increasing demands cause uncertainty.

Supply chains pertains agility in an environment where learning and cooperation is present among supply chain members. Firms having focus on learning have better performance because they are responsive to change [5]. Learning makes these organizations respond timely to an uncertainty in the environment [2]. Learning of a firm is done either from internal environment or from an external marketplace. Meanwhile, a number of studies are conducted to analyze the supply chain integrations, agility and external learning and their impacts on organizational performance [2, 4, 6]. There is no investigation present till today that has investigated the effects of IL on FP. Moreover, firms have found that integrated supply chains are necessary to monitor and improve the supply chain performance and are necessary for the achievement of SCA. Responsive and agile supply chains are integrated and are formed by the best practices internally and externally. [7] concluded that communication either internal or external increases the effectiveness of a decision; furthermore, the author states that till date no investigation has analyzed the effects of IL on FP. The research work has utilized the information collected from the survey and SEM to investigate the learning, SCI, agility and their effects on FP.

1.1. Conceptual Framework and Hypothesis Development

1.1.1. SCA

[8] have elaborated and discussed the SCA deeply. According to their definition, responsiveness of a firm and its supply chains to an uncertainty or change is termed as agility. Companies themselves and their partners should respond in time to minimize these disorders in supply chains to fulfill the consumer demands smoothly [9]. Automation is the basic tool to achieve speedy and flexible response. Concept of agile in the supply chains

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emerged after the realization by the firms regarding speed and flexibility of business operations [3].

Flexible supply chains have direct and positive impact on agility [10]. In previous studies, SCA was measured as a secondary variable and measurement tools were consumer behaviors, joint planning and increase/decrease in demand [2]. Demand variations make firms and their supply chain affiliates for a quick response to decrease the lead time of supply [3]. Various investigations has shown that new goods and services are offered by these firms with the help of their partners at strategic level [11, 12]. Coordinated plan is necessary to obtain SCA because products move swiftly among supply chains [11]. Accordingly, agility can be achieved through collective plans and coordinated partnerships [13]. [14] concludes that productivity of the firms increases when lead time decreases. Agility has become essential for the survival of firms in these dynamic circumstances of 21st century. To increase the firm performance, responsive and flexible supply chains are much needed [4].

Hypothesis 1: SCA and FP has a significant association.

1.2. The mediating role of SCA

Different studies have examined a direct association between FP and integrated supply chain processes [15, 16]. More recently, SCI and EL is implicitly connected to FP with a mediating role of SCA [2]. Data or resource management leads firms to versatility [16]. Moreover, [10] established that versatility, agility and information technology are correlated to establish an indirect association between SCI and FP through the SCA mediation role. Recently in a research by [2] suggests that SCI cannot impact the FP without increasing the SCA.

There are many researches on the direct relationship between learning and FP [17, 18]. Organizational learning has been considered essential to FP [19]. Learning enhances organizational abilities for creativity that eventually increase FP. Creativity and agility have thus strengthened direct and indirect associations between learning and FP [20, 21]. Learning can be broadened internally as well as externally through management [5]. [2] The effect of EL on the FP mediated by SCA was considered significant. No research has been conducted to date that examine the relationship between IL and FP mediated by SCA.

H 2a: SCA is the mediator on the association among SCI and FP.

H 2b: SCA is the mediator on the association among EL and FP.

H 2c: SCA is the mediator on the association among IL and FP.

1.3. SCI

SCI is the point to which the business interacts with its other supply chain members to create effective and reliable transfers of high-value, high-speed and low-cost knowledge, goods, actions, resources and information [6]. Companies are now working to merge their SC to gain versatility and speed [6]. Assimilation with the SC associates also increases the value of service provided by firm. SCI is said to be highly associated to FP [22]. However, another research demonstrates that SCI has no positive effect on the FP; in the meantime, performance is indirectly impacted by SCA [2]. [2] reveals a strong and positive relationship between SCI and SCA. Integrated Supply chain helps to deliver the highest value to ultimate users consumers in the context of information and resource flow [15].

[2] explored the effect of convergence in the supply chain on FP. Although the direct effect is observed to be negligible, a significant positive implication is observed through a mediator of agility in the supply chain. Several scholars evaluated previous studies and found that SCI can even be assessed by second-order structures such as consumer incorporation, organizational integration and supplier convergence [15]. Internal integration (II) is characterized as consistency of firm [23]. [15] said internal integration dissolves structural constraints that are required to improve company efficiency and agility.

The principle of dynamic volatility suggests that customer and manufacturer convergence represent flexibility outside the enterprise and have significant similarities with II that ultimately affect SCI [15]. The study found that II is an external integration apriorism condition that is manufacturer and consumer integration [24]. Therefore, it is critical for manufacturers to consider environmental challenges and developments that eventually affect resilience and agility, both external and internal. Ironically, a research illustrates that II positively impacts FP while the vendors and consumers have no impact. Additionally, internal and external integration did not impact company performance [15] and that was also the conclusion of the [2]. [25].

H 3a: SCI and IL have a significant association.

H 3b: SCI and EL have a significant association.

H 3c: SCI and SCA have a significant association.

H 3d: SCI and FP have a significant association.

1.4. EL

EL is characterized as knowledge acquired and generated through joint problem-solving with distributors and consumers [26]. Generally, SCA oriented organizations constantly discovers and then integrates the information about its external environment [27]. In addition, [2] discovered that EL affects FP indirectly through the mediation of SCA. Companies need to learn

from outside their organizations to obtain recent data to improve responsiveness, that eventually offers the competitiveness to the firm [27, 28] However, [29] observed that integrated relations among SC associates may strengthen corporate culture of knowledge and thus boost the FP.

H 4a: EL and SCA have a significant association

H 4b: EL and FP have a significant association.

1.5. IL

IL contributes to professional development of personnel and incorporating the feedback from staff members, which emerge mainly in developing the product [26, 30]. [9] revealed that IL directs to the expansion in target market. IL is a leading source of skillful workforce that eventually improves the firm performance. With the point of view of SCA, IL plays a supportive role. As stated in [29] concluded that integrated supply chain relations increase organizational learning that enhances FP; therefore supply chain relations are usually the outcome of coordination among the firm and its vendors and consumers. Nevertheless, no research has been carried out surrounding the influence of IL on FP and SCA. Therefore, it is proposed that IL can assist the organizations improve their agility and eventually increases the FP.

H 5a: IL has a significant association with SCA.

H 5b: IL has a significant association with FP.

1.6. Research Method

The conceptual frameworks utilized by the study have been taken from previous studies, primarily internal learning, external learning, flexibility in the supply chain, convergence in the supply chain and FP. The research tool (revealed in Appendix 1) has been using a Likert scale with five levels. The firms chosen to receive the survey have been listed in ISE. To facilitate the data collection procedure, first, Identified and contacted the appropriate staff members associated with supply chain using their LinkedIn profiles and email address. In 2019 the samples were sent to 850 people in Indonesian firms via mail. For this study, a total of 350 survey results (a response rate of 41.17%%) have been utilized. It is deemed acceptable in terms of the duration and subject of the study.

AMOS-23 was used to check the researcher's theories. AMOS is an SPSS application and a quantitative software program. This is especially ideal for structural equation modeling.

2. RESULTS

Table 1 Provides the statistical data of the respondents. 350 respondents worked in 7 sectors. In the healthcare, hotels and restaurants and automotive sectors, more than

66% of respondents were interested. As far as the managerial role is concerned, more than 79% were actively involved in the administration of supply chains, whereas the other participants, managers and business officers would be capable of understanding supply chain processes and therefore the survey queries. Most of the organizations of the participants (over 67%) had more than 300 workers, and most of the participants (over 52%) have the job duration of 10 years in the relevant firm. This can therefore be argued that all stakeholders of supply chain were fairly familiar with the processes of the supply chain.

2.1. Non-Response Bias

Non-response bias is calculated utilizing the method suggested by [10]. T-test was applied to the 60 initial and 60 later samples reported for statistically meaningful discrepancies in response (the late responses are included as a substitute for non-respondents, stated by [31]. There were no substantial differences in the feedback; hence it is established that the non-response bias will not impact the analysis directly.

2.2. Common Method Bias

The information is obtained from one participant from each firm; and used the single-factor analysis of Harmon [32] to investigate the question of common method bias. Factor analysis was applied, and the findings demonstrated that with 7 factors, 52.9% of the total variability was defined, with odd values higher than 1. The initial variable contributed 25 of the total variation, demonstrating that there is no problem in common method bias.

2.3. Reliability and Validity

The research used five variables — SCA, IL, EL, SCI and FP. The SCA was evaluated by three second-order variables — joint strategy, market responsiveness and reaction to demand. CFA is applied to make sure that the models are accurate and reliable. To test the stability Cronbach's alpha has been utilized. Evaluated factors were considered accurate based on the coefficient values [32-34]. The results are shown in **Table 2**.

The factor loadings are subsequently tested after implementing CFA on the results, assuming that values are higher than 0.5. Factor loading for another EL factor is lower than 0.5; thus, that variable is omitted from the methodology. CFA is utilized to evaluate reliability of model via convergent and discriminating validity. Convergent validity is tested by examining the results of the average variance extracted (AVE) for each factor. Studies propose that appropriate AVE value should be more than 0.40 [35, 36]. Thus, there is convergent validity in the information. Discriminating validity is tested using

the Maximum Squared Variance (MSV). Findings revealed that there is discriminating validity as AVE values are higher than MSV [37].

Table 1. Respondent Demographics

Industry	Responses	Percent	Administrative Position	Responses	Percent
Pharmaceutical	89	25.4	Asst. Manager of Supply Chain	118	33.7
Food and beverage	69	19.7	Manager of Supply Chain	92	26.3
Automobile	75	21.4	Head of Supply Chain	64	18.3
Textile	42	12	Director of Supply Chain	59	16.9
Chemical and petroleum	24	6.9	Executive / Officer	17	4.9
Agriculture	22	6.3	**Years in current position**		
Cement	29	8.3			
Number of Employees			More than 10 years	101	28.9
			8 -10 years	82	23.4
More than 400	185	52.9	4 – 7 years	75	21.4
301 – 400	48	13.7	1 – 3 years	72	20.6
201 – 300	58	16.6	Less than 1 year	20	5.7
101 – 200	34	9.7			
Less than 100	25	7.1			
Total Responses	350				

Table 2. Reliability and Validity

Variables	# of Items	Cronbach's α	AVE	MSV
Joint Planning	3	0.817	0.586	0.198
Demand Response	3	0.767	0.522	0.191
Consumer Response	3	0.761	0.503	0.240
				0.000
External Learning	3	0.684	0.416	0.378
Internal Learning	6	0.823	0.414	0.343
Supply Chain Integration	3	0.993	0.467	0.378
				0.000
Firm Performance	5	0.840	0.489	0.343

To determine the validity the values of χ^2/df were utilized, CFI, GFI and RMSEA. The value of χ^2/df is 2.147 and are in reasonable range. Accordingly, 0.886 and 0.899 are the values for comparative and goodness fit indices, and these values are supported by the hypothesis. 0.067 is the value of RMSEA and demonstrate the GDI. All values are presented in **Table 3.**

Table 3. Goodness-of-fit

	χ^2/df	GFI	CFI	RMSEA
Values	2.147	0.886	0.889	0.067
Ideal Value	<3	≥ 0.9	≥ 0.9	≤ 0.08
Acceptable Value	<5	≥ 0.8	≥ 0.8	≤ 0.08

2.4. Analysis of the Structural Model

Table 4 Shows uniform loadings of objects, all of whom are important and > 0.40. Results equivalent to 0.40 an more are true for the hypothesis of this research. Arbitration is examined in AMOS by means of bootstrap approach.

2.5. Supply chain agility

Table 5 Provides details about the measuring model. It has been found that SCA has no substantial effect on FP. Therefore, hypothesis 1 is not supported. The researchers observed that certain assets have no significance for the firm, that generally supports the result of an insignificant association between SCA and FP. Nevertheless, [2] identified SCA as a distinctive ability of firm, that has been claimed to maximize FP. The results are conflicting with respect to the research hypothesis.

2.6. SCI

SCI and IL have a significant association. There is a significant association between learning and integration of the supply chain [25]. H3a is supported by the results of the research. The findings further suggest that the convergence of the supply chain has a direct and positive effect on external learning argued by [2]. The findings, however, as well endorse H3b. Integration of the supply chain has an insignificant effect on the SCA, therefore H3c is not supported by the results. SCI has a marginal effect on FP, in line with the results of [2].

Table 4. Standardized Item Loadings

Variables	Items	Standardized Item Loading	p-value
Demand Response	DR1	0.72	***
	DR2	0.83	***
	DR3	0.68	***
Consumer Responsiveness	CR1	0.75	***
	CR2	0.75	***
	CR3	0.71	***
Joint Planning	JP1	0.79	***
	JP2	0.86	***
	JP3	0.72	***
Supply chain integration	SCI1	0.64	***
	SCI2	0.84	***

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		0.62	
	SCI3		***
External Learning	EL1	0.57	***
	EL2	0.71	***
	EL3	0.71	***
	IL1	0.55	***
	IL2	0.51	***
	IL3	0.64	***
Internal Learning		0.63	
	IL4		***
	IL5	0.86	***
	IL6	0.80	***
	FP1	0.74	***
	FP2	0.72	***
Firm Performance	FP3	0.77	***
	FP4	0.64	***
	FP5	0.66	***

Note: *** indicates a significant relationship, $p < 0.001$

Table 5. Structural Path Findings

Structural Path		B	P-value	Result
Direct Relationships				
(H1) Supply chain agility Firm performance		0.364	0.392	Insignificant
(H3a) Supply chain integration Internal learning		0.613	0.001	Significant
(H3b) Supply chain integration External learning		0.721	0.001	Significant
(H3c) Supply chain integration Supply chain agility		0.417	0.144	Insignificant
(H3d) Supply chain integration Firm performance		0.431	0.082	Insignificant
(H4a) External Learning Supply chain agility		0.451	0.118	Insignificant
(H4b) External Learning Firm performance		0.040	0.947	Insignificant
(H5a) Internal Learning Supply chain agility		0.097	0.585	Insignificant
(H5b) Internal Learning Firm performance		0.641	0.023	Significant
Indirect Relationships				
(H2a) Supply chain integration Supply chain agility Firm performance		0.688	0.006	Significant
(H2b) External learning Supply chain agility Firm performance		0.160	0.196	Insignificant
(H2c) Internal learning Supply chain agility Firm performance		0.034	0.375	Insignificant

Furthermore, H3d has not been supported in our research. However, a variety of studies [38, 39] revealed that SCI and FP do not a significant association.

2.7. EL and IL

EL had not been observed to be significantly associated with either FP or SCA, and therefore no justification for H4a and H4b was discovered. IL has been shown strong association with FP and has no positive association with SCA. The research also includes the evidence for H5b, but no evidence was found for H5a. The pattern of supporting groups inside the organization to exchange information (which may boost FP) was shown in [40]. In addition, many businesses collaborate with their SC associates to make themselves versatile, agile. [6] indicated that the SCI had not essentially create greater flexibility and efficiency. Research has found that corporate learning is associated with the emergence of new information that allows companies to increase their creativity and FP [19]. Training can therefore help increase flexibility, which in effect improves FP, but it is also depending on other variables as well, e.g. creativity, new information, motivation and the desire for the data sharing [3, 6, 19, 40].

2.8. Indirect relationships

With the mediating function of SCA, the effects of SCI and IL and EL on FP were evaluated. The findings revealed a favorable facilitating effect between SCI and FP in SCA, while endorsing H2a. We also evaluated IL and EL plays a mediation function in SCA. No indirect implications of IL and EL have been identified on FP. So, no support for H2b and H2c has been found. Prior results also endorse the mediating aspect of agility between SCI and FP, as stated above.

3. Discussion

There are three main discoveries of this investigation, and they illustrate that integration of the supply chain has positively association with both internal and external learning, and it has been observed that internal learning is substantially impacting firm productivity. it generates incentives for internal as well as external learning once supply chain trading partners communicate procedures and take bilateral decisions. Therefore, organizations can best represent clients and increase their efficiency as internal learning evolves. it is interesting that both directly and indirectly, external learning has a marginal influence on firm output. Nonetheless, external learning has been of benefit to the organization when there is good communication between supply chain partners and, most significantly, if there is a dedication to learning, honesty, joint goals, shared information and other variables. Both external and internal learning have inconsistent effects and it is evident from the findings.

Research has explored the stabilizing effect of SCA over FP. SCA mediates among SCA, FP, EL and IL. SCI has been observed to have a positive effect on FP along

with the mediating role of SCA. All these significant hypotheses are offered by our research and will help the researchers in the near future. Earlier researches have advocated that the SCA is a mediating factor and it has a significant association with SCI and FP.

4. Conclusions

Our study has discovered that SCI has a positive associated with internal and external learning. In comparison, internal learning was strongly associated with firm output. Additionally, integration of the supply chain greatly affects business efficiency as driven by the agility of the company. Managers seeking to enhance business output should consider promoting better interaction, data sharing, and learning within the business. There should also be awareness of increased attempts to incorporate structures with trade associates. When supply chain integration develops, the trading partners become more flexible and quickly respond to any environmental changes. As a result, companies continue getting better market position and income.

It is also expected that external learning will not necessarily be helpful to the firm, based on contributory factors and moderators that may influence relationships. As [25] suggested that a company's performance may not automatically be affected favorably if the company combines operations with supply chain partners. The ethos and desire of the company to understand and gain expertise from its consumers, distributors or internal all affect company output. The design of a learning-oriented culture relies on the top management of the organizations. [27] Collective trust of the firms is necessary for the development of an information sharing corporate environment. Similarly, [41] noted that a learning-oriented environment are necessary for the SCA and all the stakeholders must put their efforts for creating such an environment that supports the open- information sharing.

EL and IL may have a major effect on sensitivity and versatility and may not necessarily have a significant effect on the FP. Firms must produce new skills, creativity, confidence building, and desire to share ideas and knowledge. [42] suggested that learning-oriented entities share four variables: learning dedication, common vision, open-mindedness and the exchange of intra-organizational expertise. [17] observed that corporate success relies not only on creativity and learning in the business, as well as on expertise in information management and change. Therefore, if companies need to improve their performance, the top management needs to set up a learning-oriented operation. Management should promote a culture of information sharing, inside the company to enable the supply chain partners to share all the relevant information for the improvement of SCA. This will facilitate the information sharing process among all the stakeholders and will lead to better FP and SCI.

4.1. Future Research Directions

The research concluded that no positive association between the SCA and FP, whereas other findings at least proposed for such a relation to exist. Clearly, to check these two factors, additional analysis is needed. Although this research explored the facilitating role SCA on FP, with respect to SCI, EL and IL, future studies could include a comparison of the resource-based view (RBV), the practice-based view (PBV), and the mixed-based view (MBV) on firm efficiency. In [43], RBV notes that the specific capacities of a business will improve the FP and SCA. Another research challenged the RBV and suggested an approach based on excessive research work by [44]. [45] suggested that the RBV cannot be used exclusively to describe the performance of a company, so they have suggested the PBV by adding activities and their effect on the output of a company. moreover, it is suggested that the mixed-based view is a different method that can be used to evaluate the effect of supply chain activities on FP. Moderators can be included in the MBV to reveal some performance differences. The MBV theory will be useful in that it would compensate both the FP and the competitive edge as dependent variables for analyzing more concrete results. A further point is that this research only studied Indonesian businesses, so a reasonable expansion will be to interview members of firms from counties like US and UK. Eventually, additional studies may determine industry sector as a control variable.

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Appendix 1. Questionnaire

Please indicate your agreement with the following statements.					
Note: SD=strongly disagree, D=disagree, N=neutral, A=agree, SA=strongly agree					
		SD	D	N	A	SA
Demand Response1					
1.	Our supply chain is able to leverage the competencies of our partners to respond to market demands				
2.	Our supply chain is capable of forecasting market demand				
3.	Our supply chain is capable of responding to real market demand				
Consumer Responsiveness2					
1.	Our products are customized rather than standardized				
2.	Our supply chain utilizes postponement strategies to enable customization of products / services				
3.	We strive to increase the level of customization				
Joint Planning3					
1.	Joint planning with suppliers is important in purchasing				
2.	Joint planning with suppliers is important in production				

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3.	Joint planning with customers is important in logistics				
Supply Chain Integration4					
1.	We work with our suppliers to seaminglessly integrate our inter-firm processes				
	(eg, order placement)				
2.	Our supply chain uses rapid response initiatives (eg, continuous replenishment or				
	Vendor Managed Inventory)				
3.	We strive to establish long-term relationships with our supply chain members				
External Learning5					
1.	We often learn from other companies about their management practices to				
	improve our own				
2.	We maintain close communication with suppliers about quality considerations and				
	design changes				
3.	Our customers give us feedback on quality and delivery performance				
4.	Our customers are actively involved in our product design process				
Internal learning6					
1.	We have adequate internal routines to analyze the knowledge obtained from our				
	external partner				
2.	We successfully integrate existing knowledge with new knowledge acquired from				
	our external partner				

3.	Employees are cross trained at this plant so that they can fill in for others if necessary
Firm's Performance7 Note: SD=very low, D=low, N=nominal, A=high, SA=very high	
1.	Return on sales

2.	Sales growth
3.	Return on assets
4.	Overall profitability
5.	Return on investment