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Chapter 9
Collaboration Model Between Buyer and Supplier: An Empirical Assessment of Indonesian Pharmaceutical Industry

Erlinda Nusron Yunus

Abstract This study examines the collaboration engaged by buyers and suppliers in the pharmaceutical industry in Indonesia. Preliminary studies show that Indonesia's pharmaceutical industry is growing steadily at over 10% and has a better growth rate than neighboring South Asian countries. Unfortunately, the availability of drugs at the retail level (hospitals, health centers, and pharmacies) is relatively low, while the much-needed medicines are often unavailable. The situation shows poor coordination between entities in the drug distribution network. This study will thoroughly examine drugs' scarcity from the point of view of coordination between entities in the supply chain. This fashion has become even more crucial with the COVID-19 pandemic currently hitting the world, including Indonesia, as one of the emerging economies in Southeast Asia. Due to the pandemic, the availability of medicines and medical equipment is essential for the community. Collaboration between companies in the pharmaceutical industry is one of the keys to its smooth running. This study obtains 52 company data about supply chain relationships, architecture, collaboration, and performance. Using path analysis, the study shows that the supplier–buyer business relationship improves supply chain architecture, further increasing supply chain collaboration. As the level of partnership improves, the firms improve their performance. These findings are significant in the current situation, where pharmaceutical companies, distributors-retailers, and local governments need to work together to ensure the supply of medicines for the community.

Keywords Supply chain collaboration · Suppliers · Buyers · Pharmaceutical industry · COVID-19 pandemic · Health expenditure · Supply chain management · Business relationship · Supply chain architecture · Performance · Path analysis · Indonesia · Medical equipment · Medicines · Public health · Supply chain visibility · Agility · Flexibility · Pharmaceutical manufacturers · Supply channels · Drug costs · Industrial Revolution 4.0 · Asia–Pacific region

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9.1 Introduction

The Government of Indonesia has enacted the National Social Security System (SJSN) since 2004 to realize the highest degree of public health following the mandate of the 1945 Constitution articles 28H and 34. SJSN is a form of social protection to ensure a decent basic life of Indonesian society, including assistance and health services, both preventive and curative. Through the Ministry of Health, the Government targets the entire population of Indonesia covered under the National Health Insurance Program (as part of SJSN) in 2019 (Kementerian Kesehatan, 2015).

This government plan provides a positive opportunity for the pharmaceutical industry to give medicines to Indonesian society. Indonesia's pharmaceutical sector, which consists of pharmaceutical manufacturing companies, pharmaceutical distributors or wholesalers (hereinafter termed as PBF), as well as retails (hospitals, public health centers, pharmacies, and drugstores), is an industry that grows significantly at 10% per annum from 2010 to 2015 (OECD, 2018). The Ministry of Industry reported that the turnover of Indonesian pharmaceutical manufacturing reached Rp 69.4 trillion in 2014 will expand to Rp 102.05 trillion by 2020 (Fig. 9.1).

Growth in the pharmaceutical sector is an implication of increased public health spending. However, as reported by the Indonesian Ministry of Industry, significant industry performance is not necessarily supported by an increased public health expenditure, down from USD 358 per capita in 2016 to USD 352 in 2017 (World Bank, 2021a). Even though the number increased in 2018 (USD 375 per capita), the indicator is still far below the health spending in the country's neighbors, e.g., Malaysia, Singapore, the Philippines, Vietnam, and Thailand. Nationally, the total public health expenditure in Indonesia, which is 2.87% of GDP in 2018, is still lagging behind neighboring countries: Malaysia (3.76%), the Philippines (4.40%), Thailand (3.79%), and Vietnam (5.92%) (World Bank, 2021a).

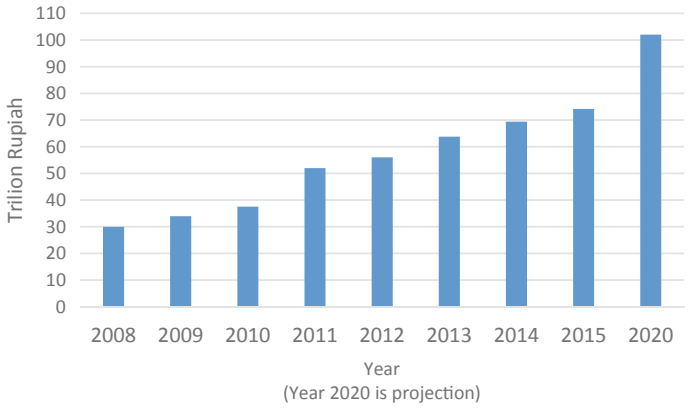

Fig. 9.1 Growth of the Indonesian pharmaceutical industry (*Source* Indonesian Ministry of Industry)

One of the causes of Indonesia's lagging compared to neighboring countries is the low accessibility of medicines in the community. People cannot shop for drugs because they are not available or not in good condition (Kementerian Kesehatan, 2015). The Ministry of Health reported that the availability of medicines and vaccines at the lowest medical-facility level only reached 75.5% in 2014. The Ministry's data also shows that inter-provincial inventory levels vary greatly, where there are provinces in 2012 with 80% drugs), while other regions reached more than 100% (overstock) (Kementerian Kesehatan, 2015).

Disparities that occur indicate not optimal supply chain governance (supply chain) in Indonesia. Unmanaged drug supply chain results in high (inefficient) shipping costs and uneven distribution (low drug accessibility). Therefore, a higher degree of collaboration is needed to ensure a smooth supply of medicines from manufacturing to retail, through the PBF and its branches nationwide.

So far, there has been minimal research on the collaboration or synergy of pharmaceutical governance in Indonesia. This study seeks to fill an existing gap by examining the effect of pharmaceutical company supply chain collaboration on company performance and overall supply chain performance. Furthermore, this study attempts to address some critical questions related to the collaboration or synergy of the pharmaceutical industry in Indonesia:

1. What is the level of collaboration or synergy of the pharmaceutical industry in Indonesia?
2. What is the relationship between business relationship, pharmaceutical architecture, supply chain collaboration, and supply chain performance in the pharmaceutical industry in Indonesia?

The findings will demonstrate the importance of supply chain collaboration in the pharmaceutical industry in Indonesia, that is, to support the accessibility of drugs to the community. The findings would benefit the industry and the government tremendously as they guide the pharmaceutical supply chain, which is very relevant to the current pandemic phase.

9.2 Supply Chain Management in the Pharmaceutical Industry

In Lambert and Cooper's (2000) study, the Global Supply Chain Forum (GSCF) defined supply chain management as an integrated business process, from suppliers to end consumers, by providing products, services, and information that add value to customers and all stakeholders. Previous research has shown the importance of entities in the supply chain to synergize to meet consumer needs as efficiently as possible (Ralston et al., 2017; Tarifa-Fernandez & De Burgos-Jiménez, 2017) and to mitigate the risks along the chain (Munir et al., 2020). Collaboration refers to the process of working together with others to produce something of common interest. Despite the inherent challenges of engaging in collaboration, companies strive for

close cooperation to gain rewards, such as cost-effectiveness (Chen et al., 2017), lead time reduction and improved customer service (Al-Doori, 2019; Sheu et al., 2006), flexibility improvement (Chaudhuri et al., 2018; Danese et al., 2013) and increased profitability and competitiveness in the market (Flynn et al., 2010; Yunus & Tadisina, 2016). Recently, evidence also found that supply chain collaboration improves firms' sustainability performance (Chen et al., 2017).

The supply chain of the pharmaceutical industry is unique because it is tightly regulated. The relationship between suppliers and buyers in the pharmaceutical industry is bound by contracts and controlled by the relevant government agencies. Therefore, it is not easy for pharmaceutical manufacturers to determine who to collaborate with and to build long-term relationships that benefit all parties. Yunus and Kurniawan (2015) have examined the impact of a lack of coordination between a pharmaceutical company and its supply chain partners and proposed factors that influence this level of coordination. The study results show three primary triggers in successfully implementing buyer–supplier collaboration: trust, top management vision, and leadership. Leadership is the most relevant factor in explaining the unsuccessful partnership between two parties in the supply chain.

Furthermore, government plays an essential role in controlling a medical-related supply network. Yu et al. (2010) examined the performance and distortions in China's pharmaceutical industry at a macro level. The results of this research are in the form of a transition and economic reform in China, which impacts several problems, including ineffective supervision, price mark-up patterns, price scheduling distortions, and the absence of authorities to formulate drugs. The leading cause of market and government failures is the 'higher than cost' price demanded by all suppliers.

Although the supply chain in the pharmaceutical industry is distinct and challenging to manage, studies on supply chain management with this industry context are limited (Wang & Jie, 2019). In their study, Wang and Jie conceptualized that pharmaceutical companies need to hinder risk and uncertainty by improving their supply chain visibility, agility, and flexibility. Moreover, Moosivand et al. (2019) suggested that pharmaceutical manufacturers have better forecast accuracy and maintain an optimal inventory level.

9.2.1 Supply Chain for Medicines in Indonesia

Research by Mustamu (2007) described the supply chain activities of the pharmaceutical industry in Indonesia (as shown in Fig. 9.2). This industry has a long supply chain of suppliers, large pharmaceutical manufacturers, distributors (PBF), sub-distributor, and retailers. The pharmaceutical industry in Indonesia takes 120 days from upstream to downstream, that is, 60 days for production and 60 days for transportation. As a result of the length of the production chain, several losses can arise in reduced opportunities for products to be absorbed by consumers more quickly, and there is a risk of product damage due to limited expiry time (expired date).

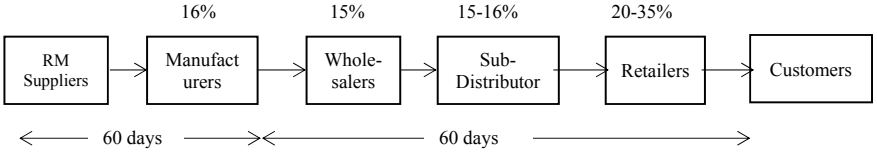

Fig. 9.2 Flow of pharmaceutical industry supply chain in Indonesia

In the context of the pharmaceutical industry, the process along the supply chain is dynamic. Therefore, controlling all supply channels is much more complex than in other manufacturing industries (Kiely, 2004). Therefore, the longer and more active the supply chain, the more critical forecasting, and demand planning activities will be. Mustamu (2007) provides solutions to improve the supply chain flow of the pharmaceutical industry by utilizing information technology in business processes along the supply chain. The application of information technology can shorten the delivery time up to 80 days. In addition to implementing the EDI process, e-commerce can also cut the "sub-distributor" chain, saving 15–16%. The latest solution is a benchmark from Japan, Malaysia, and Singapore, which implement self-dispensing (without going through pharmacies) by doctors, thus providing an opportunity for lower drug costs.

Given the importance of collaboration in a pharmaceutical supply chain, supplier and buyer relationships are the first to build long-term partnerships (Lee & Ha, 2020). Relationships that are mutually dependent, intensive, and based on solid trust will enable companies to carry out the initial stages of collaboration, namely sharing information and technology (Al-Doori, 2019; Ha et al., 2011). Sheu et al. (2006) proposed several essential factors that influence the level of collaboration, either directly or indirectly. These factors are business relationships (which can be measured by intensity, interdependence, and trust), long-term orientation, and supply chain architecture (represented by information sharing, inventory systems, information technology capabilities, and coordination structures). Based on these arguments, this study conjectures that,

H1 Supplier-Buyer Business Relationship has a positive relationship with the Supply Chain Architecture

H2 Supply Chain Architecture has a positive relationship with Supply Chain Collaboration

Furthermore, the previous discussion highlights the importance of increasing collaboration levels to have better supply chain performance (Al-Doori, 2019; Flynn et al., 2010; Yunus & Tadisina, 2016). Directly, supply chain architecture also plays a role in achieving higher performance (Saeed et al., 2019). Therefore, we posit that,

H3 Supply Chain Architecture has a positive relationship with Supply Chain Performance

H4 Supply Chain Collaboration has a positive relationship with Supply Chain Performance

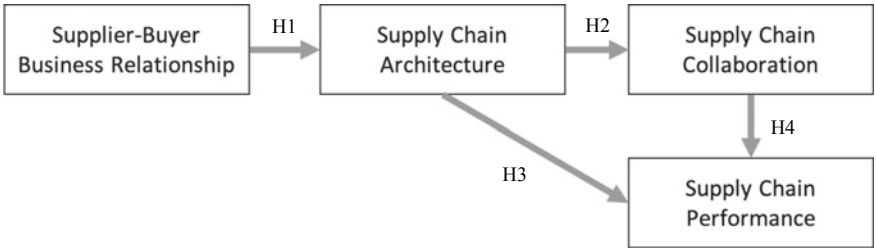

Fig. 9.3 Collaboration model between buyers and supplier[23] the supply chain

The theoretical framework for the Indonesian pharmaceutical supply chain is depicted in Fig. 9.3.

9.3 Methodology

This study examines the level of pharmaceutical supply chain collaboration. It looks at the suitability of the supply chain coordination model proposed by Sheu et al. (2006) in the pharmaceutical industry in Indonesia. The research design is described further in the next sections.

9.3.1 Unit of Analysis, Population, and Research Sample

To address the research questions, the study surveyed pharmaceutical manufacturers in Indonesia. A manufacturing company is an appropriate unit of analysis because it is positioned relatively at the supply chain center. Furthermore, measuring the level of collaboration from the company side (towards suppliers and consumers) is more operationally feasible than measuring the supply chain network as a whole. Thus, the population of this study is pharmaceutical manufacturing companies (or those producing drugs) in Indonesia.

The Ministry of Health data shows that there were 214 manufacturing companies in Indonesia. Nevertheless, mainly 102 pharmaceutical companies in Indonesia were accessible, thus becoming the sampling frame. This study obtained 52 data from the pharmaceutical companies in Indonesia after approximately two months of data collection. Even though the data were limited, they represented 51% of the total sampling frame (the targeted population). Therefore, the data were considered sufficient for the study.

9.3.2 Data Collection Procedure

Albeit not too many pharmaceutical companies in Indonesia, access to companies in this industry is tricky because no directory lists profiles and addresses of all these companies. Therefore, the researchers tried to access companies through associations, namely GP-Pharmacy (Association of Indonesian Pharmaceutical Companies) and IAI (Indonesian Pharmacist Association). Both of these associations provided support and access to companies or practitioners who are the members of the association.

Given the obstacles faced in determining the sampling frame or gaining access to the company, random sampling is not possible. Instead, researchers contacted members assigned to GP-Pharmaceuticals and IAI and used a snowball method, where the respondents could suggest or invite colleagues working in other pharmaceutical manufacturers to participate in the survey.

9.3.3 Measurements

This measurement instrument was developed from previous research (Sheu et al., 2006; Yunus & Tadisina, 2016). The construct, measurement dimensions and question indicators can be seen in Table 9.1.

Table 9.1 Measurements and operational definition

No.	Construct	Dimension	Number of Items
1	Supplier–buyer business relationship *is the degree in which suppliers and retailers within the industry are connected*	Interdependence	4
		Intensity	5
		Trust	5
2	Supply chain architecture *is the extent of practices of designing and constructing relationships among supply chain members*	Information Sharing	7
		Inventory Systems	3
		Supply Chain Coordination Structure	3
		IT Capabilities	3
3	Supply chain collaboration *is the degree of partnership between suppliers and retailers within the industry*		4
4	Supply chain performance *is the achievement of results*		10

9.3.4 Data Analysis

This study performed a two-step testing as suggested by Anderson and Gerbing (1988). Firstly, we checked for the psychometric properties of the instrument. Secondly, we tested the hypotheses using the path analysis by JASP 0.14.1, open-source software suitable for statistical analysis.

9.4 Results

Table 9.2 shows the firms' profiles.

A two-step testing (Anderson & Gerbing, 1988) was employed for the full-scale survey data by assessing the instrument and evaluating the theoretical model. The descriptions and the results of each step are detailed in the following subsection.

9.4.1 Assessment of the Measurement

After data were collected, the data were used to test for the reliability and validity of the instruments. Before evaluating the measurement, we examined the data for

Table 9.2 The profiles of respondents/firms

		Frequency	%
Title	Firm owner	2	3.8%
	Senior manager, general manager or equivalent	11	21.2%
	Young managers or equivalent	19	36.5%
	Supervisor	15	28.8%
	Staff	5	9.6%
Tenure	< 3 years	21	40.4%
	3 to < 5 years	13	25.0%
	5 to < 7 years	9	17.3%
	7 to < 10 years	1	1.9%
	10 years or more	8	15.4%
Firm size	50–99 employees	5	9.6
	100–249 employees	6	11.5
	250–499 employees	17	32.7
	500–999 employees	9	17.3
	1000–4999 employees	6	11.5
	≥ 5000 employees	9	17.3

normality and multicollinearity issues. The normality assumption was checked using the Shapiro–Wilk test. All *p*-value of the Shapiro–Wilk showed significant value, which indicated that the data did not follow the normal distribution. However, we did not alter or modify the data as the Skewness statistics of all variables (Business Relationship, Architecture, Collaboration, and Performance) were still below the ±1.50. The results of the current test showed that all Tolerance values were above 0.20 (ranged from 0.667 to 0.752) and all VIF values were below 4.0 (ranged from 1.330 to 1.546) following the suggestion by Hair et al. (2006).

9.4.2 Hypotheses Testing

This study assessed the level of collaboration or synergy of the pharmaceutical industry in Indonesia. Based on the descriptive statistics as shown in Table 9.3, the Indonesian pharmaceutical firms are engaged in an above-average level of collaboration (3.92 of 5.00).

The results of the Exploratory Factor analysis were detailed in the Appendix. The Supplier–Buyer Business Relationship (BR), which conceptually comprised 3 dimensions, became a first-order construct (factor), so as the Supply Chain Architecture (AR). The Supply Chain Collaboration (CR) and Supply Chain Performance (PR) remained distinct first-order constructs. After a series of exploratory factor analyses, all items had above 0.5 loadings, which confirmed the validity of the items, and good reliability (above 0.7).

The goodness-of-fit of the model is presented in Table 9.4. The Chi-square test revealed an unsignificant result, indicated that the model fit the data. The goodness-of-fit indices are above 0.90, showing a good model (Gerbing & Anderson, 1988). The RMSEA, however, is above the 0.08 threshold, but we maintained the model since the RMR is low (below 0.05).

Table 9.5 shows the results of the hypothesis testing. All hypotheses were supported (p-value < 0.01), except for Hypothesis 3, which conjectured a direct effect of Supply Chain Architecture (AR) to Supply Chain Performance (PF). In other words, Supply Chain Collaboration (CL) fully mediated the relationship between AR and PF. The results are discussed further in the Discussion section.

Table 9.3 Descriptive statistics ($N = 52$)

	BR	AR	CL	PF
Mean	3.9775	3.7336	3.9231	3.8527
Std. Deviation	0.4329	0.5239	0.3656	0.3275

Legend: BR = Business Relationship; AR = Architecture; CL = Collaboration; PF = Performance

Table 9.4 Model goodness-of-fit indices

	Model
χ^2	3.0633
df	2.0000
χ^2 *p*-value	0.2162
Comparative Fit Index (CFI)	0.9715
Goodness of Fit Index (GFI)	0.9640
Tucker-Lewis Index (TLI)	0.9146
Bentler-Bonett Non-normed Fit Index (NNFI)	0.9146
Bentler-Bonett Normed Fit Index (NFI)	0.9294
Relative Noncentrality Index (RNI)	0.9715
Parsimony Goodness of Fit Index (PGFI)	0.8201
RMR	0.0089

Table 9.5 Results of the hypothesis testing

	Estimate	Std. Error	*p*	CI (lower)	CI (upper)	Conclusion
BR → AR	0.5453	0.1498	0.0003	0.2516	0.8389	*H1 supported*
AR → CL	0.3780	0.0814	0.0000	0.2185	0.5374	*H2 supported*
AR → PF	0.0801	0.0933	0.3903	−0.1027	0.2630	*H3 not supported*
CL → PF	0.3076	0.1337	0.0214	0.0456	0.5696	*H4 supported*

Legend: BR = Business Relationship; AR = Architecture; CL = Collaboration; PF = Performance

9.4.3 Non-Nested Model Comparison

To ensure that our empirically tested model was better than other potential (competing) model, this study performed another run for a model relating all exogenous variable (i.e., business relationship, architecture, and collaboration) to the endogenous variable (i.e., performance). Table 9.6 displays the statistical results essential for a model comparison testing, as suggested by Kline (2015).

Based on these results, we could conclude that the current model has a better fit, because its χ^2/df ratio, AIC, and BIC were lower than the competing model and thus better represented the data (Akaike, 1987; Kline, 2015).

Table 9.6 Results of model comparison testing

	χ^2/df	AIC	BIC
Current model	1.532	125.424	139.082
Competing model	3.023	127.383	142.993

9.5 Discussion

This study aims to investigate the extent of collaboration in the pharmaceutical industry in Indonesia. It conjectures that a higher level of collaboration would improve the supply chain performance, especially in terms of product availability and order fulfillment. This study further tests determinants of supply chain collaboration, namely business relationships and supply chain architecture. The implications of the results are discussed in the next subsection.

9.5.1 Implications for Theory

This study confirms the positive relationships among supply chain architecture, supply chain collaboration, and performance. As Yunus and Kurniawan (2015) argued, a lack of coordination between pharmaceutical manufacturers and their supply chain partners could result in un-sync logistical executions and hence poor supply chain performance. This study provides empirical evidence of the positive impact of supply chain architecture on collaboration, and further on performance. In this study, collaboration fully mediates the relationship between supply chain architecture and performance.

Based on the findings, this study also corroborates the supplier-buyer business relationship as the determinant of supply chain architecture. This is aligned with previous studies (Collier & Sarkis, 2021; Saeed et al., 2019), which argue that an increase in interdependence, intensity, and trust would form superior inventory systems, information sharing practice, and information technology capability as dimensions of supply chain architecture.

Supply chain performance is critical in the pharmaceutical industry due to its significant and direct impact on society. This study measures the supply chain performance through internal impact and outward-orientation results, such as on-time delivery to customers, order fulfilment, and service excellence. This is aligned with insights from Narayana et al. (2014), who observed a shift from the company's internal focus to the supply chain network to the retail level (healthcare services). As the manufacturers improve their operational performance, people can appreciate the results through available drugs at affordable prices, which has been challenging to achieve thus far in developing countries.

9.5.2 Implications for Practice

In Indonesia, there are many issues related to the distribution of pharmaceutical products that result in people being unable to obtain medicines. This situation happens not only in remote areas but, ironically, also in big cities in Indonesia. This study

confirmed that collaboration among supply chain entities within the pharmaceutical industry—namely, suppliers, manufacturers, wholesalers, and retailers—would improve supply chain performance regarding inventory availability, order fulfillment, and return.

Collaboration indicates that supply chain partners perform integrated logistical activities by planning and engaging in intensive coordination. This study suggests that managers improve the business relationship by setting up communication channels, appointing a person in charge from each party, and establishing systems to monitor the supply chain processes. As the business relationship grows, companies would improve their supply chains architecture, such as electronic data interchange and information sharing. Thus, collaboration would also increase, and the Indonesian pharmaceutical industry would obtain a better supply chain performance.

9.5.3 Post-COVID Implications for Supply Chains in Pharmaceutical Company

When the World Health Organization (WHO) received a report of a new pneumonia case of unknown cause on December 31, 2019, and WHO declared a COVID-19 pandemic on March 11, 2021, no one realized how big the disaster was. It turns out, even after more than 20 months of us 'living life amid a pandemic', this phenomenon is not over. This coronavirus pathogen moves quickly to spread throughout the world and kills tens of millions of people, shakes the economy of almost all countries in the world, and disrupts national stability. The acceleration of the outbreak is triggered by climate change, urbanization, as well as lack of water and poor sanitation (World Bank, 2020, 2021b). Many countries are now facing a more substantial second wave. Some countries even experienced a third wave, such as the UK, Germany, Brazil, and countries in Africa. This pandemic is far from over.

On the other hand, the pandemic leads us to further consequences. During the pandemic, consumers use online channels for various activities previously done physically. Business, respond. In Indonesia, real growth is taking place. The e-commerce business is proliferating. This sector is projected to increase by 37.4% from 2020, or to Rp351.1 trillion. The compound annual growth rate (CAGR) is estimated at 19.2% between 2020 and 2024, bringing it to Rp707.6 trillion by 2024 (Global Data, 2021).

Moreover, as reported at the official Indonesian Information Portal (Indonesia.go.id), the accumulated value of purchases through e-commerce sites or apps (gross merchandise value/GMV) rose 54% from USD21 billion in 2019 to USD32 billion. This value is estimated to increase to USD83 billion in 2025. In line with the increase in the e-commerce business, digital banking transactions are projected to increase to around Rp32,206 trillion in 2021 or grow 19.1% from the realization of 2020 transactions (Hidranto, 2021).

The COVID-19 pandemic has undoubtedly brought us to the Industrial Revolution 4.0 through the acceleration of digitalization. A report from the McKinsey Global Survey, which looked at 899 senior directors and managers (their geographic origin is not specified), shows that adoption of digitization is much faster during a pandemic. The Asia–Pacific region has experienced a higher acceleration of digitalization of the interaction-with-consumer process than the Americas, Europe, and Global. The level of digital transformation of all/part of the goods or services offered in the Asia–Pacific region is the highest compared to other regions, which is experiencing an average acceleration of more than ten years, especially in the health and pharmaceutical sectors, financial services, and professional services (McKinsey, 2020).

The pandemic has made organizations realize the weaknesses of their supply chain management and begin to make improvements (Shih, 2020). When imported raw materials are not possible, the company starts to procure locally, expand the supply chain network, and develop new vendors (Shih, 2020; Harapko, 2021). Drones are now being used to deliver vaccines, blood, and medicines to various regions to reduce human contact (*The Economist*, 2021).

The pharmaceutical industry has felt the real impact of weak coordination in the supply chain of drugs, medical devices, and COVID-19 vaccines. When the second pandemic wave hit Indonesia, the public felt the unprepared supply of medicines and vaccines. However, the Indonesian government swiftly coordinated pharmaceutical manufacturers, distributors, hospitals, and oxygen and oxygen cylinders producers. All parties must move in the same rhythm to achieve optimal supply chain performance. This situation assures us about the importance of leadership in driving collaboration in supply chain networks, as argued by Yunus and Kurniawan (2015), as well as the essential factor of cooperation and coordination within the pharmaceutical supply chain.

9.6 Conclusion

This study examines the level of collaboration along the pharmaceutical supply chain in Indonesia. From the study results, the level of cooperation between pharmaceutical companies and their distributors is considerably good (3.92 out of 5.00) but still needs to be improved to the retail level, namely pharmacies, drug stores, and public health services. This study shows that the intensity and level of trust in building business relationships between suppliers and buyers is one of the drivers of improving supply chain architecture towards higher collaboration. Amid the current heavy pandemic, partnership and coordination between various parties in increasing the accessibility of drugs and vaccines are the main determinants of controlling COVID-19 virus contamination.

Appendix

Loadings and Reliability (Cronbach's Alpha)

Business Relationship (BR)—0.812		
Interdep1	Our company discusses the principal-distributor relationship at the strategic planning level	0.689
Interdep2	Our company holds periodic principal-distributor meetings regarding target agreements and supply chain performance	0.861
Interdep3	With regard to the procurement process, we as principals and distributors have an interconnected system to integrate supply information	0.718
Interdep4	In deciding something regarding the procurement of goods, we usually discuss first with the distributor	0.506
Intensity3	We develop professional procurement personnel who are directed to achieve a competitive strategy	0.617
Intensity5	Top Management pays full attention to developing and maintaining supply chain HR loyalty (develop and retain employee engagement)	0.537

Architecture (AR)—0.883		
InfSharing2	We exchange procurement information via the internet	0.778
InfSharing6	Our company shares available inventory information with distributors	0.480
InfSharing7	Distributors share existing inventory level information with us	0.543
Inventory1	Inventory management in our company is carried out in an integrated and computerized manner between the principal and distributor	0.653
IT1	Routine communication between principal and distributor is computerized	0.840
IT2	Principals and distributors use technology that enables electronic transaction processing	0.919
IT3	Coordination between companies can be achieved using electronic links	0.842

Collaboration (CL)—0.790		
CL1	We carry out logistics activities with distributors with coordination that makes it easier for each other	0.554
CL2	We carry out logistics activities with well-integrated distributors	0.987
CL3	Principal and distributor logistics integration includes distribution, transportation, and/or warehousing activities	0.600

(continued)

(continued)

Collaboration (CL)—0.790		
CL4	The flow of information and goods runs smoothly and is integrated between principals and distributors	0.666

Performance (PF)—0.788		
PF1	Our company has a good record of on-time delivery	0.7395
PF2	Our company is able to fulfill customer orders based on information from distributors quickly	0.6449
PF3	Our company provides excellent service to distributors	0.6164
PF4	Sales of our company's products are experiencing good growth	0.6459
PF5	Low company product sales returns	*deleted*
PF6	Our company's product sales returns are decreasing	0.7511
PF7	Our company profit is growing	0.9091
PF8	The market share of our company's products has increased	0.5107
PF9	My company's return on investment has increased	0.8939
PF10	Our company's investment development is getting higher	*deleted*

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