The Influence of Supplier Integration, Internal Integration, and Customer Integration on Supply Chain Performance Modified by Demand Uncertainty

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Abstract

This study aims to determine the effect of suppliers, internal and customer integration on the supply chain performance moderated by the demand uncertainty at PT XYZ. This study uses quantitative research methods to collect data using questionnaires with a sample number of 38 using saturated sampling techniques. Data analysis with SEM-PLS with WarpPLS 6.0 software. The results of this research are suppliers of integration that directly influence the performance of the supply chain, in addition to the integration of suppliers and customers that influence the performance of the supply chain, measured against the demand uncertainty. The results of this survey indicate that managers need to improve the integration of suppliers and customers to improve the performance of the supply chain.

Keywords

Customer Integration, Demand Uncertainty, Internal Integration, Supplier Integration, Supply Chain Performance.

1. Introduction

The distributor industry is undergoing rapid change, where distributors have enormous challenges and opportunities. Nowadays, many distributors must face changes in the digital age. In this digital age, distributor companies that do not adapt to take advantage of situations and opportunities will experience backwardness over time. Distributor companies are required to build and create proper supply chain management. According to Van Der Vaart in Alfalla, Marin and Medina (2014), effective supply chain management is a source of potentially sustainable competitive advantage for organizations. Supply chain integration plays an important role in this regard. Flynn et al. in Ganbold and Matsui (2017) stated that supply chain integration covers three dimensions: internal integration, supplier integration, and customer integration. Van Den Vaart et al. in Yu, Jacob, Salisbury, and Enns (2013) suggested that

supply chain integration is considered one of the main factors in improving supply chain performance. Jarvis in Wu, Huang, and Hsu (2014) stated that supply chain performance is a formative construct with two financial and non-financial dimensions for observing differences in it.

PT XYZ is a distributor company in West Jakarta engaged in trade and services, especially those that supply supermarket and minimarket support equipment such as scales, food processors, cash registers, shelving and racking, post systems, and trolleys. The company has several branches in several regions in Indonesia and has 38 permanent employees in the head office.
In its operation, PT XYZ has several problems. The problem faced lies in declining profits for the past three years so that the targets set by the company are not achieved.

Companies are engaged in importing goods/suppliers in particular, such as PT. ABC has an operational process from the stage of searching for customers, inquiry prices and specifications of goods, ordering and shipping goods, to goods reaching the customer. From the initial stage of bidding until the new stage, this operational process is received by the customer takes a long time due to the price bidding process and the old product specifications. Finally, the customer agrees to use goods procurement services from PT. ABC. Then the types of goods offered are industrial equipment, machinery, and instrumentation, which are imported from abroad. It takes a long time to process delivery, several weeks or months.

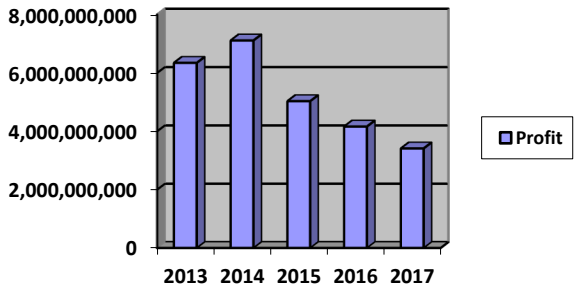

Figure 1. Company Sales Profit in 2013-2017

The second problem faced by the company is the delay in delivery (Figure 1). The company uses a third party as the executor who carries out the shipping work for shipping products. Sometimes, customers complain about a product that has not been received.
Besides the two problems above, another problem is demand uncertainty. According to Bernstein and Federgruen in Ding, Lu, and Fan (2017), demand uncertainty refers to difficulty in predicting future demand. In PT XYZ, there are two types of rack products: standard and innovative products. Standard products are primary product forms made and adjusted by the manufacturer, for example, single gondola racks, double gondola racks, wing racks, end cap racks, chiller racks, swivel racks, envelope racks, envelope racks (wagon), racks books and bread rack. In comparison, the innovation product is a shelf product with the desired design and size and is determined by the customer where the design of the shelves that have never been produced by the factory before, for example, such as the distance of the hole in the pole in the gondola rack is reduced by 1cm or extended by 3cm. Problems faced by companies in demand uncertainty often occur in innovative products. Based on the description above, the problems faced by the company are profit decline, demand uncertainty, and late delivery.

Based on previous research conducted by Ding, Lu, and Fan (2017) on automotive companies in China, the problem faced is the uncertainty of demand that moderates the supply chain integration on operational performance. This research uses the Threshold Regression Analysis (TRA) data analysis method. Their results show that supply chain integration (SCI) influences supply chain performance, moderated by demand uncertainty.

Another previous study is the research by Ganbold and Matsui (2017) in manufacturing companies in the fields of engineering, chemical, petrochemical, electronics, transportation, textiles, plastics, F&B, pharmaceuticals, wood, ceramics, building materials, pulp, and jewelry. The problem raised by the research is the existence of environmental uncertainty on supply chain integration. This study uses the PLS method for data analysis. The results showed that supplier integration, internal integration, and customer integration have a positive relationship with environmental uncertainty. What distinguishes this study from previous studies is a different unit of analysis, namely this research on distributors of supermarkets and minimarkets, while previous research in the manufacturing industry. Also, in this study, the dimensions of supply chain performance are financial and non-financial, while previous studies used the dimensions of operational performance. Based on the background above, the formulation of the problem in this study is whether supplier integration, internal integration, customer integration affects supply chain performance, whether supplier integration, internal integration, customer integration which is moderated by demand uncertainty affects the supply chain performance. This study aims to determine the effect of supplier integration, internal integration, customer integration on supply chain performance, the influence of supplier integration, internal integration, and customer integration on supply chain performance, which is moderated by demand uncertainty. Some previous studies discuss supply chain integration. Sofyalıoğlu and Öztürk in Alfalla, Marin and Medina (2014) state that several studies in the literature directly examine the relationship between SCI (supply integration, internal integration, customer integration) and performance, so they suggest more studies to test this relationship. Frohlich and Westbrook in Yu, Jacobs, Salisbury, and Enns (2013) report that integration with customers and suppliers results in better performance. Moreover, Yu, Jacob, Salisbury, and Enns (2013) showed the significant influence of supplier integration on supply chain performance. Then, Alfalla, Marin, and Medina (2014) showed the significant influence of internal integration on supply chain performance. Two recent meta-analyses of SCI and performance have been carried out by Leuschner et al. and Sofyalıoğlu and Öztürk. Both studies have tested the hypothesis that "SCI is positively related to company performance", especially on the relationship between customer integration (Alfalla, Marin, and Medina, 2014). Therefore, this research proposes the following hypothesis:

Hypothesis 1: Supplier integration influences supply chain performance.
Hypothesis 2: Internal integration influences supply chain performance.
Hypothesis 3: Customer integration influences supply chain performance.

In Ding, Lu and Fan's (2017) research, it was suggested that the moderating effect of contingency on the relationship between SCI and supply chain performance had been investigated from the perspective of the supply chain in previous studies. In Ding's research, Lu and Fan (2017) examine the uncertainty of demand as a moderating effect between supply chain integration, specifically supplier integration on supply chain performance in manufacturing companies. This research had a significant influence of supplier integration on supply chain performance, which was moderated by demand uncertainty. Therefore, this research proposes the following hypothesis:Hypothesis 4: Supplier integration influences supply chain performance, which is moderated by demand uncertainty.

Bonn-Itt and Wong in Huo, Qi, Wang, and Zhao (2014) sharing real-time information and the ability to work collaboratively, companies in a unified supply chain will be able to improve the accuracy of production planning and inventory allocation in the environment with a degree of demand uncertainty lower. The company will perform better in shipping performance under a low level of demand uncertainty. Boon-Itt and Wong's research in Huo, Qi, Wang, and Zhao (2014) showed a significant influence of internal integration on supply chain performance, which is moderated by demand uncertainty. Therefore, this research proposes the following hypothesis to be tested in distribution companies:

Hypothesis 5: Internal integration influences supply chain performance, which is moderated by demand uncertainty.
In Ding, Lu, and Fan (2017), the claims of existing empirical research on the monotonous moderating effects of demand uncertainty on supply chain integration relationships on supply chain performance, especially on incomplete customer integration. In Ding's research, Lu and Fan (2017) examine the uncertainty of demand as a moderating effect between supply chain integration, specifically customer integration on supply chain performance in manufacturing companies. This research has a significant influence of customer integration on supply chain performance, which is moderated by demand uncertainty. Therefore, this research proposes the following hypothesis to be tested in distribution companies:
Hypothesis 6: Customer integration influences supply chain performance, which is moderated by demand uncertainty.

Based on the description above, Figure 2 shows the research model.

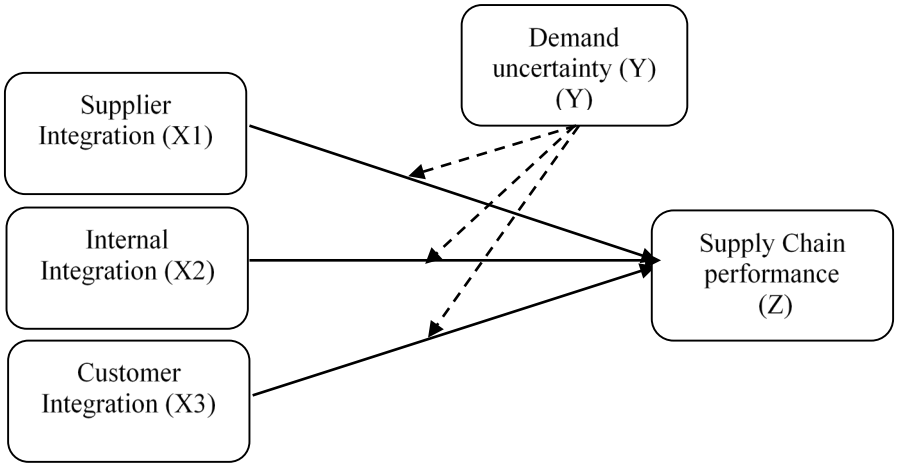

Figure 2. Research Model

2. Methods

Based on the problems, this study used a quantitative method. According to Sugiyono (2015), quantitative research methods can be interpreted as research methods based on the philosophy of positivism. It is used to examine specific populations or samples. This type of research is causal. According to Sekaran and Bougie (2016), causal research examines whether one variable causes other variables to change or describes one or more factors that cause problems. The time horizon used in this study is the cross-section. According to Sekaran and Bougie (2016), Cross Section is research conducted only at one time through a certain period to answer research questions. This research used quantitative data types. According to Saunders, Lewis, and Thornhill (2016), quantitative data refers to all primary and secondary data and can range from simple data calculations such as frequency of events to more complex data, such as test scores, prices or rental fees. The data source used in this study is to use primary data sources. According to Sekaran and Bougie (2016), primary data is data that researchers directly collect for specific purposes. Data collection techniques in this study used a questionnaire.

Regarding sampling technique, this research used saturated sampling techniques. Moreover, this research used WarpPLS 6.0 software. WarpPLS is an application program (software) with partial least square, is a non-linear analysis method and is not based on many assumptions (Kock, 2017).

3. Results and Discussion

In testing, this research uses PLS, which consists of two sub-testing models: the measurement model or the outer model and the structural or inner model. This study used the WarpPLS model, an application program (software) with partial least square, which is a non-linear analysis method, according to Kock (2017) and is not based on many assumptions.

3.1Evaluation of Outer Model

According to Kock (2017), convergent validity is the extent to which a measurement is positively correlated with alternative steps of the same construction with the loading conditions must be above the value of 0.70 or 0.40 to 0.70 can still be considered (table 1), but with the condition when discarded indicators the variable makes AVE increase. Then, the variable will be considered, and the p-value must be significant or below 0.05 (<0.05).

Table 1. Cross Loading

Variable	Indicator	Loading	P Value
IS	X11	0.843	<0.001
	X12	0.843	<0.001
II	X22	0.840	<0.001
	X23	0.840	<0.001
CI	X31	0.929	<0.001
	X32	0.929	<0.001
DU	Y1	0.951	<0.001
	Y2	0.738	<0.001
	Y3	0.937	<0.001
SCP	Z3	0.941	<0.001
	Z4	0.941	<0.001
DU*IS	Y1*X11	0.825	<0.001
	Y1*X12	0.894	<0.001
	Y2*X11	0.661	<0.001
	Y2*X12	0.741	<0.001
	Y3*X11	0.720	<0.001
	Y3*X12	0.840	<0.001
DU*II	Y1*X22	0.787	<0.001
	Y1*X23	0.790	<0.001
	Y2*X22	0.624	<0.001
	Y2*X23	0.608	<0.001
	Y3*X22	0.748	<0.001
	Y3*X23	0.771	<0.001
DU*CI	Y1*X31	0.855	<0.001
	Y1*X32	0.748	<0.001
	Y2*X31	0.718	<0.001
	Y2*X32	0.734	<0.001
	Y3*X31	0.812	<0.001

According to Kock (2017), the PLS measurement tool in this test can use Cronbach's alpha or Reliable composite with the criteria for both results (Cronbach's alpha or Reliable composite) must be above 0.70 to pass the reliability test criteria (Table 2).

Table 2. Discriminant Validity, AVE, Reliability, Cronbach's Alpha

Variable	*SQRT AVE*	*AVE*	*Composite Reliability*	*Cronbach's Alpha*
Supplier Integration	0843	0843	0831	0.592
Internal Integration	0840	0840	0827	0.582
Customer Integration	0.929	0.929	0.926	0841
Demand Uncertainty	0.881	0.881	0.911	0849
Supply Chain Performance	0.941	0.941	0.940	0.872
Supplier Integration * Supply Chain Performance	0.784	0.784	0.905	0.872
Internal Integration * Supply Chain Performance	0725	0725	0868	0817
Customer Integration * Supply Chain Performance	0.761	0.761	0.892	0.853

The AVE restriction is more than equal to 0.50. So based on data table 2, the AVE can be compared, namely supplier integration 0.843> 0.50, internal integration 0.840> 0.50, customer integration 0.929> 0.50, demand uncertainty 0.881> 0.50, supply chain performance 0.941> 0, 50, Supplier Integration * Supply Chain Performance 0.784> 0.50, Internal Integration * Supply Chain Performance 0.725> 0.50, and Customer Integration * Supply Chain Performance 0.761> 0.50. It can be concluded that all AVE values of the above variables meet the discriminant validity criteria, and composite reliability meets the reliability requirements.

3.2Evaluation of Inner Model

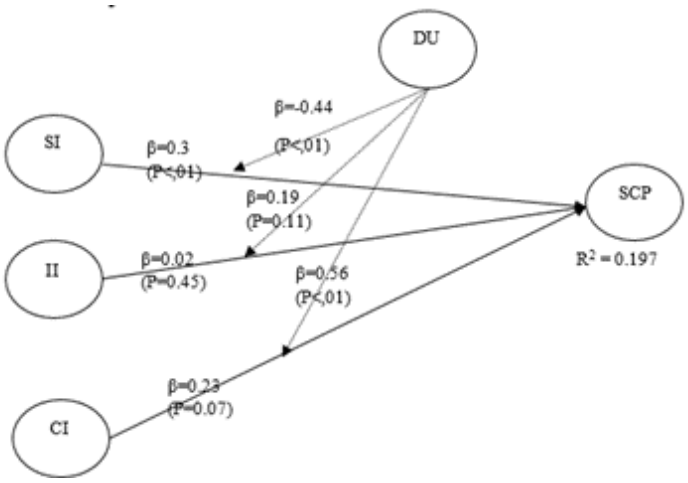

Figure 3. The result of Inner Model

Table 3. Fit and Quality Indices Model

No	Criteria	Value	Criteria	Information
1	*Average Path Coefficient* (APC)	0.010	P <0.05	Fit
2	*Average R-squared* (ARS)	0.048	P <0.05	Fit
3	*Average Adjusted R-squared* (AARS)	0.199	P <0.05	Unwell
4	*Average Block VIF* (AVIF)	1,655	accepted if the value is ≤ 5, like if ≤3.3	Fit

Table 4. Hypothesis Results

Hypothesis	Path	Coefficients	P value	*Effect size* (ES)	Results
H1	IS →·SCP	0.385	0.004	0.074	Take effect
H2	II →·SCP	0.018	0.455	0.004	No effect
H3	CI →·SCP	-0,225	0.067	0.036	No effect
H4	DU * IS →·SCP	-0,436	0.001	0.116	Take effect
H5	DU * II →·SCP	0.187	0.110	0.061	No effect
H6	DU * CI →·SCP	0.561	<0.001	0.210	Take effect

Based on Table 3, several values such as APC, ARS, and AVIF have fulfilled the requirements criteria, while the AARS does not meet the requirements criteria (figure 3 and table 4).

From these six hypotheses, the analysis for the hypothesis test was tested with a significance level of 5% (Kock, 2017). The test results of hypothesis 1 showed that the p-value of 0.004 ≤ 0.05 (Ho is rejected). This shows that supplier integration has a positive effect on supply chain performance, while the effect size is included in the weak category of only 7.4%, which indicates that supplier integration on supply chain performance has a weak influence. The results of the hypothesis 2 test show that the p-value of 0.455 ≥ 0.05 (Ho is accepted). This shows that internal integration does not affect supply chain performance. The results of the hypothesis 3 test indicate that the p-value of 0.067 ≥ 0.05 (Ho is accepted). This shows that customer integration does not affect supply chain performance. The results of hypothesis test 4 show that the p-value of 0.001 ≤ 0.05 (Ho Rejected), this shows that supplier integration negatively affects supply chain performance, which is moderated by demand uncertainty, while the effect size value is included in the weak category of only 11, 6% which indicates that supplier integration on supply chain performance has a weak influence. The test result of hypothesis 5 indicates that the p-value of 0.110 ≥ 0.05 (Ho is accepted). This shows that internal integration does not influence supply chain performance. The test result of hypothesis 6 shows that the p-value of <0.001 ≤ 0.05 (Ho is Rejected) (Table 5). This shows that customer integration has a positive effect on supply chain performance moderated by demand uncertainty, while the effect size is included in the weak category of only 21.0%, which indicates that supplier integration on supply chain performance has a medium influence. In this study, the results of hypothesis testing where in hypotheses 1, 4, and 6 found that these hypotheses are in line with previous studies (Yu, Jacob, Salisbury and Enns, 2013; Ding, Lu and Fan, 2017). However, the results of hypothesis testing 2, 3, and 5 showed no influence. This is not in line with previous research conducted by Alfalla, Marin, and Medina (2014) and Huo, Qi, Wang, and Zhao (2014). The absence of influence in the results of testing hypotheses 2, 3, and 5, which is different from previous research, can be due to: the supply chain integration does not have the same impact on performance depending on the country, industry, and product complexity (Alfalla, Marin, and Medina, 2014).

Table 5. R Square and Q Square

	R Square	***Q Square***
Supply Chain Performance	0.197	0.042

Based on Table 5, the construct variability of supplier integration, internal, and customer integration moderated by the uncertainty of demand can explain the diversity of supply chain performance variables by 19.7%. Then, 80.3% is explained by other factors not examined in this research. Q2 value for supplier integration, internal integration, and customer integration, moderated by the demand uncertainty for supply chain performance, is 0.042. This value indicates the ability of the model to predict values of 4.2%. Both results show good predictive validity because it has a value of more than 0. So, supplier integration, internal integration, and customer integration moderated by demand uncertainty can predict supply chain performance variables.

4. Conclusion and Suggestions

Based on the analysis results of the analysis, supplier integration influences supply chain performances in PT. XYZ. It means that the better the relationship with the supplier will improve the performance of the supply chain at PT XYZ. Then, internal integration and customer integration do not influence supply chain performance. This means that internal integration cannot improve supply chain performance. Supplier integration and customer integration affect supply chain performance, which is moderated by the uncertainty of demand at PT XYZ. This means that the better the integration of suppliers and customer integration the stronger demand uncertainty will further improve the performance of the supply chain, internal integration does not influences supply chain performance which is moderated by demand uncertainty at PT XYZ. This means that internal integration, which is moderated by demand uncertainty in this study, cannot improve supply chain performance.

Based on the results of the study, discussion, and conclusion, some suggestions can be concluded that the integration of suppliers that affect the performance of the supply chain. The company should be able to maintain good relations

and build collaborative relationships with suppliers, to help companies reduce mistakes in ordering, waste in activities with company partners through information sharing and joint planning to accommodate end customer demand, supplier integration which has an influence on supply chain performance that is moderated by demand uncertainty, the company should continue to maintain good relations and communication with suppliers to be able to act quickly in the receipt of erratic orders, customer integration affects the performance of the supply chain which is moderated by demand uncertainty, the company should continue to improve relations between companies and customers and improve services in the receipt of orders that are always changing or uncertain, internal integration of supply chain performance, customer integration of supply chain performance, and internal integration of supply chain performance that is moderated by demand uncertainty has no effect. For further research, can use other variables that might influence the practice of supply chain integration, and suggestions for future research can use other variables besides SCI that affect the supply chain performance. Also considering that in this study there are limitations in the number of samples because they are only done in one company, so for further research can be done by increasing the number of companies to increase the number of samples or respondents.

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Biography

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