



The Effect of Supply Chain Integration on Operational Performance and Product Quality

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Abstract: PT XYZ Indonesia is a company that has shown outstanding business performance in the last three years, and it has grown yearly. A study was conducted by distributing 40 questionnaires that became samples of company employees with work relationships and knowledge of supply chain integration, operational performance, and product quality to test these hypotheses. Furthermore, the data were analyzed with an SEM tool to test the causality relationship of the research variables. The theoretical evidence showed that product quality is positively influenced by supply chain integration for this type of company's business field. The managerial implications are to pay more attention to supply chain integration which greatly affects the company's operational performance. Meanwhile, some limitations in this study can be found at the end of the discussion.

Keywords: Supply Chain Integration, Operational Performance, and Product Quality

INTRODUCTION

Manufacturing company is expected to be more involved in the methods used by suppliers and customers to conduct business, along with the increasing global competition. It effectively integrates internal functions within the company and connect with external operations of suppliers and supply chain members to compete successfully in today's business.

PT XYZ is the number one company in the field of flavors and fragrances, and it faces the challenges of improved performance. As the "heart" of factory operations, the supply chain department is used as the research material. This is stated from observing high growth after the supply chain department was formed in 2020.

The level of quality is important in PT XYZ's business because of the typical products needed by the community. In terms of flavor products used in the food industry, the level of reliability that is safe and according to specifications is not biased. In the world of fragrances, aromas that match specifications and can last a long time are also a challenge. Therefore, PT XYZ focuses on maintaining product quality by managing company operations supported by Supply chain integration.

The research on differences in customer satisfaction between products and service organizations is focused on the perspective of output. This analysis takes research within the organization to investigate the effects of internal quality practices of key products on

customer satisfaction and business outcomes (Nilson and Gustafsson, 2011). Furthermore, it is necessary to analyze the influence of operational performance on the company's satisfactory product quality.

THEORETICAL STUDIES

Supply Chain Management (SCM) Arif (2018) stated that SCM is considered an integration and managerial function of the parts related to the supply chain through cooperative relationships, the effectiveness of business processes, and information that can be achieved at a certain managerial level to create high-performance values. Furthermore, it is portrayed as a philosophy and business planning that can make a business entity coordinate its activities with suppliers, distributors, consumers, and retailers.

Supply chain integration is a holistic approach to achieving efficiency, high quality, and cost reduction in every process, from sourcing raw materials to distributing outbound products. It has proven beneficial for the smallest to the largest multi-national tiered suppliers and integrates purchasing, quality, logistics, and customers to work effectively (Renault-Nissan Consulting et al., 2013).

Operational performance is an important aspect of measuring the output of plant flexibility, and it is seen as a measure of how well inputs are transformed into outputs in terms of quality, speed, process reliability, flexibility, and cost. Therefore, operational performance indicators should reflect low cost, high quality, varied products, and on-time delivery (Al-Jawazneh, 2011).

Product quality The definition of quality is very diverse and contains many meanings. Quality is a word for the provider or manufacturer that should be conducted well. According to Gasper in Wilson (2009), quality is the totality of the features and characteristics possessed by a product that can satisfy consumer needs.

According to Garvin in Agus (2011), the dimensions of product quality can be described in four main indicators, namely 1) Product specifications that are under customer wishes (conform), (2) Products with good performance (perform), (3) Products with a good level of reliability (reliable), and (4) Products with good durability (durable).

Previous Research

Supply chain integration and Operational Performance

Pagell (2004) in Feger (2014) explained that internal integration could be described as a process of interaction and collaboration in which production, purchasing, and logistics work cooperatively to achieve acceptable results. Some studies explained that internal integration is the first step to achieving a supply chain (Chatzoudes and Chatzoglou, 2011). The SCM literature has not studied the impact on supply chain performance. The company's operational performance can be positively affected since it has the same basic characteristics as the integration of suppliers and customers.

Supply chain integration and Product quality

Product quality needs to be considered, which can be explained as the ability to demonstrate its function. This includes overall durability, reliability, accuracy, ease of operation, product repair, and other product attributes (Agus, 2011).

Operational Performance and Product quality

The manufacturer's point of view showed that a product is of high quality when produced under established standards (Alisjahbana in Fakhri, 2012). Meanwhile, from a consumer point of view, a product is said to be of high quality when under the needs and desires of consumers. Quality products will certainly provide business benefits both for the

company and for consumers. Satisfaction can ultimately prevent the company from having consumer complaints after using the products. The research by Ulfah and Rahardjo (2013) also showed a significant influence between the implementation of operational performance on product quality.

The results of the three studies above are the basis for determining the hypothesis of this study.

H₁: Supply chain integration positively and significantly influences operational performance.

H₂: Supply chain integration positively and significantly influences product quality.

H₃: Operational Performance has a positive and significant influence on Product quality.

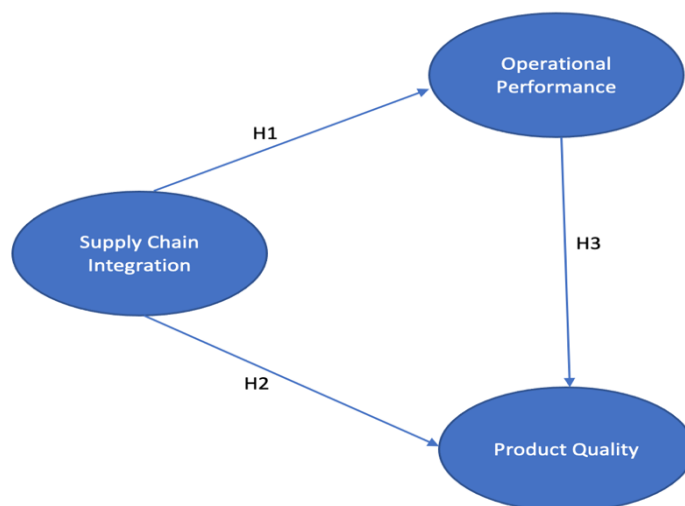


Figure 1. Frame of Mind

METHOD

This quantitative study uses a causality model that examines the causal relationship of the variables studied, and sampling was carried out using non-probability techniques. Furthermore, the population is employees of the supply chain-related department, which amounts to 40 people. SEM research requires the minimum number of samples to be 100 respondents, hence the bootstrap method is one solution for conducting the analysis process (Wijayanto, 2008).

Table 1. Operational Variables

Symbol	Indicator	Dimension	Operational Variables
PE1	Consultancy and excursions	Supplier Integration	Supply Chain Integration (Chatzoudes and Chatzoglou 2011)
PE2	Needs information	Supplier Integration	
PE3	Online ordering system	Supplier Integration	
PE4	Supplier engagement	Supplier Integration	
PE5	Cooperative	Supplier Integration	
PE6	Guarantee	Supplier Integration	
IP1	Scheduled meetings	Internal Integration	
IP2	Sustainability of cooperation	Internal Integration	
IP3	Dissemination of information	Internal Integration	
IP4	Data integration with information systems	Internal Integration	
IP5	Department-wide connections	Internal Integration	
PL1	Computerized level	Customer Integrations	
PL2	Informasi pasar melalui sistem informasi	Customer Integrations	
PL3	Level of information	Customer Integrations	

Symbol	Indicator	Dimension	Operational Variables
	sharing/market conditions		
PL4	Measurement of customer satisfaction	Customer Integrations	
PL5	Feedback from customers	Customer Integrations	
PL6	Improvement through feedback	Customer Integrations	
KL1	Good production process	Process Quality	
KL2	Product suitability	Process Quality	
KL3	Product durability	Process Quality	
WA1	Process speed	Process Quality	
WA2	Operating capability	Process Quality	
WA3	Lead time	Process Quality	
FL1	Ability to produce a wide range of products	Flexible Process	Operational Performance (Knap, 2013)
FL2	Effectiveness and efficiency of production time	Flexible Process	
FL3	Ability to manufacture various volumes of products	Flexible Process	
BY1	Number of workers	Process Fees	
BY2	Production process failures	Process Fees	
BY3	Production process failures	Process Fees	
BY4	Rework products	Process Fees	
KU1	Confirm	Product Quality	Product quality (Agus, 2011)
KU2	Perform	Product Quality	
KU3	Reliable	Product Quality	
KU4	Durable	Product Quality	

RESULTS AND DISCUSSION

The Measurement Model is used to evaluate the relationship between the constructs and their indicators, divided into the validity and reliability tests.

Table 2. Validity and Reliability Test Results

Variable	Standardized Loading Factors ≥ 0.05	Errors	Reliability		Information
			CR ≥ 0.70	VE ≥ 0.50	
Supply Chain Integration			0.99	0.99	Reliable
Cooperative	0.51	0.41			Valid
Department-wide connections	0.71	0.37			Valid
Measurement of customer satisfaction	0.43	0.47			Valid
Operational Performance			0.95	0.82	Reliable
Good production process	0.70	0.20			Valid
Product durability	0.62	0.15			Valid
Process speed	0.73	0.04			Valid
Operating capability	0.72	0.03			Valid
Product Quality			0.95	0.83	Reliable
Conform	0.76	0.25			Valid
Perform	0.93	0.00			Valid
Reliable	0.81	0.14			Valid
Durable	0.85	0.19			Valid

Data analysis was carried out through a Confirmatory Factor Analysis (CFA) measurement model. In this model, the latent variables are measured by one or more observed variables. Due to the relatively small amount of data, the bootstrapping process is carried out in the SEM analysis.

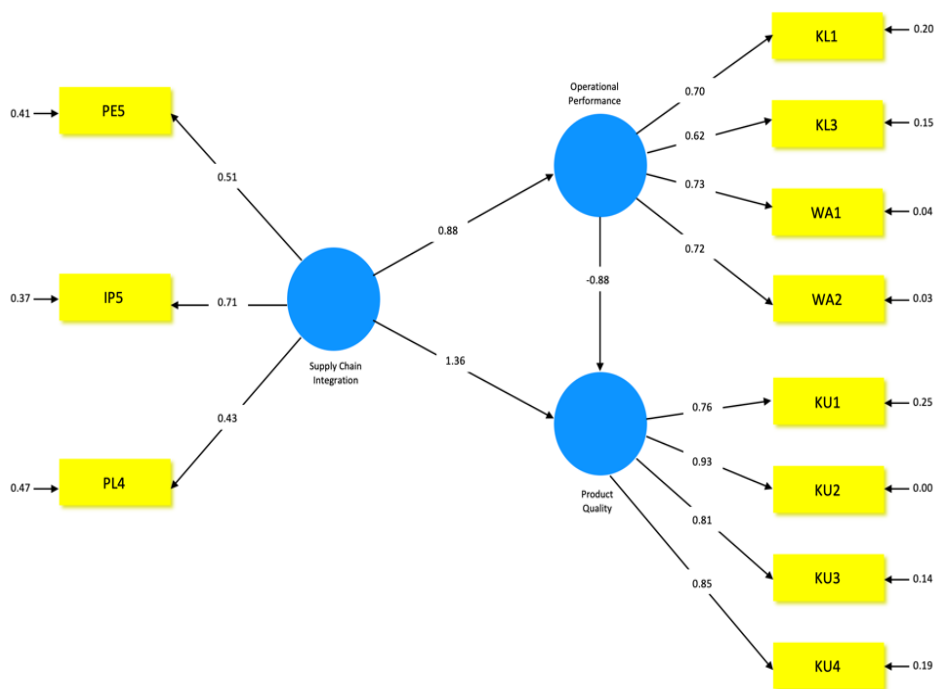


Figure 2. Model Test Results

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The above model has met the requirements to be considered a fit model in SEM, and the results from the Goodness of Fit Statistics are presented in Table 3.

Table 3. Result of Goodness of Fit Evaluation

No	Goodness of Fit Index	Cut-off Value	Result	Model Evaluation
1	Chi-Square Normed Chi-Square	Lower limit=10 Upper limit=2.0 or 3.0 normed chi-square >5	(P=0.2027) 48.27/41=1.17	Lower limit
2	NCP	Small	7.27	Fit
3	GFI	0.82	0.80 ≤ GFI ≤ 0.90	Fit
4	RMSEA	0.067	≤ 0.08	Fit
5	ECVI	ECVI= 2.52 ECVI for Saturated Model = 3.38 ECVI for Independence Model = 16.38	ECVI < ECVI Saturated dan ECFI for independence model	Fit
6	CFI	0.97	>0.9	Fit

Based on the SEM fit model, the loading factor assessment of Supply chain integration, Operational Performance, and Product quality can be seen in Table 4.

Table 4. Ranking Results and Loading Factor

Ranking	Symbol	Indicator	Loading Value	Information
Supply Chain Integration				
1	IP5	Department-wide connections	0.71	Max
2	PE5	Cooperative	0.51	
3	PL4	Measurement of customer satisfaction	0.43	Min
Operational Performance				
1	WA1	Process speed	0.73	Max
2	WA2	Operating capability	0.72	
3	KL1	Good production process	0.72	

Ranking	Symbol	Indicator	Loading Value	Information
4	KL3	Product durability	0.62	Min
Product Quality				
1	KU2	Perform	0.93	Max
2	KU4	Reliable	0.85	
3	KU3	Durable	0.81	
4	KU1	Conform	0.76	Min

Hint variable protection is carried out through a normality test, and the results are used to answer the proposed research hypothesis. The assumption of data normality is tested by looking at the skewness and kurtosis values of the data used. Based on the data processing results in Table 5, there are no CR values for skewness and kurtosis outside the ± range of 2.58. Therefore, data can be declared normally distributed at a significance level of 0.01.

Table 5. Normality Test Results

	N	Minimum		Maximum		Mean		Std. Deviation		Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error		
PE5	40	3.00	5.00	3.8000	.73324	.325	.374	-.984	.733				
IP5	40	3.00	5.00	4.2250	.69852	-.339	.374	-.848	.733				
PL4	40	3.00	5.00	4.1000	.59152	-.016	.374	.008	.733				
KL1	40	3.00	5.00	4.2750	.55422	.046	.374	-.384	.733				
KL3	40	3.00	5.00	4.1250	.56331	.042	.374	.227	.733				
WA1	40	3.00	5.00	4.2750	.59863	-1.71	.374	-.467	.733				
WA2	40	3.00	5.00	4.2750	.55411	.046	.374	-.384	.733				
KU1	40	3.00	5.00	3.9250	.61551	.039	.374	-.202	.733				
KU2	40	3.00	5.00	3.9250	.65583	.076	.374	-.551	.733				
KU3	40	3.00	5.00	3.9250	.57678	-.004	.374	.254	.733				
KU4	40	3.00	5.00	4.0000	.71612	.000	.374	-.971	.733				
Valid N (listwise)	40												

Analysis of causal relationships is carried out to determine the relationships between variables. In the structural equation, the t value of the supply chain integration coefficient is $5.07 > 1.96$. Therefore, the supply chain integration coefficient to the operational performance obtained from processing data is 0.88, which implies significant. The t value of the coefficient is $1.54 < 1.96$, which indicates that the supply chain integration to product quality coefficient of 1.36 is declared insignificant. The result of the value of t and the coefficient of structural equations is seen in Table 6.

Table 6. t-value and Model Coefficient

No	Path	Estimation	t value	Significance
1	Supply chain integration → Operational performance	0.88	5.07	Significant
2	Operational performance → Product Quality	-0.88	-1.02	Insignificant
3	Supply chain integration → Product Quality	1.36	1.54	Insignificant

Effect of Supply chain integration on Company Operational Performance

The effect of estimation parameters for supply chain integration testing that positively and significantly affects the company's operational performance is shown as a value of t (5.07) greater than 1.96. Therefore, it can be concluded that supply chain integration positively and significantly influences the company's operational performance.

Supply chain integration affects the speed of the operation process to meet customer needs. Furthermore, it influences the production process to obtain quality products with good resilience.

Effect of Supply chain integration on Company Product Quality

The effect of estimation parameters for supply chain that positively and significantly affects the company's product quality shows a t value of 1.54, smaller than 1.96. Therefore, it positively but not significantly influences the company's product quality.

The three variables with a positive effect include connections between departments supporting each other in achieving company goals, suppliers who are easy to contact and cooperate in answering questions about raw materials, and the company's efforts in measuring customer satisfaction. The influence of supply chain integration on product quality includes production, quality results, and durability.

Effect of Operational Performance on Company Product Quality

The effect of estimation parameters for operational performance has a positive and significant influence on the company's product quality showing that the value of t at -1.02 is smaller than 1.96. Therefore, it can be concluded that operational performance does not have a positive and significant influence on the company's product quality.

The company's operational performance does not influence product quality. The dimensions not influenced by operational performance in product quality are producing good results, quality production and good durability, the production that customers can rely on, and product quality under the specifications desired by customers.

CONCLUSION

This study resulted in the following conclusions:

1. Supply chain integration can positively and significantly influence the company's operational performance. The three variables that contribute significantly are the connection between departments supporting each other, suppliers who are easy to contact, and cooperation in answering questions about raw materials.
2. Some variables that contribute significantly to an operational performance are supply chain integration affects the speed of the operation process to meet customer needs. Furthermore, it influences the production process to produce quality products with good durability.
3. Supply chain integration positively affects product quality, but the influence is not significant. Meanwhile, the company's operational performance does not affect product quality. It influences supply chain integration in product quality with good durability. From these results, it is necessary to deepen a company's business, and the production process only combines a few food products. This is a logical answer to the absence of a significant influence of operational performance on product quality.

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