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### **Expanding Supply Chain Performance in Logistic and Forwarder Companies: How Collaboration Enhance Capabilities and Innovation Performance**

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#### **ABSTRACT**

The changes in the business landscape between supply chains and the lack of literature on supply chains encourage scholars to investigate the relevant topic. The study aims to investigate the linkage between supply chain collaboration, capabilities, and innovation performance on supply chain performance in emerging country Indonesia. This study distributed questionnaires to 358 logistics managers and forwarders as research samples using a quantitative approach in Bali, Indonesia. The study's results showed that supply chain collaboration significantly affected innovation performance, supply chain capabilities, and supply chain performance. In addition, innovation performance insignificant effected supply chain performance. Another crucial finding was supply chain capabilities partially mediate relationship between supply chain collaboration and supply chain performance. This result enhanced logistic and forwarder companies manager to strengthen their collaboration among partners. Theoretical and managerial implications were also discussed in this paper.

**Keywords:** Innovation Performance, Supply Chain Capabilities, Supply Chain Collaboration, Supply Chain Performance.

#### **INTRODUCTION**

The current business landscape is transforming from intercompany competition to supply chain-based competition (Baah, Acquah, et al., 2021; Baah, Opoku Agyeman, et al., 2021). Given the critical function of the supply chain in improving operational performance (Truong et al., 2017) and other essential aspects of organizational agility (Arsawan, Hariyanti, et al., 2022) and sustainability performance (Salam et al., 2017). Thus, organizations must collaborate intensely with stakeholders involved in the supply chain mechanism, i.e., producers, entrepreneurs, governments, and logistics companies (Y. Huang et al., 2020). Given the vital function of the supply chain and all parties involved, developing a collaboration structure will improve performance and minimize multiple disruptions that may occur (L. Huang et al., 2020). In the existing literature, the supply chain is a dynamic construct influenced by various determinants and viewpoints. For example, a study conducted by Rajaguru & Matanda (2019) found out how the role of collaboration forms a network that strengthens supply chain capability. Furthermore, collaboration improves coordination which has implications for increasing capabilities, innovation (Asree et al., 2018), and performance (Liu et al., 2020; Mandal, 2017).

The present study bridges the gaps in studies as follows. First, a previous study reveals that supply chain capabilities' roles as a predictor of supply chain performance have yet to be extensively

explored (Hsin Chang et al., 2019). At the same time, supply chain capabilities provide a strong foundation for building supply chain performance (S. H. Liao & Kuo, 2014) and holistic organizational performance (Aslam et al., 2020). Second, in the literature regarding the supply chain, the role of innovation performance needs to be investigated and explored adequately (Hong, Liao, et al., 2019) because innovation performance has not been considered an essential trigger in building sustainable performance and competitiveness (Arsawan, Koval, et al., 2022). Third, considering that Indonesia has a low ranking in terms of supply chain performance with very high logistics costs, strategic efforts are needed to improve this circumstance.

Fourth, there is a significant gap in supply chain management. Although the researchers can explain the effect of supply chain management activities on the operational performance of companies, they have yet to explore how supply chain management activities affect innovation performance to build competitive advantage. Cooperation between supply chain members can also generate a higher rate of transaction costs due to weak networking flexibility (Schmidt & Wagner, 2019) and make collaborative innovation and knowledge sharing in the supply chain more complex. They were constructed to reduce transactional costs and unpredictability, and the relationship quality between supply chain members is essential for collaborative innovation and knowledge sharing (Jean et al., 2014). Related studies addressed the linkage between the quality of supply chain linkages and supply chain performance (Schmidt & Wagner, 2019; Tigga et al., 2021; Tsai & Hung, 2016). Nevertheless, insights into the baseline mechanisms by which relationship quality affects firm innovation performance and the role of mediation are lagging. (Rungsithong et al., 2017).

Thus, investigating the determinants of supply chain performance in Indonesia is based on three main reasons. First, having 17,000 islands requires Indonesia to build solid logistics and supply chain collaborations because it impacts operational costs, coordination costs, and performance. The ability to manage coordination and collaboration between supply chain partners will have a positive effect on strengthening cooperation and strengthening collaboration that it is inline with stakeholder theory (Freeman, 1998). Second, logistics companies are the backbone of the distribution of goods and services in archipelagic countries. It occurs because only logistics companies can do good inter-regional cooperation through networking and collaboration (Paula et al., 2019; Pomponi et al., 2015). Third, Indonesia needs infrastructure and comprehensive studies to build a supply chain to increase the global competitiveness index while reducing logistics costs (WEF, 2019).

The existing literature reveals that supply chain collaboration aims to identify, use, and assimilate resources internally and externally and information to promote activities of the entire supply chain (S. H. Liao & Kuo, 2014). Furthermore, collaboration is a mechanism for combining and testing capabilities that affect organizational operations (do Canto et al., 2020). Interaction and collaboration between supply chain partners form a network that can help increase capability, effectiveness, and efficiency throughout the supply chain (Rajaguru & Matanda, 2019). Intense cross-organizational collaboration, collaborative, and coordinating efforts enable organizations to build resources that enhance organizational capabilities, processes, and performance (Soosay & Hyland, 2015). Furthermore, collaboration with stakeholders helps achieve the required supply chain coordination (Mandal, 2017) to enhance supply chain performance (Liu et al., 2020). It aligns with previous findings (I. Wu et al., 2014) that the critical role of collaboration determines supply chain performance.

For logistics and forwarder companies, supply chain collaboration's vital role is to enhance innovation performance sustainably (Cheng et al., 2014). Organizations with solid collaboration with supply chain associates tend to have high innovation performance (Nguyen et al., 2019a). It occurs because of the diffusion and transfer of knowledge information, which has implications for collaborative innovation (Shin et al., 2019). The quality of collaboration is an essential trigger for innovation performance because it involves collaboration, commitment, and communication (Li, 2020); thus, by supporting a collaborative relationship in the long term, innovation performance will be accomplished (Asree et al., 2018). Therefore, these are the formulated hypotheses:

H1: Supply chain collaboration positively affects supply chain capabilities

H2: Supply chain collaboration positively affects supply chain performance

H3: Supply chain collaboration positively affects innovation performance

Organizations develop their capabilities to meet the dynamic market to allow effective resource configuration (J. B. Barney, 2001). Supply chain capability identifies, utilizes, and assimilates resources internally and externally to encourage these activities (S.-H. Liao et al., 2021). Supply chain capabilities will improve operational capabilities and enable organizations to coordinate comprehensive resources to improve innovation performance (Y. Liao & Li, 2019). Furthermore, previous studies found that supply chain capabilities considerably affect supply chain performance and organizational performance (Yu et al., 2018). On the other hand, organizations with more outstanding SCM capabilities in flexibility, integration, and responsiveness have a significant supply chain performance (Flöthmann et al., 2018). Thus, supply chain capabilities assist organizations' accomplishment by increasing product availability, on-time shipments, and reducing inventory positions to boost supply chain performance (Asamoah et al., 2020). The discussion leads to the formulated hypotheses:

H4: Supply chain capabilities positively affect innovation performance

H5: Supply chain capabilities positively affect supply chain performance

Innovation performance is an organization's capability to enhance its products and services' significance, usability, and performance (Hong, Liao, et al., 2019). Improved supply chain performance can be acquired by encouraging relational exchange and innovation and collaborating with associates to detect areas needed for enhancement (Seo et al., 2014). Innovation can affect interactions between producers, suppliers, and customers. Although there is extensive supply chain management literature, researchers seem to overlook the linkage between innovation performance and supply chain performance. To the authors' knowledge, innovation performance will positively impact supply chain performance, especially in logistics. Eventually, the formulated hypothesis is:

H6: Innovation performance positively affected supply chain performance

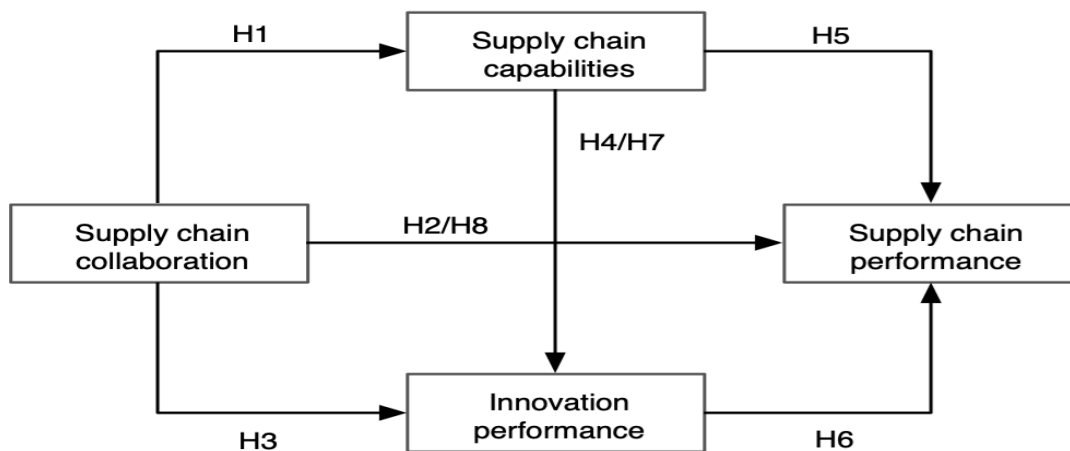
Supply chain collaboration with stakeholders (i.e., producers, suppliers, competitors, and other organizational units) will improve innovation performance (Cheng et al., 2014) in building a competitive advantage for the members of the supply chain (Lim et al., 2017). Enhancement of the quality of collaboration through networking, commitment, and building effective communication to reduce uncertainty is required to build sustainable innovation performance (Li, 2020). Thus, it enhances supply chain capabilities and forms an effective and efficient network throughout the supply chain (Rajaguru & Matanda, 2019). Finally, intense and robust collaboration improves the supply chain enabling organizations to increase innovation (Y. Liao & Li, 2019). Hence, this is the formulated hypothesis:

H7: Supply chain capabilities partially mediate the linkage between supply chain collaboration and innovation performance

Collaboration in the supply chain system will increase incremental and radical continuous innovation (Nguyen et al., 2019b; Yunus, 2018), which improves supply chain performance (Asamoah et al., 2020). The role of supply chain collaboration in this mediation framework is to improve innovation performance in building supply chain performance. Cooperation with supply chain associates will provide insight and experience to create innovation (Paula et al., 2019) to build sustainability among partners (Chen et al., 2017), which generate supply chain performance (Baah, Opoku Agyeman, et al., 2021; Cheng et al., 2014). Based on the description, the formulated hypothesis is:

H8: Innovation performance partially mediates the linkage between supply chain collaboration and supply chain performance.

Therefore, the study examines logistics and forwarder companies' supply chain performance determinant model. Figure 1. depicts the research model.



**Figure 1. Supply chain performance model**

## METHODS

The population was 179 companies affiliated with the Indonesian logistics and forwarder association. The sampling was a saturated sample, with the respondents being operational managers and chief directors. A total of 358 respondents were assumed to know strategic policies regarding the supply chain. Research variables measurement adopted previous research using a 1-7 Likert scale (“1-strongly disagreed – 7-strongly agreed”). Questionnaires were distributed online via Google Forms and collected for 3 months (October-December 2022).

To measure the variables, we used the outputs of several empirical studies. Supply chain collaboration measurement was 4 dimensions and 16 indicators, i.e., 1) internal collaboration (3 indicators), 2) collaboration with suppliers (6 indicators), 3) collaboration with customers (4 indicators), and 4) collaboration with competitors and others (3 indicators) was adapted from Chen et al. (2017). Supply chain capabilities measurement was 4 dimensions with 17 indicators, i.e., 1) information exchange (4 indicators), 2) integration (4 indicators), 3) coordination (5 indicators), and 4) responsiveness (4 indicators) adapted from the study Asamoah et al. (2020) and F. Wu et al. (2006). Innovation performance measurement 3 dimensions and 9 indicators, i.e., 1) product innovation (3 indicators), 2) process innovation (3 indicators), and 3) management innovation (3 indicators) adapted from Hong et al. (2019). Supply chain performance measurement was 3 dimensions and 14 indicators, i.e., 1) reliability (5 indicators), 2) efficiency (4 indicators), and 3) flexibility (5 indicators) adapted from previous studies (Asamoah et al., 2020; Koçoğlu et al., 2011; Lee et al., 2007).

Furthermore, the data were analyzed using SEM-PLS (Hair Jr et al., 2017) and was predictive to test the model proposed in this study. In addition, with its soft assumptions, PLS provides strength power to explain research models (Hair et al., 2019).

## RESULTS AND DISCUSSION

This study involved 358 respondents from 179 companies engaged in logistics and forwarders in Bali Province by distributing questionnaires to operational managers and chief directors regarding strategic policies regarding supply chain management. The results of descriptive statistics revealed <5 years (5%), 6-10 years (32.7%), 11-15 years (15.3%), 16-20 years (30.4%), and >20 years (20.3%) based on experience. When viewed from the age, the statistics indicated <25 years (5.7%), 25-30 years

(29.2%), 31-35 years (30.2%), 36-40 years (26.3%), and 41- 45 years (8.8%). The statistics showed males (66.7%) and females (33.3%) based on gender. Further, from educational level, the statistics denoted bachelor (81.6%), master (17.7%), and doctoral (0.7%).

Furthermore, to achieve the objectives of this research, we initially carried out the outer model measurement. Table 1. illustrates that the 69 items of the four key variables were the base of the present research model. This research model’s reliability was evaluated by Cronbach’s alpha (Hair Jr et al., 2016). Table 1. reveals that Cronbach’s alpha values exceeded 0.7. Furthermore, the research model’s convergent validity was examined using average variance extract, composite reliability, and item reliability variable, respectively. According to experts’ suggestions (Hair Jr et al., 2017), CR and AVE values must exceed 0.7. Thus, AVE and CR values met the criteria. The loading factors of the individual-level items exceeded 0.7.

**Table 1. Instrument reliability test**

Second order constructs	Items*	Cronbach’s Alpha	Rho_A	Composite Reliability	Average Variance Extracted (AVE)
Supply chain collaboration	Collaboration		1.000		
	IC	0.766	0.847	0.876	0.710
	CWS	0.889	0.921	0.934	0.681
	CWC	0.857	0.868	0.897	0.678
	CWCO	0.847	0.851	0.912	0.765
Supply chain capabilities	Capabilities		1.000		
	IC	0.842	0.966	0.894	0.724
	INTEG	0.843	0.877	0.883	0.693
	COOR	0.856	0.879	0.877	0.632
	RESP	0.861	0.887	0.921	0.735
Innovation performance	Innovation P		1.000		
	PROD	0.855	0.874	0.922	0.786
	PROC	0.875	0.892	0.939	0.823
	MAN	0.898	0.879	0.932	0.836
Supply chain performance	Performance		1.000		
	REL	0.821	0.825	0.869	0.633
	EFFIC	0.880	0.887	0.924	0.733
	FLEX	0.865	0.872	0.921	0.667

**Table 2. Perbandingan  $\sqrt{AVE}$  dengan Korelasi Antar Variabel**

Variables	AVE	$\sqrt{AVE}$	Coefficient of Correlation*			
			SCCo	SCCs	IP	SCP
Supply chain collaboration	0.541	0.736	1.000			
Supply chain capabilities	0.591	0.769	0.417	1.000		
Innovation performance	0.532	0.729	0.387	0.564	1.000	
Supply chain performance	0.549	0.741	0.268	0.532	0.323	1.000

Furthermore, according to experts’ criteria (Fornell & Larcker, 1981), upon evaluating the square root of the AVE of each variable, when the first value of the upper side of the respective column

is the highest, it indicated the formation of discriminant validity (Fornell & Larcker, 1981; Hair et al., 2016). Table 2. depicts correlation analysis based on the criteria.

The next step was to investigate the structural model to test the accuracy of the predictions and the associations between the variables, following the experts' advice (Tenenhaus et al., 2005) using the goodness of fit with a value of 0.486 which signified high fitness. Furthermore, using  $R^2$  showed that the supply chain performance model was fit (27.6%). Meanwhile, the  $Q^2$  score was positive (0.913), and all components have good predictive power (Chin et al., 2020). After testing the outer and inner models, the next step was testing the research hypotheses. Table 3. presents information on the coefficient of the direct linkage between variables through the original sample and t statistics > 1.96).

The data analysis showed that 5 of the 6 direct linkages supported the hypotheses (see Table 3.) The linkage between supply chain collaboration and supply chain capabilities was significant ( $\beta=0.462$ , t-statistic 12.538); thus, hypothesis 1 was accepted. These results supported previous studies (Baah, Opoku Agyeman, et al., 2021; S. H. Liao & Kuo, 2014) that effective and efficient collaboration will improve supply chain capabilities through the integrity of resources to achieve supply chain capabilities (Rajaguru & Matanda, 2019) in planning, procurement, and sales targets (Chand et al., 2020). The linkage between supply chain performance and supply chain collaboration ( $\beta=0.239$ , t statistics 6.160) was significant; hence, hypothesis 2 was accepted. The research results aligned with previous studies (Mandal, 2017; Mandal & Saravanan, 2019) that explained collaboration is a competitive area to improve performance by expanding mutually beneficial resources (Um & Kim, 2019).

**Table 3. Path coefficients**

Constructs	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values	Decisions
Supply Chain Collaboration -> Supply Chain Capabilities (H1)	0.462	0.463	0.037	12.538	0.000	Supported
Supply Chain Collaboration -> Supply Chain Performance (H2)	0.239	0.238	0.039	6.160	0.000	Supported
Supply Chain Collaboration -> Innovation Performance (H3)	0.304	0.298	0.048	6.300	0.000	Supported
Supply Chain Capabilities-> Innovation Performance (H4)	0.252	0.256	0.047	5.345	0.000	Supported
Supply Chain Capabilities -> Supply Chain Performance (H5)	0.454	0.450	0.055	8.298	0.000	Supported
Innovation Performance -> Supply Chain Performance (H6)	0.006	0.004	0.039	0.165	0.876	Not Supported

Furthermore, the linkage between innovation performance and supply chain collaboration ( $\beta=0.304$ , t-statistic 6.300) was significant; thus, hypothesis 3 was accepted. It reinforced the finding that collaboration is the basis for continuous innovation (Nguyen et al., 2019b). Collaborative relationships with key partners enabled innovation performance to be created due to creation (Asree et al., 2018). The establishment of innovation performance through partner relationships enhanced the competitive advantage of the supply chain (Cheng et al., 2014). Supply chain capabilities and innovation performance ( $\beta=0.252$ , t-statistics 5.354) had a significant linkage; thus, hypothesis 4 was accepted. It

supported the findings (Hong, Liao, et al., 2019), which explained that supply chain capabilities increased value creation and innovation acceleration.

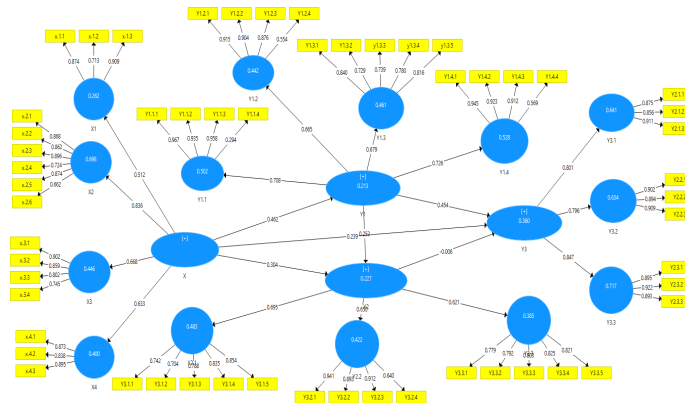
The linkage between supply chain capabilities and supply chain performance ( $\beta=0.454$ ,  $t$  statistics 8.298) was significant; hence, hypothesis 5 was accepted. These results supported the findings (Asamoah et al., 2020; Rajaguru & Matanda, 2019) that supply chain capabilities helped organizations assimilate, identify, and use internal and external resources to facilitate all activities to achieve performance. Further, innovation and supply chain performance ( $\beta=0.006$ ,  $t$  statistic 0.165) was insignificant; therefore, hypothesis 6 was rejected. It signified that innovation performance did not affect supply chain performance in logistics and forwarder companies. The result of the present study was contrary to previous studies (Seo et al., 2014; Singhry, 2015) that innovation was a vital predictor in building supply chain performance.

Furthermore, to evaluate mediation with the variance accounted for (VAF) (Hair Jr et al., 2016). (referensi) method. There were two mediation pathways evaluated in this study. First, supply chain capabilities in the linkage between innovation performance and supply chain collaboration (0.116/0.420). The VAF value was 0.276 (27.6%), which indicated a partial mediation; thus, hypothesis 7 was accepted. If the collaboration between supply chains goes well, it will increase capability, increasing innovation performance (Hong, Zheng, et al., 2019; Maldonado-Guzmán et al., 2019). Second, we concluded that innovation performance did not mediate the linkage between supply chain performance and supply chain collaboration (0.001/0.240). With the VAF value = 0.007 (7%), hypothesis 8 was rejected. The calculation results are illustrated in Table 4. and Figure 2.

**Table 4. Mediation effects**

Link*	Mediator	Independent Variable→ Mediator	Mediator→ Dependent Variable	Direct	Indirect	Total effect	VAF (%)	Decisions
SCCoI-IP	SCCap	0.462	0.252	0.304	0.116	0.420	0.276	H7=Partial mediation
SCCoI-SCP	Innov	0.304	0.006	0.239	0.001	0.240	0.007	H8= No mediation

The analysis denoted that this study enriched the insight into supply chain management in five aspects. First, the results of this study revealed that collaboration develops supply chain capabilities (Biotto et al., 2012; Shin et al., 2019) and innovation performance (Ferraris et al., 2021; Hong, Zheng, et al., 2019). Consequently, this study contributed to a comprehensive understanding of improving supply chain performance (Baah, Opoku Agyeman, et al., 2021; Cheng et al., 2014; S. H. Liao & Kuo, 2014). Second, the study showed that innovation performance was affected by supply chain collaboration and supply chain capabilities, which answered the gaps in the literature from Y. Liao & Li (2019). To the authors' knowledge, there has yet to be a study that attempts to initiate an evident linkage between different types of collaboration and capabilities to achieve innovative performance and eventually gain a more comprehensive understanding (Bravo et al., 2017; Zimmermann et al., 2016). An integrated perspective was required to understand how collaboration and capabilities mutually reinforced innovation performance in the supply chain context (Asree et al., 2018).



**Figure 2. SmartPLS Output analysis**

Third, unexpectedly, the innovation performance effect was insignificant on supply chain performance. It implied that innovation performance did not affect supply chain performance in logistics and forwarder companies. The results contradicted previous studies, which stated that innovation is a primary predictor in establishing supply chain performance (Seo et al., 2014; Singhry, 2015). The possible explanation was that logistics and forwarder companies focused more on distributing products and services. Subsequently, they only required innovation occasionally.

Fourth, supply chain capabilities partially mediated the linkage between supply chain collaboration and innovation performance. If the collaboration between supply chains goes well, it will increase capability, increasing innovation performance (Hong, Zheng, et al., 2019; Maldonado-Guzmán et al., 2019). Fifth, in the aspect of the theory, this study enhanced stakeholder theory (Freeman, 1998) through mutually beneficial collaboration configurations between associates. The strength of collaboration provides superiority in knowledge and dynamic capabilities to generate a sustainable competitive advantage (J. Barney, 1991).

## CONCLUSIONS

Three crucial conclusions were yielded from this study. First, collaboration is the foundation for building supply chain capability, innovation, and performance. Second, innovation performance insignificantly affects supply chain performance. Third, supply chain capabilities partially mediate the linkage between supply chain collaboration and innovation performance. Although this study offers theoretical and managerial significance, there are limitations to be addressed. First, supply chain collaboration has several dimensions, such as customer integration, internal integration, and supplier integration have yet to be explored in this study. Hence, we recommend re-examining the above model by splitting these dimensions into key variables for further research. Second, this study is based on 358 responses from 179 logistics and forwarder companies in Bali, Indonesia to evaluate the hypotheses. Thus, the forthcoming study must consider acquiring diverse data from different countries to increase generalizability.

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