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Competitive Advantage in Indonesian Pharmaceutical Raw Material Companies: Effect of External Integration, Agility, and Innovativeness

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Abstract

Indonesian pharmaceutical raw material companies have an important position in the supply chain of drug products because 90-95% of pharmaceutical raw materials are still imported. Therefore, it is very important to measure the ability of pharmaceutical raw material companies to maintain the pharmaceutical supply chain in Indonesia. The aim of this study is to evaluate and examine the impact of External Integration (EIN), Supply Chain Agility (SCA), and Supply Chain Innovativeness (SCI) on competitive advantage (KK). This study also explored the mediation role of SCA and SCI in the relationship between EIN and KK. This study involved 84 Pharmaceutical raw material companies and used quantitative method with partial-least squares structural equation modeling (PLS-SEM) as the analysis tool. The results showed that EIN had a positive and significant effect on SCA, SCI, and KK. Furthermore, the findings indicated that SCA positively and significantly influenced KK. Additionally, SCA played a mediating role in the correlation between EIN and KK. However, the effect of SCI on KK and its mediating role were not supported by the data. This indicates that the capabilities of EIN and SCA play an important role in improving the KK of pharmaceutical raw material companies in Indonesia

Keywords: External Integration; Supply Chain Agility; Innovativeness; Competitive Advantage

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INTRODUCTION

Indonesia is a country with the largest pharmaceutical market share in Southeast Asia and one of the markets with the fastest projected growth rate from 2017 to 2027, it is estimated that pharmaceutical sales in Indonesia will reach US$27 billion in 2027 (Lim & Rokhim, 2020). Nevertheless, Indonesian pharmaceutical companies currently face challenges in their raw material supplies, with 90% of their supplies coming from imports (Pramudana et al., 2023). Referring to data from the Ministry of Health, as of 2022, Indonesia only has 16 raw material producers, with only 5 actively producing pharmaceutical materials (Isnaeniah et al., 2023). In the pharmaceutical supply chain, companies often rely solely on supplies from one region, placing them at risk of raw material shortages if there is uncertainty about supply chain conditions in that region (Foster et al., n.d.).

Pharmaceutical raw material companies play an important role as part of the upstream channel in the industry. Complexity within the supply chain, specifically in upstream channels and operations, adversely impacts of supply chain performance (Chand et al., 2022). Another study found that a company's financial performance can improve if it maintains stability with key customers and suppliers (Gu et al., 2022). Both results highlight how crucial of upstream channel management to reduce complexity and the significance of improving stability with key suppliers to ensure better performance.

Integration on supply chain, encompassing both external and internal facets, has the potential to enhance a company's flexibility and improve its ability to deal with disruption (Asare et al., 2023). As the world becomes increasingly complex and competitive, integration in the supply chain has become important to maintaining competitive advantage (Prakash, 2022). Supply chain integration provides significant advantages for businesses, such as enhancing customer satisfaction, improving operational efficiency, and driving cost savings (Abdallah et al., 2021). External integration refers to a company's capacity to work closely with essential stakeholders such as suppliers and customers, aligning plans, observations, measurements, and actions across organizations within the supply chain (Jum'a & Bushnaq, 2023).

The modern supply chain management system is thought to place a high value on agility (Nabass & Abdallah, 2019). This is because the notion of agility in the operations of the supply chain is critical to driving significant transformation in critical business functions. By fostering responsiveness and flexibility, agility enables organizations to effectively navigate and respond to changes in a dynamic business environment (Aldhaheri

& Ahmad, 2023). Agility within global supply chains (GSCs) refers to the speed at which these chains respond to shifts in customer preferences, environmental factors, and competitive dynamics. It functions as a gauge for how well businesses adjust their supply networks to these changes and how well they can carry out such adjustments. (Kazancoglu et al., 2022).Integration and agility have partial mediators on the competitive advantage in environmental uncertainty (Koç et al., 2022).

Innovation in the supply chain is a multifaceted process involving the generation of new logistics services and information processing through the utilization of technological and process innovations. Its primary aim is to address customer needs effectively while identifying new approaches to enhance operational processes (Wang et al., 2023). In order to properly handle new challenges and issues, supply networks must innovate in response to the growing unpredictability and complexity of logistics and supply chains. (Wang et al., 2020). SCI acts as a catalyst that facilitates various functions in supply chain practices, including planning, forecasting, purchasing, and monitoring. In addition, this improves operational capabilities and increases organizational capacity for risk management (Afraz et al., 2021). To provide fast and flexible responses, supply chain innovation requires technology integration with partners (Shamout, 2021). Companies may innovate swiftly to create new products and modify internal procedures in response to shifts in consumer demand (Siagian et al., 2021).

From the explanation provided, this research offers several hypotheses that are proposed, as follows:

Well-managed supply chain integration will enable businesses to innovate in terms of supply chain resilience, flexibility, and innovation, all of which will eventually affect the business of the organization (Siagian et al., 2021). External integration can also provide benefits such as reduced costs, increased productivity, and improvements in agility, as well as ease of obtaining resources (Amoako-Gyampah et al., 2020). Another research conducted by Koç et al. (2022) revealed that supply chain integration is able to play a moderating role in the connection between competitive advantage and environmental uncertainty. Therefore, the researchers proposed the first hypothesis:

H1: External integration (EIN) have positive effect on competitive advantage (KK).

Research by Roscoe et al. (2020) shows that internal and external integration enable fast and efficient responses to changing customer demands. In this context, external integration is positively related to hyperagility, how businesses may quickly establish and

manage supply chains in erratic situations, obtain raw materials, and move raw materials and components at very high speeds (Raj et al., 2023). Other research has also found that integration with external parties, such as suppliers and customers, can increase levels of agility as it facilitates cooperation and communication among supply chain participants. This in turn increases the ability to readjust supply chains towards greater flexibility and responsiveness (Abdelilah et al., 2023). Therefore, the researchers proposed the second hypothesis:

H2: External integration (EIN) have positive effect on supply chain agility (SCA).

Buyers and suppliers can exchange information with partners about strategies, tactics, and projects aimed at adding value to the supply chain through supply chain integration (Shamout, 2021). Working together to preserve operational continuity while acquiring new expertise from outside partners is crucial (Paula et al., 2020). Supply chain integration enables businesses to implement innovations such as information technology application, process innovation, and new product development by exchanging comprehensive information with partners. Therefore, the researchers proposed the third hypothesis:

H3: External integration (EIN) have positive effect on supply chain innovativeness (SCI).

According to research by Koç et al. (2022), supply chain integration and SCA play a somewhat moderating function in the relationship between competitive advantage and environmental unpredictability. According to the study's findings, businesses can strengthen their supply chain partnerships' integrated structures to enhance their supply chain analytics in high-uncertainty environments. This would help them gain a competitive edge over rivals. Asuamah Yeboah (2023) study on food companies in Ghana revealed that firms can gain a competitive edge by incorporating tactics such as supply chain agility, collaboration, and integration into their networks. Therefore, the researchers proposed the fourth hypothesis:

H4: Supply chain agility (SCA) have positive effect on competitive advantage (KK).

According to research by Afraz et al. (2021), supply chain innovation (SCI) and competitive advantage are positively correlated in Pakistan construction enterprises. These results imply that a company's competitive advantage is directly impacted by a high degree of supply chain innovation. The company's competitive advantage increases with the degree of innovation demonstrated by attempting new concepts and approaches, looking for inventive solutions, and implementing new procedures within the supply chain context (Chen, 2019). Therefore, the researchers proposed the fifth hypothesis:

H5: Supply chain innovativeness (SCI) have positive effect on competitive advantage (KK).

One key component of supply chain agility is a company's capacity to create partnerships with supply chain partners that will benefit both parties in a volatile and uncertain business climate (Shukor et al., 2020). Integration partners in the supply chain must be flexible enough to adjust their capacity in response to the uncertain and fast changing supply chain environment of today, especially when it comes to supply and demand uncertainties (Aggrey et al., 2022). According to Meng et al. (2023), supply chain integration represents the outcome of supply chain integration and efficacy, whereas supply chain agility generally signifies the speed and effectiveness of resource integration. Therefore, the researchers proposed the sixth hypothesis:

H6: Supply chain agility (SCA) have mediating roles on external integration (EIN) and competitive advantage (KK).

According to Siagian et al. (2021), supply chain flexibility and system innovation boost supply chain resilience by enabling it to handle unexpected fluctuations in customer demand and production issues. By cutting costs and lead times, guaranteeing consistency in quality, and creating new operational strategies and adaptability in a business environment that is changing quickly, supply chain innovation is a tool that helps all supply chain stakeholders to work together smoothly (Pal et al., 2022). Therefore, the researchers proposed the seventh hypothesis:

H7: Supply chain innovativeness (SCI) have mediating roles on external integration (EIN) and competitive advantage (KK).

The researcher constructs a research model in Figure 1, which refers to the conceptual framework of Ayoub & Abdallah (2019), who found a positive influence between SCA and export performance (EP). The researcher modifies elements from previous research, aiming to adjust the model according the research context, namely pharmaceutical industry. The researcher is using competitive advantage (KK) as a substitute for EP, given that pharmaceutical raw material companies engage in importing business processes or procuring pharmaceutical raw materials from abroad.

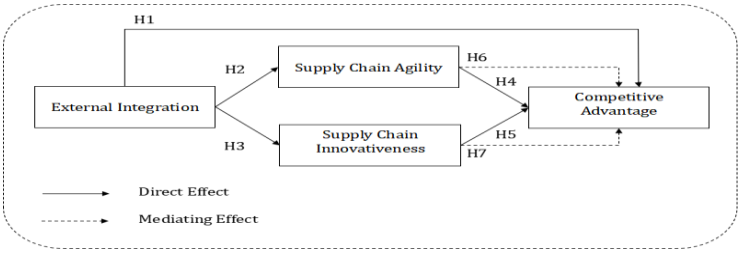

Figure 1. Research Model

RESEARCH METHODS

The research population consisted of all pharmaceutical raw material supplier companies in Indonesia that had obtained the Good Distribution Practice (GDP) certificate from the Badan Pengawas Obat dan Makanan (BPOM). The unit of analysis of this research is pharmaceutical raw material supplier company. The survey was conducted by distributing questionnaires via email and direct messages, to respondents working in pharmaceutical raw material supplier companies in Indonesia. The target respondents were at the Supervisor level and above, thus having the competence to fill out the questionnaire. This study use company as the unit of analysis, so each company could only be represented by one competent respondent.

In this research model, there were four latent variables (constructs): external integration, supply chain agility, innovativeness, and competitive advantage. Each variable was measured using indicator variables according to theory, with the construct EIN according to the research by Danese et al. (2013), construct SCA according to the research by Koç et al. (2022); Ayoub & Abdallah, (2019), construct SCI according to the research by Afraz et al. (2021) and Chen (2019). Finally, the construct of competitive advantage was in line with the research by Chen (2019) and Koç et al. (2022). Each indicator was measured with a six-point Likert scale and the data that has been collected is then analyzed using smartPLS version 4.

Before distributing the final questionnaire, the researcher conducted a wording test with 3 respondents holding the Manager position who worked at pharmaceutical raw material supplier companies. This aimed to refine the questionnaire's wording before the actual research questionnaire was distributed to the research sample. A total of 112 questionnaires were distributed to all pharmaceutical raw material supplier companies in Indonesia, and the researcher obtained 102 respondents who filled out the questionnaire. 18 respondents were not included in the data processing because they did not meet the criteria, resulting in a total of 84 respondents for analysis.

RESULTS AND DISCUSSION

Table 1 show the demographic information of the respondents. Based on gender, the proportion of male respondents was 65.5%, with the largest age range between 26-35 (27.4%) and 41-45 (23.8%). Majority of respondents had more than 5 years of experience, which is 75.0% of

the sample. The most common positions held by respondents are Manager (63.1%) and Director (16.7%).

Table 1. Profile Respondents

Demographics			
Gender	**Male**	**Female**	**Total**
Frequency	55	29	84
	(65,5%)	(34,5%)	(100%)
Age	**Range**	**Frequency**	**Percentage**
(Years)	Above 50	15	17,9%
	26 – 35	23	27,4%
	36 – 40	15	17,9%
	41 – 45	20	23,8%
	46 – 50	11	13,1%
Experience	Less than 1	5	5,95%
(Years)	1 – 5	16	19,05%
	Above 5	63	75,00%
Position			
Assistant Manager		5	6,0%
Direktur		14	16,7%
General Manager		7	8,3%
Manager		53	63,1%
Supervisor		5	6,0%

(Source: Processed Data)

The initial stage includes assessing the outer model to ensure the validity and reliability of each indicator. Table 2 presents the output of the measurement model. An indicator is considered valid if its loading factor value >0.5 (Cheung et al., 2023). Indicators with loading factor below 0.40. should consistently removed from the measurement model (Hair et al., 2022). Based on Table 2, the values of all indicators is >0.5. This means all indicators used in the study can explain their variables and meet the validity requirements.

The results of reliability testing can also be observed through the values of composite reliability. Based on the theory proposed by Hair, a Composite Reliability value >0.7 is acceptable (Hair et al., 2019). Based on Table 2, all variables have CR values >0.7. This means that all variables in this study have reliability.

The research is conducting convergent validity analyses of the constructs. Convergent validity is essentially about how well a construct aligns and accounts for the variability seen in its individual components or items (Hair et al., 2019). The AVE values is being assessed to confirm convergent validity. Results of AVE above 0.5 shows that the constructs have validity convergent. (Koç et al., 2022). According on Table 2, all variables have an AVE value exceeding 0.50. which indicates that the measurement model in this study shows convergent validity and is considered valid.

Table 2. Measurement Model

Variable	Loading	CR	AVE
External Integration (EIN) (Danese et al., 2013)		0.926	0.615
EIN1	0.838		
EIN2	0.765		
EIN3	0.840		
EIN4	0.790		
EIN5	0.786		
EIN6	0.554		
EIN7	0.836		
EIN8	0.823		
Supply Chain Agility (SCA) Koc et al., 2022; Ayoub & Abdallah, 2019)		0.890	0.509
SCA1	0.663		
SCA2	0.799		
SCA3	0.774		
SCA4	0.517		
SCA5	0.731		
SCA6	0.624		
SCA7	0.848		
SCA8	0.694		
Supply Chain Innovativeness (SCI) (Chen, 2018; Afraz et al., 2021)		0.929	0.724
SCI1	0.849		
SCI2	0.862		
SCI3	0.894		
SCI4	0.860		
SCI5	0.787		
Competitive Advantage (KK) (Chen, 2018, Koc et al., 2022)		0.912	0.602
KK1	0.660		
KK2	0.862		
KK3	0.893		
KK4	0.563		
KK5	0.841		
KK6	0.707		
KK7	0.844		

(Source: Processed Data)

Finally, discriminant validity measurement is conducted to explain how much one construct variable differs from another (Hair et al., 2022). Discriminant validity is measured using the heterotrait-monotrait (HTMT) ratio. Construct variables are considered to have sufficient discriminant validity if their HTMT values are below 0.9 and if the construct more distinct use conservative value below 0.85 (Hair et al., 2022). According on table 3 where all correlations between variables have values below 1. Thus, based on the Heterotrait-Monotrait (HTMT) approach, all variables exhibit sufficiently good discriminant validity.

Table 3. Discriminant Validity Test Results

Variable	EIN	SCA	SCI
SCA	0.725		
SCI	0.706	0.848	
KK	0.578	0.703	0.849

(Source: Processed Data)

After evaluating the quality of the measurement model, the next analysis is to assess the structural model. Evaluation is carried out by evaluating the following criteria: Coefficient of determination (R^2), cross-validated redundancy (Q^2), and effect size (f^2) (Hair et al., 2019). Table 4 presents the results of the R^2 and Q^2 test. Table 5 presents the results of the f^2 test.

Table 4. R2 and Q2 Test Results

Variable	R2	Q2
KK	0.629	0.430
SCA	0.431	0.396
SCI	0.283	0.255

(Source: Processed Data)

The testing of R-square is used to determine how much the independent variable is capable of explaining the variation in the dependent variable. Based on (Hair et al., 2019), the R-square values can be classified as follows: significant (0.75), moderate (0.5), and weak (0.25). Referring to the data presented in Table 4, the variables KK and SCA can be classified as moderate, while SCI is classified as weak. This means that the variable EIN can explain the variance of the KK by 62.9%, the variance of the SCA by 43.1%, and the variance of the SCI by 28.3%.

Testing Q-square or cross-validated redundancy is necessary to assess the predictive relevance of the inner model. $Q^2 > 0$ indicates that the model has good predictive relevance, while $Q^2 < 0$ indicates a lack of predictive relevance in the model (Hair et al., 2019). From the Q-square measurement results presented in Table 4, all variables have values > 0. This means that it can be said that the endogenous variables used in this research have good predictive relevance values.

Table 5. f2 Test Results

Variable	KK	SCA	SCI
EIN	0.135	0.757	0.394
SCA	0.202		
SCI	0.021		

(Source: Processed Data)

The f^2 value is used to measure the significance of the independent variable in explaining the dependent. Criteria for assessing the magnitude of f^2 include: 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect), while values below 0.02 indicate no effect (Hair et al., 2019). According Table 4, the value of f^2 from EIN to SCA is 0.757, and from EIN to SCI is 0.394, indicating a large influence. The value of f^2 from EIN to KK is 0.135, and from SCA to KK is 0.202, indicating a medium influence. The value of f^2 from SCI to KK is 0.021, categorizing it as having a small influence.

Table 6. Hypothesis Analysis Results

Hypothesis	Path Coefficient	p-Values	t-Values
External Integration → Competitive Advantage (H1)	0.298	0.020	2,058
External Integration → Supply Chain Agility (H2)	0.656	0.000	13,172
External Integration → Supply Chain Innovativeness (H3)	0.532	0.000	6,691

Table 6. Hypothesis Analysis Results

Hypothesis	Path Coefficient	p-Values	t-Values
Supply Chain Agility → Competitive Advantage (H4)	0.459	0.002	2,849
Supply Chain Innovativeness → Competitive Advantage (H5)	0.132	0.168	0.963
External Integration → Supply Chain Agility → Competitive Advantage (H6)	0.301	0.004	2,628
External Integration → Supply Chain Innovativeness → Competitive Advantage (H7)	0.070	0.185	0.897

(Source: Processed Data)

The final stage in using PLS-SEM involves testing hypothesis that link the constructs in the study. A hypothesis is supported by data if the path coefficient value is positive, the t value exceeds 1.65, or the p-value below 0.05 (Hair et al., 2022). Figure 2 show the model of the research along with analysis findings obtained through smartPLS software. The analysis results for hypothesis H1 to H7 are displayed in table 6.

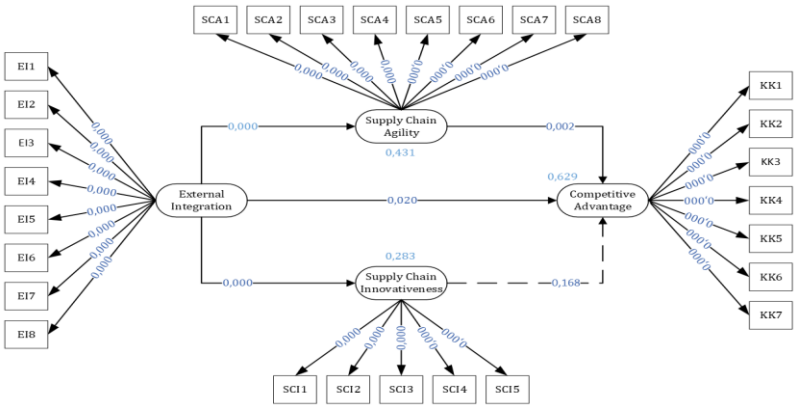

Figure 2. Model and Findings

In Table 6, the path coefficient values are positive, with all t-values above 1.65 and p-values below 0.05, except for hypotheses H5 and H7. As previously established, seven hypotheses were formulated, five of which received empirical support, as indicated by positive path coefficient values, t-values exceeding 1.65, and p-values below 0.05. While two hypotheses (H5 and H7) are not supported by the data, with t-values of 0.963 < 1.65 and 0.897 < 1.65; and p-values of 0.168 > 0.05 and 0.185 > 0.05, respectively.

The results of the study indicate that the competitive advantage of Indonesian pharmaceutical raw material firms is positively impacted by external integration (H1). This result is consistent with earlier studies' conclusion that supply chain integration is a crucial strategy for giving businesses a sustained competitive edge, which can enhance business performance (Yu et al., 2021). Koç et al. (2022) also demonstrated how supply chain integration might boost competitive advantage in unsteady environmental conditions. Benefits from external integration include lower costs, increased productivity, increased agility, and simpler resource procurement (Amoako-

Gyampah et al., 2020). Additionally, it improves cost effectiveness and operational performance (Panigrahi et al., 2023).

The data supports the hypothesis that external integration has a positive effect on supply chain agility (H2). According to Abdelilah et al. (2023), relationships between suppliers and customers foster communication and collaboration among supply chain entities, increasing the supply chain's capacity for reconfiguration and enhancing its flexibility and responsiveness. This research supports that claim. The capacity of a business to swiftly and readily adjust to ever-changing surroundings is frequently linked to its agility (Rawashdeh et al., 2024). It emphasizes the need for pharmaceutical raw material firms in Indonesia to continuously improve their lines of communication with suppliers in order to obtain timely market intelligence and make necessary adjustments. The data supports the hypothesis that external integration positively influences supply chain innovation (H3). This result validated Siagian et al. (2021) that extensive information exchange with supply chain partners, as part of supply chain integration, empowers organizations to innovate, including activities such as the development of new products, improvement of processes, and application of technology information. By encouraging integration with customers and suppliers, it is expected to generate accurate information about the need for product and process innovations.

The findings of this study provide credence to the fourth hypothesis (H4), according to which supply chain agility has a positive effect on competitive advantage. The results of earlier studies, which indicated that supply chain agility can increase a company's competitive advantage, are reinforced by the current study. A company's competitive advantage is boosted by increased agility among supply chain participants, which includes improved demand forecasting, adaptable and quick responses, and coordinated operations (Chen, 2019). The fifth hypothesis (H5), according to which supply chain innovation positively impacts competitive advantage, is not supported by the data. These findings differ from previous research, which shows the positive and significant impact of SCI on KK in construction companies in Pakistan (Afraz et al., 2021). These findings may be due to the fact that majority of pharmaceutical raw material companies in Indonesia are trading and importing companies. Based on findings from Geng & Kali (2021) foreign resources can hinder domestic innovation and show a substitution effect from foreign sources on domestic research and development. Another reason for innovation not significantly impacting supply chain performance may be the limited adoption of technology (Zhou et al., 2023). According to research conducted by Nurlaela Arief et al. (2022) on the implementation of Pharma 4.0 in the pharmaceutical industry in Indonesia, the majority of pharmaceutical industries in Indo-

nesia are still at a low level of adoption.

The results support (H6), which states that supply chain agility has a mediation roles on competitive advantage and supply chain integration. This research supports a study by Abdelilah et al. (2023) discovered that supply chain agility is a totally mediating factor in the impact of external integration on the operational performance of a corporation. According to that study, a company's agility improved its ability to integrate, which ultimately had a favorable impact on the business. Furthermore, supply chain agility gives businesses the capacity to anticipate and react to shifts in demand brought on by unexpected events and disturbances in the market (Çetindaş et al., 2023). However, the mediating role of supply chain innovation on supply chain integration and business performance (H7) is not supported by data. This objection seems reasonable because supply chain innovation alone does not directly affect competitive advantage (H5). As a result, supply chain innovation does not function as a mediator of the relationship between supply chain integration and competitive advantage. The reason is that due to limited technology adoption (Zhou et al., 2023), according to research conducted by Arief et al. (2022) regarding the implementation of Pharma 4.0 in the pharmaceutical industry in Indonesia, the majority of the pharmaceutical industry in Indonesia is still at a low level of adoption.

CONCLUSION

This research examines the effect of EIN on KK, considering the mediating roles of SCA and SCI. The findings show that of the seven hypotheses formulated, five were supported by data and two were not supported. EIN affects KK, SCA, and SCI. Moreover, SCA affects KK, and SCI does not affect KK. EIN indirectly affects KK via SCA. This suggests that EIN enhances KK by improving SCA. In contrast, SCI did not serve as a mediator for the indirect effect of EIN on KK, so based on this research, pharmaceutical raw material companies in Indonesia need to increase their supply chain agility to strengthen their external integration capabilities.

This research emphasizes the significance of EIN in supporting SCA and SCI to enhance KK for pharmaceutical raw material companies in Indonesia. External integration supported by agility can strengthen the position of pharmaceutical raw material companies in Indonesia. The stronger the level of integration they have, the more agile the company will be to adjust and adapt to uncertain conditions. However, there are still challenges for pharmaceutical raw material companies in Indonesia to maximize integration with innovation activities in the supply chain. One thing that can be done is to increase

the level of technological adaptation at pharmaceutical raw material companies.

The research provides practical insights for companies to continuously improve integration with customers and suppliers to build competitive advantages for themselves. Additionally, it is important for companies to remain agile in their supply chains to quickly adapt the changes in supply and demand. This study contributes to current research in the field of supply chain management by providing explanations and empirical evidence on the roles of external integrity and supply chain agility in influencing the company's competitive advantage.

This study is not without limitations. A comparison analysis with other emerging countries may provide a more complete understanding of how supply chain factors affect the pharmaceutical raw material company's competitive advantage. Moreover, there are other variables (such as risk management supply chain, responsiveness, and other dimensions related on supply chain) that can be included the model to obtain better insights. Future research by address this limitations.

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