

THE IMPACT OF SUPPLY FLEXIBILITY ON SUPPLY CHAIN PERFORMANCE

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Abstract

Manufacturing operating system has been increasing from time to time. Challenging business competition coupled with the ever-changing business environment are primary factors that companies must be able to improve production efficiency and effectiveness. Supply chain management is one of the business practices in operation management that emphasizes on integrating and coordinating of product and information flows from suppliers to end costumers. The rapidly of changing market-demands have to be faced with a flexible supply chain management to reach market acceptance. The key to successful supply chain management also depends on supply flexibility; given the smooth flow of materials and parts will define the whole manufacture operation. This study aimed to analyze the impact of supply flexibility on supply chain performance. Supply flexibility consists of two variables, namely supplier flexibility and supply network flexibility. The research was conducted by taking samples from the garment industry in Indonesia. The results showed that the supplier flexibility affects the supply chain performance, while supply network flexibility does not affect the supply chain performance.

Keywords: supply flexibility, supply chain performance, supply chain management, supplier flexibility, supply network flexibility.

Introduction

Business nowadays is more consumer-focused; companies have to be able to deliver consumers' demands to create products that are suitable for the customers. In uncertain conditions, both from customers and suppliers end, companies are trying to improve the flexibility, the term that can be defined as the capability to cope with changing environment. Several companies have discovered that supply chain flexibility is now more crucial to build competitiveness, particularly within the rapidly changing market. Fashion industry, mobile phone industry or bicycle industry are in the list of industries benefitting in applying flexible supply chain (Catalan dan Kotzab, 2003; Lao *et*

al., 2010). Efficient operation is emphasizing the ability to respond the resources to create values amongst supply chain members. Network cooperation improvement between supply chain members is aiming to strengthen coordination the product and information flows between supply chain members, as well as improving the skill to deliver various products. This is how supply flexibility is becoming crucial, due to more complex consumer demands, along with the business environment uncertainty as well as supply and demand uncertainty.

This uncertain business condition demands companies to continuously refining their supply chain strategies to be able to respond to consumer demands quickly. To be responsive dealing with consumer demands, companies have to manage product and information flows between supply chain members, so the demand information can be accessible to the whole members of supply chain, including the suppliers. The application of information and technology has becoming crucial in improving the synergy in supply chain. Organization's inter-functional collaboration and cooperation are as well needed to be improved in order to respond the changes of consumers demands quickly (McKone Sweet and Lee, 2009). Successful supply chain is also affected by supply flexibility to secure smooth operation until the product reached end-customers. This study is aiming to analyze the effect of supply flexibility on supply chain performance in garment industry in Indonesia.

Theoretical Background and Hypotheses Development

1. Supply Flexibility

Supply Chain Management has been developed from operational management aspect related to the continuation of the product, service and information flow from suppliers to customers. Supply chain management emphasizes on the synergy of the product flow process from supplier, manufacturer, and retailer, to end customers. The principles of supply chain management are synchronization and coordination between activities that are related to raw material/product flow either within and inter-organizations (Zabidi, 2001). Supply chain management holds crucial role in integrating external suppliers with internal operation within a company to create value for customers (Narasimhan *et al.*, 2004).

Operation performance is highly dependent with the flow of products and information within and across supply chain. This also means that stable supply is needed during operational process. Supply flexibility is derived from the understanding that resources can be distributed and coordinated to build particular capacities. Supply flexibility does also mean companies' ability to respond to environmental changes by coordinating and optimizing the whole available resources (Lao *et al.*, 2010). Sanchez (1995) divided supply flexibility into resources flexibility and coordination flexibility. Resources flexibility means companies responsive ability in implementing specific company management knowledge, and in deploying physical asset. Coordination flexibility defined as responsive capability in implementing cross-functions coordination. Lao *et al.*, (2010) has developed the concept of supply flexibility into two elements: supplier flexibility and supply network flexibility. Supplier flexibility is defined as responsive ability in deploying specific capabilities of the supplier. Companies have been emphasizing the connection between internal resources and performance so that they add values to suppliers' coordination. Competitiveness can be achieved by combining internal resources with external resources to create distinct qualities (Lavie, 2006).

Supply network flexibility is defined as responsive ability by implementing collaborative capability to form supply network efficiently and effectively (Lao *et al.*, 2010). This concept was derived from the concept of coordination flexibility and explains why leading competitors are able to be more responsive and achieved more advantages than the rest of the competitors. Supply network structure will affect product and information flow within and across supply chain. Better structure, coordination and management within supply chain will bring the organization to better utilization of supply chain on optimal resources (Skilton and Robinson, 2009). Flexibility within supply chain leads companies to gain better performance in different aspects at once, e.g. responsiveness and cost performance. This performance can be achieved by implementing new science and technology and by reading the market changes to create and deliver values to customers.

2. Supply Chain Performance

Supply chain performance measurement is necessary to measure the success of product development and product delivery to end customers. Supply chain performance can be defined as the ability to meet the end-customer demands and the ability to deliver the consumer demands efficiently (Hausman, 2005). This definition does as well mean that supply chain performance can be measured by two variables, efficiency, and effectiveness, and how those two variables can be optimized. This research measures supply chain performance by four variables. They are performance on timing, reliability, suppliers performance and cost performance (Lao *et al.*, 2010). Timing performance is measured by the ability of supply chain in responsiveness; Reliability is measured by the ability of supply chain to deliver product and services accurately; Supplier performance is measured by the suppliers whole outcomes, both the visible and invisible, including the quality of product, service reliability, and relationship; and cost performance is measured by cost management effectiveness within supply chain operational.

3. Hypotheses Development

Several researches on supply chain flexibility in relation with resources have been conducted by researchers; amongst them are Kumar, *et al.*, (2006) and Gonzales-Benito (2007). Kumar's research *et al.* (2007) have showed that delegation between suppliers and manufacturers will be beneficial to have the ability to reach integrated flexibility. Gonzales-Benito's research (2007) shows that supply chain contribution to business performance success depends on supply chain fastness towards business strategies. Companies that implemented flexible chain supply will have the advantage of having the ability to be responsive with business environment changes. A flexible supply chain required commitment and investment in developing suppliers' performance and suppliers' relation.

Supply flexibility will be highly affecting supply chain performance, especially in responding business environment rapid changes. Suppliers that have flexible system and process will be able to respond to business environment changes, leading to increasing performance in supply chain. Flexible suppliers had

also have better coordination to communicate ideas, product designs, and mutual collaboration (Lao, *et al.*, 2010). Suppliers with high flexibility rates contribute better in product and services deliveries, and also have better responsiveness.

Supply network flexibility is also necessary to achieve responsive supply chain to assure the reliability of product supply. The ability to change supply network will enable companies to quickly response the changes in business environment as well as the fact that supplier relation is also dynamic. Managing the relationship needs constant improvement to secure supply chain operation.

Based on the literature review, the hypotheses proposals are:

H1: Suppliers flexibility positively affect the supply chain performance.

H2: Supply network flexibility positively affect supply chain performance.

Based on the elaborated hypothesizes and theories, the research model being proposed is as follow.

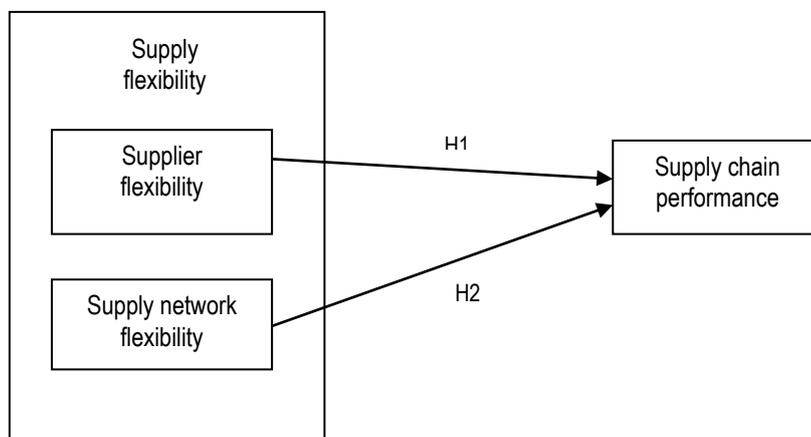


Illustration 1.
Research Model

Methods

This study is causal research that has been conducted to identify the causal relationship between variables of which the research problems have been clearly defined (Zikmund, 2000). This study is done based on previous researches (Lao,

2010) thus the literature review and hypothesis have already been formed. Therefore, this research is classified as causal research. The research population is every manufacture companies in West Java that are registered in The Directory of Manufacture Industries published by Indonesia Central Bureau of Statistics in 2011. Sampling technique being used is *purposive sampling*, by using large garment companies in Indonesia with above 100 employees. Garment industry being chosen for it befits the research topic underlying the chain supply flexibility. The product of garment industry is by definition having short life cycle due to ever-changing customer demands. Therefore, garment industry is the most suitable for this research. The data being used is primary data gathered by spreading questionnaires. Data collection is done via post mail survey. Analysis tool being used are validity test, reliability test and multiple linear regression analysis.

Result and Analysis

As many as 48 questionnaires were answered and returned for further analysis. Validity test was conducted using *Confirmatory Factor Analysis (CFA)*. The result shows that acceptable convergent validity are items with larger *factor loading* than 0,40 and significance level at 5%. This research uses three variables: supplier flexibility, supply network flexibility and supply chain performance. Each variable has different indicators summarized in table 1.

Table 1. Research Variables and Indicators

No.	Variable	Indicator
1	Supply Flexibility (PT)	PT 1 and PT 2
2	Supply Network Flexibility (FJP)	FJP 1 – FJP 4
3	Supply Chain Performance (KP)	KP 1 – KP 2

Analysis result shows that every indicator is valid with higher than 0.4 *factor loading* value and grouped into the grouping variable. Factor analysis results shown in Table 2.

Table 2. Factor Analysis Results

Indicator	Component 1	Component 2	Component 3	Remarks
FJP 1		.870		valid
FJP 2		.532		valid
FJP 3		.875		valid
FJP 4		.610		valid
FP 1			.851	valid
FP 2			.853	valid
K1	.843			valid
K2	.859			valid
K3	.880			valid
K4	.787			valid
K5	.878			valid
K6	.838			valid
K7	.881			valid
K8	.842			valid

The next step is reliability test for each construct by using Cronbach's Alpha coefficient and item-to-total correlation to fix the examination by eliminating unnecessary points that would be reducing Cronbach's Alpha. The examination resulting Cronbach's Alpha value for each construct is higher than 0.60, and is qualified for reliability test. Results of reliability test using Cronbach's Alpha can be seen on Table 3.

Table 3. Reliability Test Result

Variable	<i>Cronbach's Alpha Based Value on Standardized Items</i>	Remarks
Supplier flexibility	0.805	Reliable
Supply network flexibility	0.713	Reliable
Chain supply performance	0.954	Reliable

Hypotheses examination used in this study is multiple linear regressions with supplier flexibility and supply network flexibility as the independent variable, and supply chain performance as dependent variable. Using statistical model of multiple regression on SPSS version 17, obtained t value as estimation parameter, multiple correlation coefficient (R), and multiple determinant coefficient (R²), regression coefficient has also obtained for each independent variable. This research uses 0.05 α , which brings the confidence level on 95%. According to the limitations, if p value is $\leq 0,05$, the independent variable

significantly affecting dependent variable, with confidence level of 95% and tolerate a maximum deviation rate of 5%, while multiple determinant coefficient (R^2) shows the ability of independent variables to explain the fluctuation of dependent variable. For more details, multiple regression test results can be seen in Table 4.

Table 4. *Multiple Regression Test Result*

Independent Variable	Dependent Variable	Coefficient	t	Sig t
Supply chain flexibility	Supply chain performance	0.407	3.179	0.003
Supply network flexibility		-0.189	-1.479	0.146
R^2				0.198
Adjusted R^2				0.165
F				6.037
Sig F				0.005

Table 4. shows that supplier flexibility variable positively affects supply chain performance. However, supply network flexibility variable does not affect supply chain network. *Adjusted R²* value in this model is also very low, 0.165, only 16.5% of the supply chain performance variation can be explained by supplier flexibility, the rest are influenced by another factors other than the factors being researched. Whilst determining by the model significance, the value of F is 6.037 with 0.005 probability. Since it's less than 0.05 probability, regression model can be used to predict supply chain performance using supply chain flexibility variable.

Conclusions

This study aims to analyze the effect of supply chain flexibility on supply chain performance. Data was gathered by sending questionnaires and 48 questionnaires were returned for further analysis. The result of multiple regression analysis showed that supply network flexibility variable affects supply chain performance, while supply network flexibility variable does not affect supply chain performance. According to Lao, *et al.*, (2010), supply flexibility is one of

the variables affecting supply chain performance, specifically in facing competitive and rapidly-changing business environment. Suppliers with flexible system and process have the ability to respond to changes in business environment, that enhances supply chain performance. Flexible suppliers are also having better coordination and communication to deliver ideas, product designs, and mutual collaboration. Suppliers with high flexibility rates contribute better to product and service delivery with as well better responsiveness. This research also shows that supply network flexibility does not affect supply chain performance. Based on the questions in questionnaire, this variable is measured by the number of suppliers as well as producers capability to replace the suppliers within the network if one of the suppliers does not perform well. However, producers are highly dependent with only several suppliers, so that the operation smoothness is keep going.

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