The Effect of Supply Chain Strategy on the Efficiency of Drug Product Distribution at Pt Novell Pharmaceutical Laboratories

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Abstract

This study aims to analyze the effect of supply chain integration and supply chain collaboration on drug distribution efficiency at PT Novell Pharmaceutical Laboratories. The method used in this study is quantitative with an associative approach. Then, the sample in this study was 40 respondents who were taken with saturated sampling techniques. Then, data collection was carried out through a Likert scale questionnaire which was then analyzed using multiple linear regression. The results of the study showed that supply chain integration had a positive and significant effect on distribution efficiency, which was proven by the results of the t-test with a t-value of 2,698 > t table 1,685 and a significance of 0.04 < 0.05. Then, supply chain collaboration also has a positive and significant effect on distribution efficiency, with a t-value of 2,123 > t table 1,685 and a significance of 0.04 < 0.05. Simultaneously, supply chain integration and supply chain collaboration have been shown to have a significant effect on distribution efficiency, which is shown by the F value of 3.72 > F table 2.86 with a significance of 0.03 < 0.05. An R2 value of 76.7% indicates that the two variables have a strong contribution in explaining the distribution efficiency at PT Novell Pharmaceutical Laboratories, while the remaining 23.3% is influenced by other factors outside the study.

Keywords: *Supply Chain Integration, Supply Chain Collaboration, Distribution Efficiency*

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Introduction

The pharmaceutical industry is one of the strategic sectors that has a vital role in maintaining public health and supporting national resilience in the health sector. The characteristics of the pharmaceutical industry are highly regulated, have strict quality standards, and depend on the availability of raw materials, most of which come from imports, making supply chain management a crucial factor in maintaining the continuity of the company's operations. Delays in distribution or inefficiency of product flow not only impact operational costs, but also have the potential to disrupt the availability of drugs in the market. Globally, the World Health Organization (WHO) emphasizes that around 30-40% of drug availability problems in developing countries are caused by weak distribution systems and supply chain management, not just due to production limitations. This condition shows that distribution efficiency is an important aspect in ensuring equitable and timely access to medicines. One of the approaches that is widely discussed in the modern supply chain management literature is a supply chain strategy based on integration and collaboration. Supply chain integration refers to the degree of integration of a company's internal processes with external partners such as suppliers and distributors. Christopher (2022), explains that supply chain integration allows companies to gain better visibility into information, speed up decision-making, and reduce duplication of activities in distribution. With good integration, the flow of demand, inventory, and shipping information can be synchronized in real-time so that distribution efficiency can be improved. time so that the efficiency of distribution can be improved. In addition to integration, supply chain collaboration is also an important strategy in dealing with the complexity of pharmaceutical product distribution. Supply chain collaboration is defined as a form of long-term cooperation between a company and supply chain partners in the planning, control, and implementation of distribution. According to Bilal, Bititci, and Fenta (2024), effective collaboration between manufacturers, distributors, and logistics providers is able to reduce distribution costs by up to 15–25% through reducing delivery delays and improving demand planning accuracy.

As one of the national pharmaceutical companies, PT Novell Pharmaceutical Laboratories carries out drug product distribution activities to various regions in Indonesia with different market characteristics. The wide scale of distribution, high product variety, and regulatory demands from the Food and Drug Supervisory Agency (BPOM) make distribution efficiency a significant managerial challenge. In practice, pharmaceutical companies are often faced with problems such as delivery delays, increased distribution costs, and suboptimal coordination between production departments, warehouses, and distributors.

Table 1 Indication of Distribution Efficiency Problems (Y)

Distribution Efficiency Indicators	Expected Conditions	Conditions That Occur (Indicative)	Impact on the Company
Delivery timeliness	≥ 95% on-time delivery	± 85–90% on-time delivery	Delay in supply to distributors
Distribution fee per unit	Stable & controlled costs	Tends to increase	Decreased profit margin
Accuracy of delivery quantity	100% to order	There is still a difference in the number	Returns and redistribution
Lead time distribution	Concise & consistent	Fluctuating	Stock planning difficulties
Coordination between units	Real-time integration	Not fully integrated yet	Slow distribution information

Indication of Distribution Efficiency Problems (Y)

The table above shows that the distribution efficiency of drug products at PT Novell Pharmaceutical Laboratories has not been fully optimal, especially in terms of delivery timeliness and distribution costs. Intimeliness of delivery have the potential to lead to delays in the availability of drugs at the point of distribution, while rising distribution costs can reduce

the company's competitiveness in an increasingly competitive pharmaceutical market. These problems indicate that the supply chain strategy implemented is not fully able to support maximum distribution efficiency. One of the factors that is suspected of contributing is the level of supply chain integration that is not optimal, both between internal units (production, warehouse, and distribution) and with external partners such as distributors and logistics service providers.

Table 2 The Relationship of Supply Chain Strategy with Distribution Efficiency Problems

Variable Strategy *Supply Chain*	Indicative Conditions	Impact on Distribution Efficiency
Supply chain *integration* (X1)	Information systems are not yet fully integrated	Demand and stock data are out of sync
Supply chain *collaboration* (X2)	Coordination with distributors has not been optimal	Delays and increased distribution costs

Source: PT Novell Pharmaceutical Laboratories, 2026

Based on indicative data on PT Novell Pharmaceutical Laboratories, it can be seen that the problem of distribution efficiency is closely related to the supply chain strategy implemented by the company. Therefore, an empirical study is needed to determine the extent of the influence of supply chain strategy represented by supply chain integration and supply chain collaboration on the efficiency of drug product distribution.

According to Christopher (2022), weak supply chain integration causes information delays that have a direct impact on distribution inefficiencies. Meanwhile, Bilal et al. (2024) emphasized that the low level of supply chain collaboration in the pharmaceutical industry often triggers increased logistics costs and untimely delivery.

Based on the theoretical description, industry data, and empirical conditions at PT Novell Pharmaceutical Laboratories, it can be concluded that supply chain strategy has an important role in influencing the efficiency of drug product distribution. Therefore, this study is important to analyze the influence of supply chain strategy on the efficiency of drug product distribution at PT Novell Pharmaceutical Laboratories.

To avoid discussions that are too long and wide, limited time, energy and knowledge. Therefore, the author limits this study only to the discussion of the Influence of Supply Chain Strategy on the Efficiency of Drug Product Distribution at PT Novell Pharmaceutical Laboratories where the data used is primary data processed using the SPSS application. The purpose of this study is to find out whether the integration of supply chain and supply chain collaboration has a positive and significant effect on distribution efficiency, as well as to find out it simultaneously. This research was carried out as a result of the development of Muhammad Mirza Arzhanianta's research with the title "The Influence of Collaboration, Capabilities, and Supply Chain Integration on Company Performance (Study on MSMEs in the Special Region of Yogyakarta)".

Literature Review

Definition of Distribution

According to Tambunan (2017), distribution is the process of distributing goods from producers to consumers through various trade channels that aim to ensure the availability of goods in the market at a cost-efficient and stable price. According to Kotler & Keller (2016), distribution is a series of corporate activities that aim to make products available to target consumers at the right time, place, and quantity through effective distribution channels.

Distribution Efficiency Concept

According to Tambunan (2017), distribution efficiency is the ability of the goods distribution system to maintain the availability of products in the market with low costs, fast times, and stable prices in various regions. According to Christopher (2016), distribution efficiency is the ability of the logistics system to manage the delivery of products to the destination location on time, at minimal cost, and the condition of the product is maintained.

Efficiency is achieved when the company is able to balance distribution costs and customer service levels. According to Bowersox, Closs, & Cooper (2019), distribution efficiency is the success in planning, controlling, and executing the flow of goods from the point of production to consumers by minimizing waste and maximizing productivity.

Distribution Efficiency Indicators

According to Tambunan (2017), distribution efficiency is basically related to the ability of the system to distribute goods/services from producers to consumers with minimum costs, the right time, and a low loss rate.

1. Distribution costs
2. Distribution Margin
3. Distribution chain length
4. Distribution speed
5. Accuracy of Quantity and Availability of goods
6. Extent of product damage and loss
7. Coverage of distribution areas
8. Price affordability in consumers

Supply Chain Strategy Concept

Supply chain strategy is an integrated approach that companies use to manage the flow of goods, information, and resources from suppliers to consumers effectively and efficiently. According to Chopra and Meindl (2019), supply chain strategy is long-term planning that aims to create a fit between supply chain capabilities and customer needs. This strategy includes the management of production, storage, distribution, and transportation so that the company is able to provide maximum value at optimal cost.

Supply Chain Integration Definition

Supply chain integration is an important concept in modern supply chain management that emphasizes the interconnectedness and harmonization of processes between parties involved in the flow of goods, information, and finance. According to Pujawan and Mahendrawathi (2017), supply chain integration is the process of uniting the company's internal activities with external partners such as suppliers, distributors, and customers in one coordinated system to improve operational efficiency and effectiveness. This integration allows companies to reduce barriers, increase visibility, and accelerate decision-making in the distribution process.

Supply Chain Indicator

The indicators of supply chain integration according to Pujawan and Mahendrawathi (2017) are as follows:

1. Internal integrations
2. Integration with suppliers
3. Integration with customers
4. Information integration
5. Coordination of planning and decision-making

Definition of Supply Chain Collaboration

Supply chain collaboration is a strategic approach that emphasizes active cooperation between parties in the supply chain to achieve more optimal performance. In an increasingly dynamic and competitive business environment, companies can no longer operate individually, but rather need to build collaborative relationships with suppliers, distributors, and customers. According to Simatupang and Sridharan (2018), supply chain collaboration is a partnership process between organizations in sharing information, resources, risks, and benefits to improve

the efficiency and effectiveness of product and information flows from upstream to downstream.

Supply Chain Collaboration Concept

The basic concept of collaboration in the supply chain departs from the understanding that the success of supply chain management is not only determined by the ability of one company, but also by the synergy of all parties involved in it. According to Christopher (2016), collaboration in the supply chain is a strategic approach that emphasizes long-term cooperation between organizations to create a more effective flow of goods, information, and services. Through collaboration, companies can reduce demand uncertainty, increase operational flexibility, and accelerate response to market needs.

Supply Chain Collaboration Indicators

The indicators of supply chain collaboration according to Simatupang and Sridharan (2018), are as follows:

1. Information sharing
2. Joint planning
3. Joint Decision-Making
4. Activity synchronization
5. Intensive communication
6. Trust between partners
7. Sharing of risk and benefits
8. Joint problem-solving

Research Methodology

This study uses a type of quantitative research with an associative approach. The associative approach aims to determine the relationship and influence between independent variables and bound variables. In this study, the independent variable consists of Supply Chain Integration (X1) and Supply Chain Collaboration (X2), while the bound variable is Distribution Efficiency (Y). This research was conducted at PT Novell Pharmaceutical Laboratories which is located at Jl. Bunga Asoka No.95, Asam Kumbang, Kec. The population in this study is as many as 40 respondents/person.

The population in this study is all employees of PT Novell Pharmaceutical Laboratories who are directly involved in supply chain activities, logistics, warehousing, and product distribution, with a total of 40 people. Because the population is relatively small and it is still possible to reach as a whole, the sampling technique used is saturated sampling (total sampling). Saturated sampling is a sample determination technique by making all members of the population as research samples. The data collection technique in this study uses lifting/questionnaires, conducting interviews, observations and documentation. The data analysis techniques in this study are: data quality test, classical assumption test and conformity test.

Results

Overview of the research object

PT Novell Pharmaceutical Laboratories is one of the leading national pharmaceutical companies in Indonesia engaged in the manufacturing, distribution, and marketing of pharmaceutical products. The company was established in 1998 as a result of the globalization of the pharmaceutical industry and the increasing demands of operational efficiency. This company was born after the acquisition of the former PT Burroughs Wellcome Indonesia factory by a group of local and foreign investors following the global merger of Glaxo International and Burroughs Wellcome.

The name Novell comes from the word novel which means something new, fresh, and innovative. This philosophy reflects the company's commitment to providing high-quality pharmaceutical products at competitive prices as an alternative to imported products.

Along with its development, PT Novell Pharmaceutical Laboratories has managed to become one of the Indonesian pharmaceutical companies with an international reputation. In 2013, the company became the first Indonesian local pharmaceutical company to obtain EU-GMP certification from the European Union authorities for its injection production facilities. In addition, the company has also obtained various GMP certifications from Australia, GCC, South Africa, and several other countries.

Data Quality Test

Validity Test

Table 3 Validity Test Results

Item	r count	R table	Ket
X1.1	0,621	0,312	Valid
X1.2	0,655	0,312	Valid
X1.3	0,602	0,312	Valid
X1.4	0,644	0,312	Valid
X1.5	0,687	0,312	Valid
X1.6	0,631	0,312	Valid
X1.7	0,665	0,312	Valid
X1.8	0,619	0,312	Valid
X1.9	0,642	0,312	Valid
X1.10	0,677	0,312	Valid
X1.11	0,658	0,312	Valid
X1.12	0,689	0,312	Valid
X1.13	0,698	0,312	Valid
X1.14	0,664	0,312	Valid
X1.15	0,651	0,312	Valid
X1.16	0,672	0,312	Valid
X1.17	0,681	0,312	Valid
X1.18	0,690	0,312	Valid
X1.19	0,645	0,312	Valid
X1.20	0,668	0,312	Valid
X1.21	0,701	0,312	Valid
X1.22	0,684	0,312	Valid
X1.23	0,662	0,312	Valid
X1.24	0,695	0,312	Valid
Item	**r count**	**R table**	**Ket**
X2.1	0,701	0,312	Valid
X2.2	0,688	0,312	Valid
X2.3	0,725	0,312	Valid
X2.4	0,693	0,312	Valid
X2.5	0,710	0,312	Valid
X2.6	0,675	0,312	Valid
X2.7	0,699	0,312	Valid
X2.8	0,682	0,312	Valid

X2.9	0,721	0,312	Valid
X2.10	0,694	0,312	Valid
X2.11	0,708	0,312	Valid
X2.12	0,687	0,312	Valid
X2.13	0,716	0,312	Valid
X2.14	0,692	0,312	Valid
X2.15	0,705	0,312	Valid
X2.16	0,699	0,312	Valid
X2.17	0,711	0,312	Valid
X2.18	0,684	0,312	Valid
X2.19	0,720	0,312	Valid
X2.20	0,690	0,312	Valid
X2.21	0,706	0,312	Valid
X2.22	0,695	0,312	Valid
X2.23	0,714	0,312	Valid
X2.24	0,688	0,312	Valid
X2.25	0,702	0,312	Valid
X2.26	0,691	0,312	Valid
X2.27	0,718	0,312	Valid
X2.28	0,699	0,312	Valid
X2.29	0,709	0,312	Valid
X2.30	0,686	0,312	Valid
X2.31	0,713	0,312	Valid
X2.32	0,697	0,312	Valid
Item	**r count**	**R table**	**Ket**
Y1	0,611	0,312	Valid
Y2	0,645	0,312	Valid
Y3	0,632	0,312	Valid
Y4	0,658	0,312	Valid
Y5	0,667	0,312	Valid
Y6	0,620	0,312	Valid
Y7	0,649	0,312	Valid
Y8	0,671	0,312	Valid
Y9	0,662	0,312	Valid
Y10	0,675	0,312	Valid
Y11	0,640	0,312	Valid
Y12	0,668	0,312	Valid
Y13	0,681	0,312	Valid
Y14	0,654	0,312	Valid
Y15	0,673	0,312	Valid
Y16	0,660	0,312	Valid
Y17	0,689	0,312	Valid
Y18	0,652	0,312	Valid
Y19	0,671	0,312	Valid
Y20	0,665	0,312	Valid

Y21	0,684	0,312	Valid
Y22	0,659	0,312	Valid
Y23	0,676	0,312	Valid
Y24	0,668	0,312	Valid
Y25	0,690	0,312	Valid
Y26	0,663	0,312	Valid
Y27	0,678	0,312	Valid
Y28	0,669	0,312	Valid
Y29	0,685	0,312	Valid
Y30	0,661	0,312	Valid
Y31	0,674	0,312	Valid
Y32	0,670	0,312	Valid

Source : Data processed by researchers, 2026

From the table above, it is known that the validity value for each statement from the calculation is obtained with a higher validity value than the r-value of the table. Therefore, it is concluded that all instruments used to measure work discipline variables are appropriate.

Reliability Test

Table 4 Reliability Results

Variabel	**Cronbach's Alpha**	**Standard**	**Remarks**
Supply Chain Integration (X1)	0,892	0,60	Reliabel
Supply Chain Collaboration (X2)	0,914	0,60	Reliabel
Distribution Efficiency (Y)	0,881	0,60	Reliabel

Source : Data processed by researchers, 2026

From the table above, it is known that the results of the cronbach alpha value for each variable are >0.6 So it can be concluded that the item/statement instrument used in each is declared reliable.

Classic Assumption Test
Normality Test

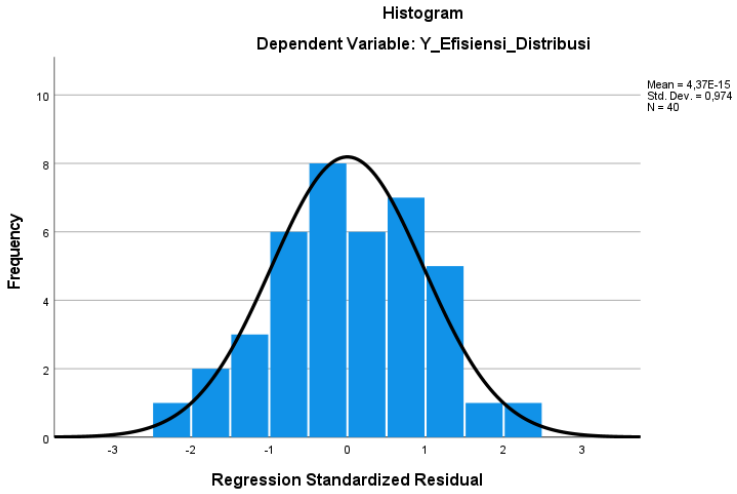
One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		40
Normal Parameters[a,b]	Mean	,0000000
	Hours of deviation	1,7790838
Most Extreme Differences	Absolute	,070
	Positive	,039
	Negative	-,091
Test Statistic		,091
Asymp. Sig. (2-tailed)[c]		,200d

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

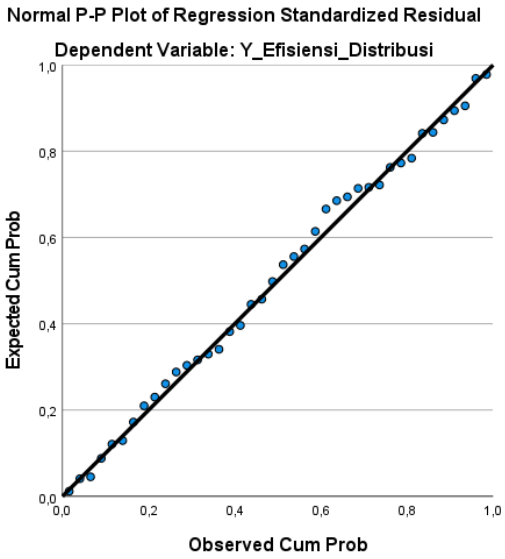
d. This is a lower bound of the true significance.
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.
Source : Processed SPSS ver 27, 2026

Based on the table above, it is known that the value of Asymp.Sig. (2-tailed) of 0.200 greater than the significance value of 0.05. This shows that the regression model used in the study has fulfilled one of the classic assumptions, namely the assumption of normality, so that multiple linear regression analysis can be continued to the hypothesis testing stage. In addition to using the kolmogorov-smirnov test, the normality test can also be seen through the normal P-Plots graph and the histogram graph as follows:



Source: Processed SPPS ver 27,2026

Figure 1. Graphic P-Plots



Source: Processed SPPS ver 27, 2026

Multicollinearity Test

Table 5 Multicollinearity Test Results

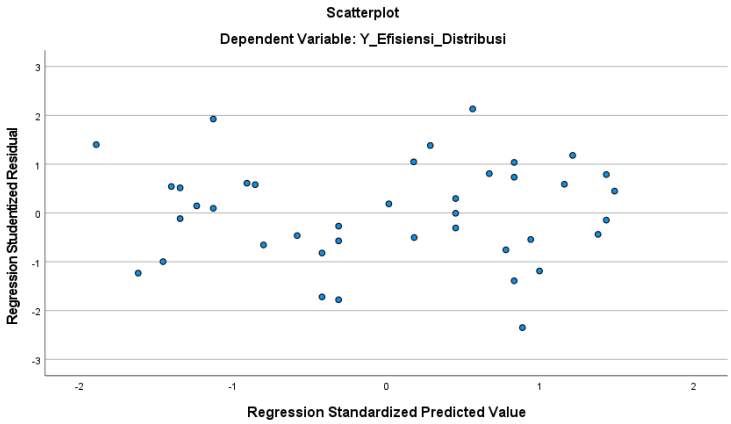
Model		Unstandardized Coefficients		Standardized Coefficients	t	Say.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	LIV E
1	(Constant)	71.402	41.777		1.709	0.096		
	X1_Integrasi_Supply_Chain	0.563	0.209	0.405	2.698	0.010	0.521	1.91 8

	X2_Kolaborasi_Supply_Chain	0.080	0.247	0.048	0.323	0.748	0.521	1.918

a. Dependent Variable: Y_Efisiensi_Distribusi

Source: Processed SPPS ver 27, 2026

Based on the table above, the Tolerance value for variables X1 and X2 is 0.521, which means it is greater than the minimum limit of 0.10. In addition, the VIF value is 1.918, which is smaller than the maximum limit of 10.0, so it can be concluded that there is no multicollinearity between independent variables.



Source: Processed SPPS ver 27, 2026

Figure 2. Graphic scatterplots

The results of the scatterplots graph above, show that the dots are scattered randomly and scattered above or below the number 0 on the Y axis and do not form a specific pattern such as constricting, widening or wavy. This reinforces the conclusion that the regression model does not experience heteroscedasticity.

Conformity Test Results

Multiple Linear Regression Test

Table 6 Multiple Linear Equations

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Say.
		B	Std. Error	Beta		
1	(Constant)	1.402	0,522		1.709	0.006
	X1_Integrasi_Supply_Chain	0.453	0.094	0.805	2.698	0.010
	X2_Kolaborasi_Supply_Chain	0.380	0.107	0.748	2.123	0.048

a. Dependent Variable: Y_Efisiensi_Distribusi

Source: Processed SPPS ver 27, 2026

$$Y = 1.402 + 0.453X_1 + 0.380X_2$$

The constant value of 1,402 indicates that if the variable supply chain integration (x1) and supply chain collaboration (x2) are assumed to be 0, then the basic value of distribution efficiency (Y) is 1,402.Substantively, this figure describes the minimum level of distribution efficiency that can still be achieved by the company even though there has been no increase in supply chain integration or collaboration. The regression coefficient for the Supply Chain Integration (X1) variable is 0.453. This means that for every 1 unit increase in supply chain integration, the distribution efficiency increases by 0.453 units. Assuming the other variables are fixed. The regression coefficient for Supply Chain Collaboration (X2) is 0.380. This means

that for every 1 unit increase in supply chain collaboration, the distribution efficiency increases by 0.580 units assuming other variables are constant. Based on the coefficient value, it can be seen that Supply Chain Integration (0.453) has a more dominant influence than Supply Chain Collaboration (0.380). This shows that at PT Novell Pharmaceutical Laboratories, the biggest factor driving distribution efficiency is the connectivity between internal processes, suppliers, customers, and information systems. Collaboration still has a big impact, but it strengthens the relationship between distribution partners.

Table 7. Partial test t

Coefficientsa				
Model		Standardized Coefficients Beta	t	Say.
1	(Constant)		1.709	0.006
	X1_Integrasi_Supply_Chain	0.805	2.698	0.010
	X2_Kolaborasi_Supply_Chain	0.748	2.123	0.048
a. Dependent Variable: Y_Efisiensi_Distribusi				

Source: Processed SPPS ver 27, 2026

Based on the table above, the results obtained that the t-value of 2,698 is greater than the t-table of 1,685 with a significance value of 0.01<0.05, then supply chain integration has a positive and significant effect on distribution efficiency, meaning that the better internal coordination, integration of suppliers, customers, information, and business processes, the more efficient the distribution of pharmaceutical products. Then, the calculated t value of 2,123 is greater than the t of table 1,685 with a significance value of 0.04<0.05, then supply chain collaboration has a positive and significant effect on distribution efficiency, meaning that operationally intensive communication, trust, joint planning, risk sharing and problem solving are proven to increase lead time and distribution accuracy.

Table 8. Test F

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Say.
1	Regression	85.223	2	42.611	3.720	,034b
	Residual	423.877	37	11.456		
	Total	509.100	39			
a. Dependent Variable: Y_Efisiensi_Distribusi						
b. Predictors: (Constant), X2_Kolaborasi_Supply_Chain, X1_Integrasi_Supply_Chain						

Source: Processed SPPS ver 27, 2026

The test results found that the Fcal value was 3.72 > Ftable 2.86 and the significance value was 0.03 < 0.05, this is that H0 is rejected and Ha is accepted. This means that the variables X1 (supply chain integration), X2 (supply chain collaboration) have a significant effect simultaneously on distribution efficiency, meaning that the better the integration and collaboration of the supply chain, the higher the distribution efficiency at PT Novell Pharmaceutical Laboratories.

Table 9. Coefficient of Determination R2

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,809a	0.767	0.822	2.385

a. Predictors: (Constant), X2_Kolaborasi_Supply_Chain, X1_Integrasi_Supply_Chain
b. Dependent Variable: Y_Efisiensi_Distribusi

Source: Processed SPPS ver 27, 2026

Based on the results of the table above, it is known that the R Square tilapia is 0.767 or 76.7%, this shows that 76.7% of the variation in distribution efficiency can be explained by supply chain integration and supply chain collaboration while the remaining 23.3% is influenced by other variables outside the research model. Thus, it can be said that the contribution of the two independent variables to improving distribution efficiency is in the strong category.

Conclusion

Based on the results of the study on the influence of supply chain integration and supply chain collaboration on distribution efficiency at PT Novell Pharmaceutical Laboratories, it can be concluded that supply chain integration has a positive and significant effect on distribution efficiency, which is evidenced by the results of the t-test with a t-value of 2,698 > t table 1,685 and a significance of 0.04 < 0.05. This shows that the better the integration of internal, supplier, customer, information, and business processes, the more the company's distribution efficiency will increase.

Furthermore, supply chain collaboration also has a positive and significant effect on distribution efficiency, with a t-value of 2,123 > t table 1,685 and a significance of 0.04 < 0.05. These results confirm that information sharing, joint planning, intensive communication, and trust between supply chain partners can improve the smooth distribution of products.

Simultaneously, supply chain integration and supply chain collaboration have been shown to have a significant effect on distribution efficiency, which is shown by the F value of 3.72 > F table 2.86 with a significance of 0.03 < 0.05. In addition, a determination coefficient value of 76.7% indicates that the two variables have a strong contribution in explaining the distribution efficiency of PT Novell Pharmaceutical Laboratories, while the remaining 23.3% are influenced by other factors outside the study.

Overall, the study proves that the better the integration and collaboration in the supply chain, the higher the distribution efficiency that companies can achieve.

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