IJBS VOL. 5, NO. 1, JUNE 2022: 30–43 DOI: 10.9744/ijbs.5.1.30–43
E-ISSN 2621-6426

Impact of Supply Chain Integration, Supply Chain Responsiveness, and Innovation Capability on Operational Performance in Era Covid-19

Dillwyn Felix Johono[1], Hotlan Siagian[2*]
[1,2]Faculty of Business and Economics, Petra Christian University
Jl. Siwalankerto No. 121 – 131, Surabaya, Indonesia
Email: [1]d21210007@john.petra.ac.id; [2*]hotlan.siagian@petra.ac.id
[*]Corresponding author

Abstract

The study investigated the influence of supply chain integration on operational performance through supply chain responsiveness and innovation capability. Data collection used a questionnaire designed with a 7-point Likert scale in Google Form and printed format. The questionnaire is distributed through social media, email, WhatsApp, and mail posts. The sampling method uses probability sampling technique utilizing online software https://numbergenerator.org/. Of the 266 population of food and beverage companies in East Java, as many as 140 samples were selected. Data analysis used the partial least square technique (PLS) utilizing SmarrtPLS Version 3.0 software. The analysis results showed that the nine hypotheses formulated were empirically and significantly supported. Supply chain integration affects supply chain responsiveness, innovation capability, and operational performance. In addition, supply chain responsiveness and innovation capability positively affect operational performance. This study's exciting and new findings are the mediating role of supply chain responsiveness and innovation capability. This result offers solutions to practitioners to build supply chain integration, supply chain responsiveness, and innovation capability to improve operational performance. The theoretical contribution of this research is mainly in the mediating role of supply chain responsiveness and innovation capability on the influence of supply chain integration on operational performance.

Keywords: Supply Chain Integration; Supply Chain Responsiveness; Innovation Capability; Operational Performance.

1. Introduction

The Covid-19 pandemic has impacted the decline in the performance of the manufacturing industry. Manufacturing companies themselves are the sectors that have suffered the most drop in operational performance caused by this pandemic. In Indonesia, the government implements various policies such as large-scale social restrictions (PSBB) and Community Activity Restrictions (PPKM) to avoid the spread of Covid-19. These policies have an impact on declining performance, such as manufacturing companies. One of the impacts of the Covid-19 pandemic is the disruption of supply and demand which will ultimately reduce the operational performance of manufacturing companies. In addition, industrial sectors such as Pharmacy experienced an increase in demand, especially for Health products needed by the community to overcome and prevent the Covid-19 virus. The products in question are hand sanitizers, masks, and medicines to prevent covid-19. However, this increased demand is also underserved due to the hampered production process. The company's operational performance development can be seen from the Purchasing Manager Index (PMI)." PMI is an indicator of the performance of manufacturing companies that reflects: new product development, flexibility, cost, time to market, and delivery. This PMI index (Jabbour et al., 2013) also describes the company's operational PERF because operational performance is also measured by indicators of cost, flexibility, delivery time, and quality. According to the Ministry of Industry, 50% of the performance of the manufacturing industry has decreased due to the Covid-19 pandemic. Therefore, manufacturing companies must take (Ginting, 2020) actions and strategies to improve the company's performance and simultaneously avoid the spread of covid-19.

The question that arises and needs to be answered is how the company, in this case, especially manufacturing companies, can improve operational performance in conditions of supply and demand disruption. This condition requires companies, including industrial manufacturers, to respond to this disruption quickly through responsive supply chains (supply chain responsiveness). Operational performance is defined as achieving the company's operations in terms of quality and productivity (Kafetzopoulos & Psomas, 2015). Several previous studies show that companies

can improve operational performance through supply chain integration, supply chain responsiveness, and innovation capability. Research from Siagian et al. (2021) shows that supply chain responsiveness (SCR) can improve the company's operations by maximizing the use of resources contained in the company to face the competition that occurs. SCR is an interaction between supply chain activities and market conditions to provide products better than before. According to (Kim & Cavusgil, 2009) and (Tseng & Liao, 2015), supply chain integration (SCI) is intended as collaboration and integration between organizations in a supply chain that can reduce costs and improve performance. Other research has also found that supply chain integration is also a concept that can be used to improve operational performance. (Cheng et al., 2016). SCI is a coordination activity in all activities, ranging from suppliers and manufacturers to customers, who can improve the company's performance to increase (Tseng & Liao, 2015; Tian et al., 2021). It has been confirmed that it's innovation and performance have a positive relationship. In addition, the level of innovation can significantly increase the company's productivity, knowledge, and profit. As a result, innovative companies show much higher profits and growth rates compared to non-innovative companies. Innovation capability is defined as the level of innovation capability of an enterprise that is temporary and has many points of view or a multidimensional concept (Kafetzopoulos & Psomas, 2015). In addition, innovation capability is the best way to improve performance and more competitive capabilities. (Saunila et al., 2014).

In addition, SCI is the basis for more quickly and effectively responding to the changing business environment. Thus, SCI directly affects SCR (Yu et al., 2019). SCI also has an essential role in the realization of innovation in organizations. Production process activities must be balanced with communication between partners so that no mistake occurs. Integration with supply chain partners can provide the knowledge needed to improve innovation capabilities. According to Kumar et al. (2020) and Yu et al. (2019), supply chain responsiveness allows a rapid response to technological developments and new products. SCR also pays attention to competitors who develop identical products not to lose. In addition, it must also be able to analyze what is more needed by customers and create a product through collaboration with partners to produce more innovative products (Bag et al., 2018)

From the review of the phenomenon above, there is a practical gap where manufacturing companies experience a significant decline in operational performance, so it is necessary to find a solution. In addition, previous studies show what factors can improve the company's operational performance, including supply chain integration, supply chain responsiveness, and innovation capability. However, previous studies have only focused on the direct influence between the two variables, and there has been no research examining the mediating role of these variables. This research aims to build a model involving four constructs that have been discussed above, namely the influence of supply chain integration on operational performance through supply chain responsiveness and innovation capability. The research update lies in a model that involves four constructs in a manner with the mediation of supply chain responsiveness and innovation capability. Based on this model, the questions that need to be answered in this study are as follows: 1) whether previous studies apply to the industrial population in Indonesia, 2) Whether variable supply chain responsiveness and innovation capability mediate supply chain integration relationship with operational performance. The results of this study make a practical contribution as input for industry players related to strategies to improve operational performance in the perspective of supply chain management. Furthermore, it contributes to academics and researchers, especially the mediating role of variable supply chain responsiveness and innovation capability in improving operational performance.

2. Literature Review

2.1. Supply Chain Integration

Supply chain integration (SCI) is a series of activities closely related to the planning, coordination, and control related to the procurement of raw materials, production process, distribution of goods, and delivery of products to customers. The implementation of SCI is expected to obtain information to achieve a good alignment of goals (Cheng et al., 2016). Some authors have conducted performance measurement studies throughout the supply chain based on these performance measures with individual measurements of company performance (Hussein Zolait et al., 2010). This research adopts research

from Tseng & Liao (2015) the measurement of supply chain integration with eight indicators as follows: 1) Companies exchange information with supplier partners (SCI1), 2) Conduct strategic collaboration with partners (SCI2), 3) Collaboration with partners is based on trust and mutual benefit (SCI3), 4) The Company integrates data internally using information systems/ technology (SCI4), 5) Coordinating across departments periodically (SCI5), 6) The Company makes production plans periodically with suppliers (SCI6), 7) the company makes regular contact with customers (SCI7), and 8) the company collaborates between different departments (SCI8).

2.2. Supply Chain Responsiveness

Supply chain responsiveness (SCR) is defined as the ability of supply chain partnerships to interact quickly with the current market (Kim & Cavusgil, 2009). SCR must respond quickly to customers changing needs while paying attention to other competitors in developing a new product (Fayezi & Zomorrodi, 2015). Furthermore, manufacturing responsiveness is needed to cope with changing dynamic customer needs (Bag et al., 2018). In addition, SCR must also adjust supply chain operations following the current market conditions by conducting strategic collaboration with supply chain partners (Yu et al., 2019). Research by Yu et al. (2019) measured supply chain responsiveness using four indicators that will also be used in this study, namely: 1) Able to respond to changes in customer demand faster than competitors (SCR1), 2) Able to respond quickly to changes in competitor strategies (SCR2), 3) Able to introduce new products faster than competitors to the market (SCR3), 4) Have a supply chain strategy that can adjust to customer's wishes (SCR4).

2.3. Innovation Capability

Innovation capability is defined as a company's ability to innovate and has a multidimensional concept (Kafetzopoulos & Psomas, 2015). Innovation requires creative organizational empowerment, such as internal company promotion activities and the company's ability to respond to changes in the external environment (Saunila et al., 2014). Companies are required to take advantage of the opportunities by providing customer needs that still do not exist today (Hussein Zolait et al., 2010). The continuous innovation process will encourage the company to get the best results (Bag et al., 2018). Ganguly et al. (2019) suggested innovation capability measurements using six indicators that were also used in this study, namely: 1) Able to introduce new products and services (IC1), 2) Commercialize new product and service ideas (IC2), 3) Have creative in carrying out their operating methods (IC3), 4) Develop new techniques/processes for new product development (IC4), 5) Be the first in the development of a new product (IC5), and 6) Be the first in marketing a new product (IC6).

2.4. Operational Performance

Operational performance is defined as the achievement of an operation of a company in the form of quality and productivity (Kafetzopoulos & Psomas, 2015). Operational performance includes the concept of the company's operations, company management, as well as the advantages and disadvantages of the company's activities (Tseng & Liao, 2015b). Operational performance basically measures the output and productivity of a process (Hussein Zolait et al., 2010). This measurement aims to find out whether a process is effective or improved to get maximum profit (Saunila et al., 2014). This research uses indicators recommended by Kafetzopoulos & Psomas (2015): 1) The company can increase the speed of delivery of goods and reduce the lead time (OP1), 2) the company can improve the quality of its products (OP2), 3) the company can be flexible in dealing with customers (OP3), 4) the company can improve product development (OP4), and 5) The company can lower its production costs (OP5).

2.5. Influence of Supply Chain Integration on Supply Chain Responsiveness

Supply chain integration enables supply chains to quickly and effectively respond to a rapidly changing business environment. (Flynn et al., 2010; Huo, 2012; Wong et al., 2011) (Yu et al., 2019). Relationships with suppliers and customers can increase productivity, flexibility, and accurate information in reducing current uncertainty (Siagian et al., 2021). The integration relationship factor has a fairly high impact on communication and has a low impact on the development of flexibility (Fayezi & Zomorrodi, 2015). Based on the above arguments, the first hypothesis can be formulated as follows.

H_1: Supply chain integration affects supply chain responsiveness.

2.6. Influence Supply Chain Integration on Innovation Capability

Supply chain integration positively impacts innovation capability (Kolbe et al., 2021). Collaboration with the customers and suppliers enables the company to create a new product (Jimenez-Jimenez et al., 2019). Integration with suppliers allows the companies to develop innovative products and improves competitiveness globally (Kumar et al., 2020; Siagian et al., 2021; Tarigan et al., 2021). Based on the description above, hypothesis 2 can be formulated as follows.

H_2: Supply chain integration affects innovation capability.

2.7. Effect of Supply Chain Integration on Operational Performance

Supply chain integration positively influences performance outcomes (Hussein Zolait et al., 2010). Supply chain integration should be able to regulate the efficient flow of goods by paying attention to the time interval between the customer's demand for the service and its delivery. SCI, where partners share relevant and accurate information, is more effective than a collaboration lacking characteristics (Siagian et al., 2021; Tseng & Liao, 2015b; Vafaei-Zadeh et al., 2020). Supplier integration facilitates suppliers to understand and anticipate the needs of factory networks. Supplier relationship management, one of the supply chain integration, significantly affects firm performance in the 3-star Hotels in Surabaya, Indonesia (Chandra Tanuwijaya et al., 2021). In addition, research on fifty-three 3PL logistics companies in East Java, Indonesia, indicated that customer relationship management, which is part of supply chain integration, significantly affects organizational performance (Santoso & Siagian, 2019). Furthermore, exchanging information about products, processes, schedules, and capabilities helps the network plant develop its production plan and produce goods on time (Cheng et al., 2016).

H_3: Supply chain integration affects operational performance.

2.8. Influence Supply Chain Responsiveness on Innovation Capability

The change in technology development is inevitable, and it requires companies to adopt product and process innovations (Yu et al., 2019). Supply chain responsiveness is a supply chain system that is highly responsive to change by product innovation according to market and technology demands (Sukati et al., 2012). Changes in the design of new products in an organization are needed to develop a product according to market demand (Jermsittiparsert, 2019). The process of research and development in developing a new product in terms of manufacturing and materials is needed because it will build innovation (Bag et al., 2018). Thus, hypothesis 4 can be proposed as follows.

H_4: Supply chain responsiveness affects innovation capability.

2.9. Effect of Supply Chain Responsiveness on Operational Performance

The ability to respond to changing customer needs and competitor actions (Fayezi & Zomorrodi, 2015) In addition, the organization can compete effectively and will increase its competitive advantage of the organization (Kim & Cavusgil, 2009). Collaboration with supply chain partners allows for a rapid response from companies to markets and enhances operational profits (Yu et al., 2019). SCR can optimize the use of internal resources to maintain the competition and improve operational performance (Siagian et al., 2021). Based on the above arguments, hypothesis 5 can be formulated as follows.

H_5: Supply chain responsiveness affects operational performance.

2.10. Influence of Innovation Capability on Operational Performance

Innovation capability has a positive influence on performance outcomes. Past empirical studies have confirmed a positive relationship between innovation and corporate performance (Raymond et al., 2013) (Tian et al., 2021). Innovative companies show much higher profits and growth figures than non-innovative companies (Kafetzopoulos & Psomas, 2015). Companies will be more

effective in new product innovations when they have a common goal and show a better level of integrase, especially between marketing and R&D (Huhtala et al., 2014). Based on the description above, it can be proposed hypothesis 6, namely:

H_6: Innovation capability affects operational performance.

2.11. The Mediation of Supply Chain Responsiveness on the Supply Chain Integration and Operational Performance Relationships

Supply chain responsiveness will be optimal when supported by supply chain integration (Yu et al., 2019). Furthermore, relationships with suppliers can increase the company's productivity to serve customer demand and reduce uncertainty (Siagian et al., 2021). Meanwhile, it has been discussed before that supply chain responsiveness can directly improve operational performance with collaboration (Fayezi & Zomorrodi, 2015). In addition, collaboration with supply chain partners can respond to market changes and optimize performance (Bag et al., 2018). Based on the two relationships between the variables above, the mediation hypothesis of supply chain responsiveness can be formulated as follows.

H_7: Supply chain integration indirectly affects operational performance through supply chain responsiveness.

2.12. Relationship of Supply Chain Integration and Operational Performance through Innovation Capability

The implementation of innovation capability can run well if there is support from the supply chain integration. Organizational supply chain partner relationships are the most important source of new knowledge creation and learning and have an essential role in improving innovation in the organization (Tian et al., 2021)(Huhtala et al., 2014). Therefore, supply chain integration has an essential role in innovation capability (Kolbe et al., 2021). Innovation capability can also improve operational performance by developing new innovations when organizations have goals and demonstrate a greater level of integration (Kafetzopoulos & Psomas, 2015).

H_8: Supply chain integration indirectly affects operational performance through innovation capability?

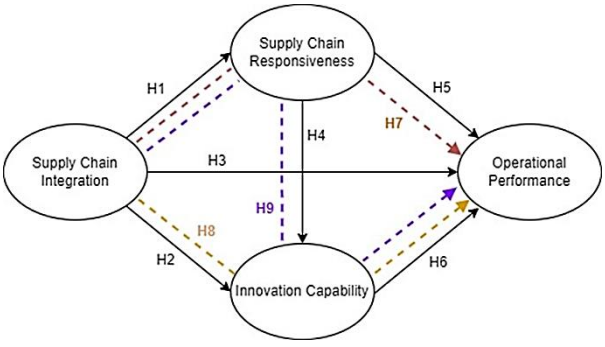
2.13. The Effect of Supply Chain Integration on Operational Performance through Innovation Capability and Supply Chain Responsiveness

The implementation of supply chain responsiveness will run optimally if supported by supply chain integration that runs well (Yu et al., 2019). Supply chain integration relationships with suppliers can increase the company's production more significantly to cope with customer demand and reduce uncertainty (Siagian et al., 2021). Therefore, supply chain integration has an important role in supply chain responsiveness. Developing a new product in overcoming responsive conditions needs to be done so that materials are needed because it will build innovation in the company (Bag et al., 2018). The level of innovation can significantly increase the company's productivity, and innovation has a positive impact on the company's profit, so it can be said that an innovative company will show much higher profits and growth figures than non-innovative companies (Kafetzopoulos & Psomas, 2015).

H_9: Supply chain integration indirectly affects operational performance through supply chain responsiveness and innovation capability.

2.14. Research Model

Based on the research discussed above, it will produce the following research model framework:



Note. Solid black line indicates direct hypothesis, and dotted coloured line indicates indirect hypothesis.

Figure 1. Research Model

3. Methods

3.1. Population and Sampling

This study used quantitative methods to explain the relationships between variables causally. This research population focused on

food and beverage manufacturing companies located in East Java. The population of food and beverage companies in East Java is as many as 266 companies (BPS, 2020). Of the 266 companies, 140 samples were selected at random using online software https://numbergenerator.org/. Using the Slovin formula with a margin of error of 10% and a population of 266 companies, the minimum number of samples is 81 companies. Data collection uses a questionnaire designed with 7 points on the Likert scale, with 1: strongly disagree and 7: strongly agree. The respondent profile is the company employee in charge of managerial positions such as supervisor, general manager, or director. Questionnaires are distributed. Questionnaires were distributed to as many as 140 using a Google form link and printed copy, sent via social media, email, and mail. And as many as 114 responses were received. After validating the incoming data, 110 questionnaires were considered valid for analysis.

3.2. Data Analysis

Data analysis used the Partial Least Square (PLS) technique. An analysis is performed in two steps, namely, outer model and inner model assessment. Outer model assessment includes validity and reliability test. At the same time, the inner model test includes R-square, Q-square, and hypothesis testing. Hypothesis testing is performed by a bootstrapping process automatically conducted by the software. Bootstrapping is a process of calculating the t-statistic and probability values to examine whether the hypothesis is supported or not.

3.3. Measurement Item

This study involves five constructs: supply chain integration, supply chain responsiveness, innovation capability, and operational performance. The measurement item for each construct has been explored in the previous literature review. Supply chain integration is measured using eight indicators (SCI1-SCI8), supply chain responsiveness with four items (SCR1-SCR4), innovation capability with six items (IC1-IC6), and operational performance with six items (OP1-OP6).

4. Results

4.1. Respondent Profile

Table 1 indicates the industrial sector of the company where the respondent works. The total number of respondents obtained was 110 companies.

The total respondents engaged in the food industry sector amounted to 83 companies, the beverage industry amounted to 24 companies, and the industrial sector engaged in the food and beverage industry sector amounted to 3 companies. Furthermore, Table 2 shows the department of respondents; the result indicated that those respondents are working in departments related to the activities of supply chain management. Hence, all respondents are considered knowledgeable in responding to the measurement items.

Table 1. Respondents Profile by Industry Sector

Industry Sector	Frequency	Percentage (%)
Food	83	75.5
Beverage	24	21.8
Food and Beverage	3	2.7
Total	**110**	**100**

Table 2. Respondent Profile Based on Department

Department	Frequency	Percentage (%)
Purchasing	13	11.8
Warehouse	10	9.1
PPIC	12	10.9
IT	7	6.4
QC	17	15.5
Logistics/Distribution	8	7.3
Production	24	21.8
Marketing	19	17.2
Total	**110**	**100**

Furthermore, Table 3 shows respondents' profiles against managerial positions in companies. Thus, respondents are considered to understand the company's various rules and strategies and be capable of providing the relevant responses.

Table 3. Respondent Profile Based Position

Position	Frequency	Percentage (%)
Supervisor	62	5.4
Manager	46	41.8
General Manager	1	0.9
Director/CEO	1	0.9
Total	**110**	**100**

There are 62 respondents as supervisors, 46 managers, one general manager, and one director/ CEO. Respondents are considered knowledgeable, have a decision-making level position, and understand the company strategy.

4.2. Measurement Model Assessment

4.2.1. Convergent Validity

This study used the partial least square technique (PLS) utilizing SmartPLS version 3.0 software. The results of the convergent validity assessment, called the outer model, are shown in Table 4.

Table 4 indicated that all outer loading values of the indicators exceed 0.50 (minimum recommended value). Hence, all indicators are considered to satisfy the criteria (Hair et al., 2017). Moreover, Table 4 also shows the VIF value less than 5 (maximum recommended value), so there is no multicollinearity in variable measurement indicators.

4.2.2. Discriminant Validity

The discriminant validity assesses the correlation of indicators with its variable compared with other variables using the Forner-Larcker criteria, as shown in Table 5. The result shows the square root of the AVE of the four research variables (written in bold) is greater than the correlation between constructs. Thus, the indicators are considered valid for discriminant validity (Hair et al., 2017).

4.2.3. Reliability Assessment

Further measurement model assessment is to assess the consistency of the indicator of each research variable. This study uses Cronbach's alpha, rho A, composite reliability, and average variance extracted (AVE) to measure the reliability. The acceptable value is greater than 0.70 except for AVE greater than 0.5. Table 6 shows the results of the reliability test and the average extracted value (AVE), which satisfy the minimum values requirement, and the measurement model is considered reliable (Hair et al., 2017). Based on this result, further analysis of the inner model assessment can proceed.

Table 4. Convergent Validity and VIF

Items	Statement	Outer Loading	VIF	Remarks
SCI1	The company exchanges information with supplier partners	0.800	3.075	Valid
SCI2	Conduct strategic collaboration with partners	0.747	1.861	Valid
SCI3	Collaboration based on trust and mutual benefit	0.863	3.772	Valid
SCI4	Carry out data integration internally with information technology	0.761	2.124	Valid
SCI5	Coordinate across departments periodically	0.770	2.124	Valid
SCI6	Make a production plan periodically with suppliers	0.746	2.104	Valid
SCI7	The company makes contact with customers periodically	0.656	1.626	Valid
SCI8	Conduct collaboration between different departments	0.788	2.149	Valid
SCR1	Respond to customers faster than competitors	0.859	2.271	Valid
SCR2	Respond quickly to changes in competitors' strategies	0.766	1.709	Valid
SCR3	Quicker to introduce new products than competitors	0.754	1.481	Valid
SCR4	Strategy supply chain adjusts to customer's wishes	0.886	2.582	Valid
IC1	Able to introduce new products and services	0.817	2.833	Valid
IC2	Commercialize new product and service ideas	0.804	2.790	Valid
IC3	Have creative in carrying out their operating methods	0.838	2.744	Valid
IC4	The company develops new products	0.820	2.245	Valid
IC5	Be the first in the development of a new product	0.842	2.788	Valid
IC6	Be the first to market a new product	0.790	2.498	Valid
OP1	The company increases the speed of delivery	0.876	2.541	Valid
OP2	The company can improve the quality of its products.	0.764	1.998	Valid
OP3	Companies can be flexible in dealing with customers.	0.843	2.533	Valid
OP4	The company can improve product development	0.790	1.989	Valid
OP5	The company can lower its production costs.	0.774	1.880	Valid

Table 5. Fornell-Larcker Criteria

Construct	Innovation Capability	Operational Performance	Supply Chain Integration	Supply Chain Responsiveness
Innovation Capability	**0.819**			
Operational Performance	0.756	**0.811**		
Supply Chain Integration	0.635	0.743	**0.768**	
Supply Chain Responsiveness	0.793	0.724	0.590	**0.818**

Table 6. Reliability Test Result

	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Innovation Capability	0.903	0.910	0.924	0.670
Operational Performance	0.869	0.882	0.905	0.657
Supply Chain Integration	0.900	0.902	0.920	0.590
Supply Chain Responsiveness	0.833	0.839	0.890	0.669

4.3. Inner Model Assessment

4.3.1. R-square, Q-square, and GOF

The first step of the inner model assessment seeks the values of R-square and Q-square. The values of R-square and Q-square are shown in Table 7.

Table 7. R-Square dan Q square

	R-Square	**Q Square**
Supply Chain Responsiveness	0.348	0.226
Innovation Capability	0.671	0.422
Operational Performance	0.708	0.449

The R-square value for supply chain responsiveness is 0.348, meaning supply chain integration can explain the variance of supply chain responsiveness of 34.8%. The R-square innovation capability value of 0.671 means supply chain integration and supply chain responsiveness can explain innovation capability by 67.1%. While the R-square operational performance value of 0.708 means supply chain integration, supply chain responsiveness, and innovation capability can explain the operational performance of 70.8%. Q-square is required to know the suitability of the research model with existing data and show the level of predictive relevance of the research model (Henseler & Sarstedt, 2013). Table 7 demonstrates the Q-square value for the three dependent constructs is greater than zero. Hence, the research model satisfies the requirement. Furthermore, the goodness of fit (GoF) for the research model needs to assess to make sure that the model meets the goodness of fit criteria calculated using the formula of GoF. It is calculated as the square root of the multiplication between the mean coefficient of determination (R-Square) and AVE, as shown in the result shows a value of 0.612, which is a good fit > 0.36(Tenenhaus et al., 2005).

$$GoF = \sqrt{R^2 x\ AVE}\sqrt{0.576\ x\ 0.647} = 0.610$$

4.3.2. Hypothesis Testing

Table 8 shows the results of direct hypothesis tests, namely H1 to H6, and all hypotheses are supported by empirical data collected from respondents.

Table 8 shows that six direct hypotheses from H1 to H6 are supported by empirical data and accepted. The hypothesis test used a significance level of 95%, with the cut-off value of 1.96 for t statistics or a p-value of 0.05. The first hypothesis, the effect of supply chain integration on supply chain responsiveness, is received with a path coefficient value of 0.590 and t-statistics of 9.635 > 1.96 or p-value of 0.000 < 0.05. The second hypothesis, the effect of supply chain integration on innovation capability, is received with a path coefficient value of 0.257 and t-statistics of 3.219>1.96 or p-value 0.001<0.05. Then, the third hypothesis, which states that supply chain integration affects operational performance, is supported with a path coefficient value of 0.405 and t-statistics of 4.490 >1.96 or a p-value of 0.000 < 0.05. The fourth hypothesis, the effect of supply chain responsiveness on innovation capability, gets a path coefficient value of 0.641 and t-statistics of 8.125>1.96 or a p-value of 0.000 <0.05. The fifth hypothesis is that the effect of supply chain responsiveness on operational performance is accepted with a path coefficient value of 0.241 with a t-statistic of 2.359 >1.96 or a p-value of 0.019 < 0.05. Finally, the sixth hypothesis, which states that innovation capability affects operational performance, is accepted with a path coefficient of 0.307 and a t-statistic of 3.007 > 1.96 or a p-value of 0.003 <0.05.

This study also formulated three indirect hypotheses, and the results of the hypothesis test are shown in Table 9. The three indirect hypotheses, ranging from H7 to H9, are accepted. The seventh hypothesis, the effect of supply chain integration on operational performance through supply chain responsiveness, is supported with the path coefficient value of 0.142 and t-statistic value of 2.230>1.96 or p-value of 0.026 < 0.05.

Tabel 8. Direct Path Coefficient

	Path Coefficient	T Statistics	P Values	Remark
Supply Chain Integration → Supply Chain Responsiveness (H1)	0.590	9.635	0.000	Supported
Supply Chain Integration → Innovation Capability (H2)	0.257	3.219	0.001	Supported
Supply Chain Integration → Operational Performance (H3)	0.405	4.490	0.000	Supported
Supply Chain Responsiveness → Innovation Capability (H4)	0.641	8.125	0.000	Supported
Supply Chain Responsiveness → Operational Performance (H5)	0.241	2.359	0.019	Supported
Innovation Capability → Operational Performance (H6)	0.307	3.007	0.003	Supported

Tabel 9. Indirect Path Coefficient

	Path Coefficient	T Statistics	P Values	Remark
Supply Chain Integration → Supply Chain Responsiveness → Operational Performance (H7)	0.142	2.230	0.026	Supported
Supply Chain Integration → Innovation Capability → Operational Performance (H8)	0.079	2.019	0.044	Supported
Supply Chain Integration → Supply Chain Responsiveness → Innovation Capability → Operational Performance (H9)	0.116	2.620	0.009	Supported

Table 10. Total Effect between Constructs

	Supply Chain Responsiveness	Innovation Capability	Operational Performance
Supply Chain Integration	0.590	0.378	0.338
Supply Chain Responsiveness		0.641	0.197
Innovation Capability			0.307

Moreover, the eighth hypothesis, the effect of supply chain integration on operational performance through innovation capability, is accepted with the path coefficient value of 0.079 and t-statistics value of 2.019 > 1.96 or p-value 0.044 <0.05. The last hypothesis, the effect of supply chain integration on operational performance through the mediation of supply chain responsiveness and innovation capability, is also supported with the path coefficient value of 0.116 and t-statistic value of 2.620>1.96 or p-value of 0.009 < 0.05.

The total effect between construct is obtained by summing the direct and indirect effects. Table 10 shows the total effect result between constructs. The result indicated that supply chain integration has the greatest impact on operational performance, followed by supply chain responsiveness and innovation capability. This finding is essential in providing insight for the practitioner, which construct primarily contributes to enhancing operational performance. In this case, supply chain integration contributes most significantly to improving operational performance since it has a total effect of 0.338.

Figure 2 summarizes the research model, including the analysis result of the measurement model and inner model.

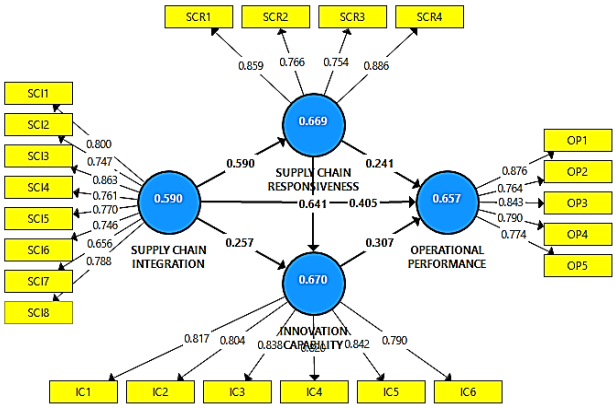


Figure 2. Research Model and Analysis Result

5. Discussion

5.1. Result Interpretation

The effect of supply chain integration on supply chain responsiveness can be interpreted as follows. Collaborating with partners based on trust and mutual benefit (SCI3), and exchanging information with partners, namely suppliers (SCI1), will enable a supply chain strategy to adjust to customer desires (SCR4). As a result, the company will be able to respond to changes in customer demand faster than competitors (SCR1).

The results of this study are supported by the results of research that states that supply chain integration can significantly increase supply chain responsiveness in the manufacturing industry. In practice, the collaboration with partners based on trust and mutual benefit will affect the SCR; namely, the company can meet customer desires. This result is in line with previous studies (Huo, 2012)Yu et al., 2019; Siagian et al., 2021; Fayezi & Zomorodi, 2015). Furthermore, supply chain integration and innovation capability show that collaboration with partners based on trust and mutual benefit (SCI3) and exchanging information with supplier partners (SCI1) enables companies to be the first in the development of new products (IC5). This research follows previous research saying that the relationship between supply chain partners improves innovation capability in the manufacturing industry. In practice, for example, the SCI, namely collaboration with partners based on trust, can affect IC; namely, companies can be the first in product development in the market (Kolbe et al., 2021; (Jimenez-Jimenez et al., 2019).

The analysis results also showed that supply chain integration affects operational performance. Cooperation with partners is based on trust and mutual benefit (SCI3). The company exchanging information with supplier partners (SCI1) will impact by increasing the speed of delivery of goods and reducing lead time (OP1) so that delivery is always on time. As a result, the company can flexibly face customers in performing services (OP3). Research that has been done before under these results shows that supply chain integration can significantly increase operational performance in the manufacturing industry. In practice, for example, the SCI indicator, namely collaboration with partners based on trust can affect the OP indicator, i.e., the company can increase the speed of its delivery to customers (Vafaei-Zadeh et al., 2020; Cheng et al., 2016).

Furthermore, the influence of supply chain responsiveness on innovation capability can be interpreted as follows. The companies that have a supply chain strategy that can adjust to customer desires (SCR4) can respond to changes in customer demand faster than competitors (SCR1) to have an impact that the company can be the first in the development of new products (IC5. This result is in line with previous research that said that supply chain responsiveness could significantly increase innovation capability (Sukati et al., 2012; Jermsittiparsert, 2019; Bag et al., 2018). This is because the company has a strategy based on customers' wishes and positively supports the company to be the first to develop new products for customers.

The effect of supply chain responsiveness to operational performance can mean that the more responsive the supply chain will increase the operational performance of manufacturing companies. The company has a supply chain strategy that can adjust to customer desires (SCR4) and can respond to changes in customer demand faster than competitors (SCR1), impacting the increase in the speed of delivery of goods (OP1) flexibility in serving customers in performing services (OP3). The results of this study support the results of research that has been done previously by (Yu et al., 2019; Siagian et al., 2021). In practice, for example, the SCR indicator, the company has a strategy that following customer wishes can affect the OP indicator. The company can be flexible in dealing with customers when serving.

The subsequent research results also showed that innovation capability has a positive effect on operational performance. Companies that can be the first in the development of new products (IC5) and creative in carrying out their operating methods (IC3) have an impact on increasing the speed of delivery of goods and reducing lead time (OP1), and flexibly in dealing with customers in performing services (OP3). Based on the results of research done before, the relationship between innovation capability can significantly increase operational performance in the manufacturing industry. In practice, for example, indicators, namely companies, being the first to develop new products can affect the OP indicator; namely, the company can serve its customers well by explaining new products.(Kafetzopoulos & Psomas, 2015; Huhtala et al., 2014).

In addition to the direct influence between variables, this study also formulated the mediating influence of intervening variables. The analysis results showed that supply chain integration affects operational performance through the mediation of supply chain responsiveness. In this case, it can be said that the implementation of supply chain integration can affect operational performance through the mediation of supply chain responsiveness for food and beverage manufacturing companies in Surabaya. The analysis results also show that supply chain responsiveness mediates the influence of supply chain integration on operational performance. The company's partnership with partners based on trust and mutual benefit (SCI3) will support a supply chain strategy to adapt to customer desires (SCR4).

Furthermore, a supply chain strategy that adapts to customer desires will improve the company's ability to deliver goods and reduce the lead time (OP1). It can be concluded that the relationship between supply chain integration and operational performance through the mediation of supply chain responsiveness has a significant influence on the manufacturing industry's performance. The company collaborating with partners with mutual benefit can support the strategy that by customer wishes, can affect the OP, i.e., the company can communicate well to customers in explaining new products to be produced.

The analysis results also showed that supply chain integration has an indirect effect on operational performance through innovation capability mediation. In this case, it can be said that the implementation of supply chain integration can affect operational performance through innovation capability mediation for food and beverage manufacturing companies in Surabaya. Innovation capability mediates the influence of supply chain integration on operational performance. The companies collaborating with partners based on trust and mutual benefit (SCI3) enables the company to be the first to develop new products (IC5). It will allow companies to increase the speed of delivery of goods and reduce lead time (OP1) time. It can be concluded that the relationship between supply chain integration and operational performance through innovation capability mediation has a significant influence on the manufacturing industry. In practice, the companies collaborating with partners with mutual benefit can affect IC; namely, the company becomes the first in product development and can affect the OP. As a result, the company can quickly produce the new product and distribute it to customers.

The latest result of this study is that supply chain integration does not affect operational performance through the mediation of supply chain responsiveness. However, implementing supply chain integration can affect operational performance through responsiveness and innovation capability. Supply chain responsiveness and innovation capability mediate the influence of supply chain integration on operational performance. The company's collaboration with partners is based on trust and mutual benefit (SCI3), enabling the company to have a supply chain strategy that can adapt to customer desires (SCR4) and further support the company to perform in the development of new products (IC5). Thus, it will be able to increase the speed of delivery of goods and reduce the lead time (OP1. It can be concluded that the relationship between supply chain integration and operational performance through the mediation of supply chain responsiveness and innovation capability has a significant influence on the manufacturing industry. In practice, the company collaborating with partners based on mutual benefit supports the company's excellent strategy for developing new.

5.2. Managerial Implications

Based on the research on supply chain integration, collaboration with partners based on trust and mutual benefit becomes very important. This result is necessary so that the company continues to grow and can survive and compete. Companies must establish a supply chain strategy that can adapt quickly to changes in market demand through product and process innovation. Manufacturing companies continue to develop strategies that can make the company more advanced compared to competing companies. The company also continues to maintain the level of response to the market so that the company can quickly respond to the market faster than competitors. It is essential to be the first to develop new products and have the creativity of its efficient operating system.

5.3. Theoretical Contributions

This study contributes to the existing theory, namely the mediation of supply chain responsiveness and innovation capability on the influence of supply chain integration on operational performance.

5.4. Limitation

This study has a limitation, particularly the limited coverage of the population focusing on the East Java Region. This study also focuses on limited constructs: supply chain integration, supply chain responsiveness, innovation capability, and operational performance. For this reason, future research to cover other industries, such as Hotel Industry and automotive. It is also suggested to involve other recently trending constructs such as green environmental and digital supply chain.

6. Conclusions

The results of the study have answered nine hypotheses formulated, and the results of the study are concluded as follows: 1) Supply chain

integration directly affects supply chain responsiveness, 2) Supply chain integration has a direct effect on innovation capability, 3) Supply chain integration has a direct effect on supply chain responsiveness, 4) Supply chain responsiveness has a direct effect on innovation capability, 5) Supply chain responsiveness has a direct effect on the company operational performance, 6) Innovation capability directly affects operational performance, 7) Supply chain integration indirectly affects operational performance through the mediation of supply chain responsiveness, 8) Supply chain integration indirectly affects operational performance through innovation capability mediation, 9) Supply chain integration indirectly affects operational performance through the mediation of supply chain responsiveness and innovation capability in food and beverage manufacturing companies in East Java. The result of this study provides an insight to the practitioner on how to enhance the operational performance through the establishment of supply chain integration, responsiveness, and innovation. Supply chain integration allows the company to collaborate with its partners based on trust in the pursuit of enhanced innovation capability, and responsiveness in serving customer need. Responsiveness enables the company to become the first mover in coping with the customer demand shifting. Hence, the company an survive and outperform the competitor.

References

Bag, S., Gupta, S., & Telukdarie, A. (2018). Importance of Innovation and Flexibility in Configuring Supply Network Sustainability. *Benchmarking*, *25*(9), 3951–3985. https://doi.org/10.1108/BIJ-06-2017-0132

Chandra Tanuwijaya, N., Jiwa, Z., Tarigan, H., & Siagian, H. (2021). The Effect of Top Management Commitment on Firm Performance through the Green Purchasing and Supplier Relationship Management in 3-Star Hotel Industry in Surabaya. *Petra International Journal of Business Studies*, *4*(2), 169–181. https://doi.org/10.9744/IJBS.4.2.169-181

Cheng, Y., Chaudhuri, A., & Farooq, S. (2016). Interplant Coordination, Supply Chain Integration, and Operational Performance of a Plant in A Manufacturing Network: A Mediation Analysis. *Supply Chain Management*, *21*(5), 550–568. https://doi.org/10.1108/SCM-10-2015-0391

Fayezi, S., & Zomorrodi, M. (2015). The Role of Relationship Integration in Supply Chain Agility and Flexibility Development: An Australian Perspective. *Journal of Manufacturing Technology Management*, *26*(8), 1126–1157. https://doi.org/10.1108/JMTM-11-2014-0123

Flynn, B. B., Huo, B., & Zhao, X. (2010). The Impact of Supply Chain Integration on Performance: A Contingency and Configuration Approach. *Journal of Operations Management*, *28*(1), 58–71. https://doi.org/10.1016/J.JOM.2009.06.001

Ganguly, A., Talukdar, A., & Chatterjee, D. (2019). Evaluating The Role of Social Capital, Tacit Knowledge Sharing, Knowledge Quality and Reciprocity in Determining Innovation Capability of an Organization. *Journal of Knowledge Management*, *23*(6), 1105–1135. https://doi.org/10.1108/JKM-03-2018-0190/FULL/PDF

Ginting, K. (2020). Terdampak Covid-19, PMI Manufaktur Turun di April 2020 - Iconomics. *THE ICONOMICS*. https://www.theiconomics.com/art-of-execution/terdampak-covid-19-pmi-manufaktur-turun-di-april-2020/

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, Marko. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (Second)*. SAGE Publications.

Henseler, J., & Sarstedt, M. (2013). Goodness-of-Fit Indices for Partial Least Squares Path Modeling. *Computational Statistics*, *28*(2), 565–580. https://doi.org/10.1007/s00180-012-0317-1

Huhtala, J. P., Sihvonen, A., Frösén, J., Jaakkola, M., & Tikkanen, H. (2014). Market Orientation, Innovation Capability and Business Performance: Insights from the Global Financial Crisis. *Baltic Journal of Management*, *9*(2), 134–152. https://doi.org/10.1108/BJM-03-2013-0044

Huo, B. (2012). The Impact of Supply Chain Integration on Company Performance: An Organizational Capability Perspective. *Supply Chain Management*, *17*(6), 596–610. https://doi.org/10.1108/13598541211269210/FULL/XML

Hussein Zolait, A., Razak Ibrahim, A., Sundram, V. P. K., & Chandran, V. G. R. (2010). Supply Chain Integration: An Empirical Study on Manufacturing Industry in Malaysia. *Journal of Systems and Information Technology*, *12*(3), 210–221. https://doi.org/10.1108/13287261011070830

Jabbour, C. J. C., De Sousa Jabbour, A. B. L., Govindan, K., Teixeira, A. A., & De Souza Freitas, W. R. (2013). Environmental Management and Operational Performance in Automotive Companies in Brazil: The Role of Human Resource Management and Lean Manufacturing. *Journal of Cleaner Production, 47*, 129–140. https://doi.org/10.1016/J.JCLEPRO.2012.07.010

Jermsittiparsert, K. (2019). The Supply Chain Innovation, Supply Chain Transaction Cost, Supply Chain Risk and Supply Chain Responsiveness and the Supply Base and Its Complexity Human Trafficking Project View project Political Ideology Project View project. https://www.researchgate.net/publication/335504849

Jimenez-Jimenez, D., Martínez-Costa, M., & Sanchez Rodriguez, C. (2019). The Mediating Role of Supply Chain Collaboration on the Relationship Between Information Technology and Innovation. *Journal of Knowledge Management, 23*(3), 548–567. https://doi.org/10.1108/JKM-01-2018-0019

Kafetzopoulos, D., & Psomas, E. (2015). The Impact of Innovation Capability on the Performance of Manufacturing Companies The Greek Case. *Journal of Manufacturing Technology Management, 26*(1), 104–130. https://doi.org/10.1108/JMTM-12-2012-0117

Kim, D., & Cavusgil, E. (2009). The Impact of Supply Chain Integration on Brand Equity. *Journal of Business and Industrial Marketing, 24*(7), 496–505. https://doi.org/10.1108/08858620910986730

Kolbe, D., Calderón, H., & Frasquet, M. (2021). Multichannel Integration through Innovation Capability in Manufacturing Smes and Its Impact on Performance. *Journal of Business and Industrial Marketing*. https://doi.org/10.1108/JBIM-04-2020-0204

Kumar, V., Jabarzadeh, Y., Jeihouni, P., & Garza-Reyes, J. A. (2020). Learning Orientation and Innovation Performance: The Mediating Role of Operations Strategy and Supply Chain Integration. *Supply Chain Management, 25*(4), 457–474. https://doi.org/10.1108/SCM-05-2019-0209

Raymond, L., Bergeron, F., & Croteau, A. M. (2013). Innovation Capability and Performance of Manufacturing Smes: The Paradoxical Effect of IT Integration. *Journal of Organizational Computing and Electronic Commerce, 23*(3), 249–272. https://doi.org/10.1080/10919392.2013.807714

Santoso, O. G., & Siagian, H. (2019). Influence of IT Application to Organizational Performance Mediated by Warehouse Management and Customer Relationship Management. *Petra International Journal of Business Studies, 2*(1), 44–52. https://doi.org/10.9744/IJBS.2.1.44-52

Saunila, M., Pekkola, S., & Ukko, J. (2014). The Relationship Between Innovation Capability and Performance: The Moderating Effect of Measurement. *International Journal of Productivity and Performance Management, 63*(2), 234–249. https://doi.org/10.1108/IJPPM-04-2013-0065

Siagian, H., Tarigan, Z. J. H., & Jie, F. (2021a). Supply Chain Integration Enables Resilience, Flexibility, and Innovation to Improve Business Performance in Covid-19 Era. *Sustainability (Switzerland), 13*(9), 1–19. https://doi.org/10.3390/su13094669

Siagian, H., Tarigan, Z. J. H., & Jie, F. (2021b). Supply Chain Integration Enables Resilience, Flexibility, and Innovation to Improve Business Performance in Covid-19 Era. *Sustainability (Switzerland), 13*(9). https://doi.org/10.3390/su13094669

Sukati, I., Bakar, A., Holloway, R., Hamid, A., & Baharun, R. (n.d.). Competitive Advantage through Supply Chain Responsiveness and Supply Chain Integration Service Quality Measurements View project Gen Y behaviour, Content Analysis of sosial media V. www.ijbcnet.com

Tarigan, Z. J. H., Siagian, H., & Jie, F. (2021). Impact of Enhanced Enterprise Resource Planning (ERP) on Firm Performance through Green Supply Chain Management. *Sustainability, 13*(8), 4358. https://doi.org/10.3390/SU13084358

Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS Path Modeling. *Computational Statistics & Data Analysis, 48*(1), 159–205. https://doi.org/10.1016/J.CSDA.2004.03.005

Tian, H., Otchere, S. K., Coffie, C. P. K., Mensah, I. A., & Baku, R. K. (2021). Supply Chain Integration, Interfirm Value Co-Creation and Firm Performance Nexus In Ghanaian Smes: Mediating Roles of Stakeholder Pressure and Innovation Capability. *Sustainability (Switzerland), 13*(4), 1–18. https://doi.org/10.3390/su13042351

Tseng, P. H., & Liao, C. H. (2015a). Supply Chain Integration, Information Technology, Market

Orientation and Firm Performance in Container Shipping Firms. *International Journal of Logistics Management*, *26*(1), 82–106. https://doi.org/10.1108/IJLM-09-2012-0088

Tseng, P. H., & Liao, C. H. (2015b). Supply Chain Integration, Information Technology, Market Orientation and Firm Performance in Container Shipping Firms. *International Journal of Logistics Management*, *26*(1), 82–106. https://doi.org/10.1108/IJLM-09-2012-0088

Vafaei-Zadeh, A., Ramayah, T., Hanifah, H., Kurnia, S., & Mahmud, I. (2020). Supply Chain Information Integration and Its Impact on the Operational Performance of Manufacturing Firms in Malaysia. *Information and Management*, *57*(8). https://doi.org/10.1016/j.im.2020.103386

Wong, C. Y., Boon-itt, S., & Wong, C. W. Y. (2011). The Contingency Effects of Environmental Uncertainty on the Relationship Between Supply Chain Integration and Operational Performance. *Journal of Operations Management*, *29*(6), 604–615. https://doi.org/10.1016/J.JOM.2011.01.003

Yu, W., Chavez, R., Jacobs, M., Wong, C. Y., & Yuan, C. (2019). Environmental Scanning, Supply Chain Integration, Responsiveness, and Operational Performance: An Integrative Framework from an Organizational Information Processing Theory Perspective. *International Journal of Operations and Production Management*, *39*(5), 787–814. https://doi.org/10.1108/IJOPM-07-2018-0395