

## DEVELOPMENT MODEL OF SUPPLY CHAIN MANAGEMENT IN MANUFACTURING PROCESSES

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### ABSTRACT

*The researchers developed a model of supply chain management (MSC) for snack marketing as a strategy in competition. This research process was conducted in three experiments, i.e. measurement models, structural models and modification models. The results of the mathematical equation of supply chain management model development is  $Y_5 = 0.23 X + Z_5$ . The hypothesis results are all of the MSC variables influence significantly with Goodness of Fit Indices.*

**Keywords:** *MSC variable, company performance, sustainable competitive advantage*

### INTRODUCTION

A manufacturing company, which produces snacks and located at Surabaya, East Java, Indonesia, needs a strategic supply chain management model development (MSC) in order to give a unique strategy management. This current era, the industries can no longer have partial mindset and they must work together simultaneously. One of the method that can be synergized simultaneously is tiered regression tool (Waluyo 2011). This method is widely used by the industry so the researcher use a unique development, supply chain management model development which synergized with company performance and sustainable competitive advantage, Structural Equation Modelling can synergized simultaneously (Waluyo, 2011), the model results are used as a strategic plan future in an effort to win the competition.

Supply chain management is a network organization involving upstream and downstream relationship in the process and the activities that can give a value in products and services to customers (Martin Christopher, 1998). In essence, the supply chain is a network. Then, in developing this idea, the supply chain can be defined as follows: Supply chain is a network of connected and interdependent organization mutually and cooperatively working together to control, manage and improve the flow of materials and information from suppliers to end user.

Supply chain management can be defined as follows : *"Supply Chain Management is a set of approaches utilized to efficiently integrated supplier, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right location, at the right time in the order*

to minimize system wide cost while satisfying service level requirement". (Levi David Simchi et al, 2000).

The company's performance has a specific purpose to fulfil the interests of its members, it is not easy to assess whether the goals have been set and can be achieved because it involves several aspects that must be considered. One of the way to find out if the company's performance has been appropriate with the predetermined plan and appropriate with its purpose. According to Helfert (1996), the company's performance is the result of many individual interest which made continuously by the management to achieve the goal.

Sustainable competitive advantage is sustainability from the key attributes of a product, durability and the superiority of intangible resources which owned compared to the competitors (Ferdinand, 2004).

## STUDY AREA AND METHODS

PT. X is a manufacturing company which have a large production and well respected by competitor. PT X is a company which oriented to the snacks production. During this time, PT. X prefers in its product that means more leads to the financial problems for example, how much profit in each year without knowing how the supply chain variable influence on the performance company to a sustainable competitive advantage. Actually PT. X is already considering the supply chain factors but they do not focus on the use of MSC methods. There are many business industries use MSC, its need a develop model, therefore the researchers hope it could be positive input so that the business world is becoming more conducive and promising. MSC is a key factor to increase organizational effectiveness in achieving the company's goals in order to win the competition and to improve customer service. The tool is Structural Equation Modelling. The development model based on theory. Supplier Indicator is taken from Kotler (2010). The manufacturing indicators are taken from Ahyari (2002) and Assauri (1999). The distribution indicator is taken from Kotler, 2010, customer indicator is taken from Indrajit (2002), the company's performance indicators are taken from Indrajit (2002) and indicators of sustainable competitive advantage is taken from Ferdinand (2004) (see table 1).

Questionnaire was developed by using semantic difference scale (seven scale) and given to the competent employees of PT. X, the minimum sample is 100 because it uses Maximum Likelihood Estimation techniques (ML). The measurement scale in this book uses semantic difference scale (seven scale) (M. Nasir, 2005). Univariate and multivariate normality assumption using output by observing the critical value from test results assessment of normality of AMOS 22. The value of normality and linearity standardized residual (SR) is include the ring  $-2.58 \leq SR \leq 2.58$  and linearity using SPSS 19.0 (Nourusis, 2011) shows the linear line between the variables X and Y. The evaluation of univariate outliers generate z-score value between  $-3 \leq z\text{-score} \leq 3$ . The evaluation of multivariate outliers not occur at the significance level of 0.001 with 22 X2 indicator  $(22; 0,001) = 48.268$ . The highest mahalonobis D-Squared value is 43.426, so it can be concluded that Multivariate Outliers do not happen.

The hypothesis of the model (see Figure 1). Inter construct one another is performed gradually to explain causality. The parameter of testing model in its first evaluation using chi - square and fit index  $p > 0.05$  (Hulland et al, 1996) and was supported by other test tools (Hair et al., 1995; Tabachnick & Fidell, 1996), GFI (Bentler, 1983; Tanaka and Huba, 1989), AGFI, CMIN / DF, TLI (Baumgartner & Homburg, 1996), CFI (Hulland, 1996 & Tanaka, 1993) and RMSEA (Hair, et al., 2006).

**Table 1. Construct and indicator**

Construct	Indicator
Supplier (X) Levi David Simchi, et.al, 2000)	1. Price (Kotler, 2010) 2. Right amount (Kotler, 2010) 3. Right time (Kotler, 2010) 4. Quality (Kotler, 2010)
Manufacture (Y <sub>1</sub> ) Levi David Simchi, et.al, 2000)	1. Right amount (Ahyari, 2002, Assauri, 1999) 2. Specifications (Ahyari, 2002, Assauri, 1999) 3. Quality (Ahyari, 2002, Assauri, 1999)
Distributors (Y <sub>2</sub> ) Levi David Simchi, et.al, 2000)	1. Creativity (Kotler, 2010) 2. Service (Kotler, 2010) 3. Relation (Kotler, 2010)
Customers (Y <sub>3</sub> ) Levi David Simchi, et.al, 2000)	1. Consumer needs (Indrajit, 2002) 2. Quality (Indrajit, 2002) 3. Price (Indrajit, 2002)
Company performance (Y <sub>4</sub> ) (Indrajit, 2002, Helfert, Erich.A, 1996)	1. Sales volume (Indrajit, 2002) 2. Customer growth (Indrajit, 2002) 3. Sales growth (Indrajit, 2002) 4. Information system (Indrajit, 2002) 5. Employee motivation (Indrajit, 2002) 6. Customer satisfaction (Indrajit, 2002)
Superiority (X <sub>5</sub> ) Sustainable competitive advantage (Ferdinand A, 2004)	1. Service (Ferdinand A, 2004) 2. Quality (Ferdinand A, 2004) 3. Price (Ferdinand A, 2004)

Source: Processed Primary & Secondary Data

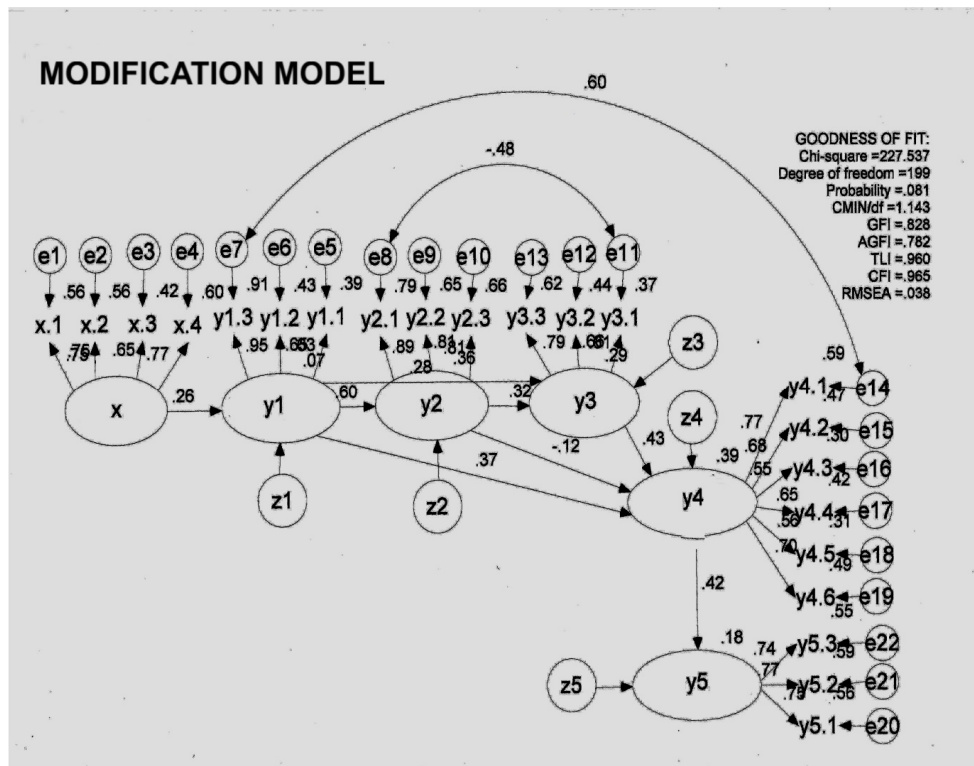
**Table 2. Regression Test Results Weight Modifications**

			Estimate	S.E	C.R	P	Standardized Regression Weights
Y1	<--	X	0.492150	0.214265	2.296922	0.021623	0.262
Y2	←	Y1	0.575775	0.102096	5.639553	0.000000	0.600
0.Y3	<--	Y1	0.218890	0.113083	1.935660	0.052909	0.283
Y3	<--	Y2	0.257278	0.120881	2.128359	0.033307	0.320
Y4	<--	Y1	0.500775	0.198537	2.522327	0.011658	0.370
Y4	<--	Y2	-0.166407	0.201248	-0.826873	0.408309	-0.118
Y4	<--	Y3	0.761928	0.262383	2.903878	0.003686	0.435
Y5	<--	Y4	0.235925	0.071797	3.285981	0.001016	0.419

**Table 3.** Goodness Of Fit, Model Test Results and Cut Off Value (Modification)

Goodness of Fit Indices	Test Result Model	Cut – Off Value	Description
X <sup>2</sup> Chi Square	227,537	Kecil*	Good
Probabilitas	0,081	≥ 0,05	Good
CMIN/DF	1,143	≤ 2,00	Good
RMSEA	0,038	≤ 0,08	Good
GFI	0,828	≥ 0,90	Marginal
AGFI	0,782	≥ 0,90	Marginal
TLI	0,960	≥ 0,95	Good
CFI	0,965	≥ 0,95	Good

Description: (\*): X2 with df = 199 with α = 0.05 is 232.9118.



**Figure 1.** Modification Model

**HYPOTHESIS TESTING**

Based on the hypothesis see Figure 1, as follows:

1. The First Hypothesis (H -1)

H0: Suppliers (X1) do not influence significantly to the Manufacturing (Y1).

H1: Suppliers (X1) influence significantly to the Manufacturing (Y1).

The hypothesis test result H1 is accepted

Suppliers (X1) influence significantly to the Manufacturing (Y1) with regression coefficient of 0.262, probability value <0.05 (0.021623) (see Table. 2). It

means that the suppliers (X1) increase by 1. The applications are price negotiation activities with their mutual agreements, the delivery process of raw materials / additional materials in the right time, the right amount of raw material and quality appropriate with the agreement. The results of respondents' answers indicate Suppliers (X1) with a performance indicator about mutually beneficial price negotiations, the delivery process on the right amount and time as well as the quality of raw materials accordance with the agreement shows that the percentage of dominant frequency questionnaire are in the range. So, we need more focus on increasing indicator Suppliers activity.

#### 2. The Second Hypothesis (H-2)

H0: Manufacturing (Y1) does not influence significantly to the Distributor (Y2).

H1: Manufacturing (Y1) influences significantly to the Distributor (Y2).

The hypothesis test result H1 is accepted

Manufacturing (Y1) influences significantly to the Distributor (Y2) with regression coefficient of 0.600, probability value  $<0.05$  (0.000000) (see Table. 2). The number of 0.600 mean that if the manufacturing (Y1) increased by 1 unit will cause the contribution to the Distributor (Y2) increased by 0.600 times. The applications are manufactures its product in the right amount, appropriate with the specifications and quality according to standard then it will cause the contribution to the Distributor (Y2) increased by 0.600 times. The results of the respondent frequency showed manufacturing (Y1). Performance indicator above concludes that manufactures its product the right amount, appropriate product specifications and quality according to standard shows the dominant frequency percentage are in the high range. It is necessary for sustained the activity in manufacturing indicator (Y1).

#### 3. The Third Hypothesis (H-3)

H0: Distributors (Y2) do not influence significantly to the Customer (Y3).

H1: Distributors (Y2) influence significantly to the Costumer (Y3).

The hypothesis test result H1 is accepted

Distributors (Y2) influence significantly to the Costumer (Y3) with a regression coefficient of 0.320, also supported by the probability value  $<0.05$  (0.033307) (see table.2). The number of 0.320 mean if Distributor (Y2) increased by 1 unit will cause the contribution to Costumer (Y3) increased by 0.320 times. The applications are the implementation of creative distribution activity, have good service and extensive relationships which lead the contribution to Costumer (Y3) will increase by 0.320 times. The results of the respondent frequency indicated Distributor (Y2). The indicator are the implementation of creative distribution activity, the good service and extensive relationship shows the dominant frequency percentage are in the medium range. So, we need activity improvement in the Distributor indicators (Y2).

#### 4. The Fourth Hypothesis (H-4)

H0: Customers (Y3) do not influence significantly to the Company Performance (Y4).

H1: Customers (Y3) influence significantly to the Company Performance (Y4).

The hypothesis test result H1 is accepted

Customers (Y3) influence significantly to the Company Performance (Y4) with a regression coefficient of 0.370, probability value <0.05 (0.011658) (see Table. 2). The number of 0.370 mean if Customer (Y3) increased by 1 unit will cause the contribution to the Company's Performance (Y4) increased 0.370 times. The applications are activity that can fulfil customer needs competitive quality and price, it will cause the contribution to the Company's Performance (Y4) increased by 0.370 times. The results of respondents' answers indicate Customer (Y3) with an activities indicator that can fulfil customer needs with quality and prices shows the dominant frequency percentage are in the medium range. So, we need an activity improvement on the Customer indicators (Y3).

#### 5. The Fifth Hypothesis (H-5)

H0: Company Performance (Y4) does not influence significantly to the Sustainable Competitive Advantage (Y5).

H1: Company Performance (Y4) influences significantly to the Sustainable Competitive Advantage (Y5).

The hypothesis test result H1 is accepted

Company Performance (Y4) influences significantly to the Sustainable Competitive Advantage (Y5) of 0.419 with a probability value <0.05 (0.001016) (see Table. 2). The number of 0.419 mean if the Company Performance (Y4) increased by 1 unit will lead to a contribution to Sustainable Competitive Advantage (Y5) increased by 0.419 times. The applications are activities to increase sales volume, customer and sales growth included the system. Motivation and customer satisfaction will lead to a contribution to Sustainable Competitive Advantage (Y5) increased by 0.419 times. The results of respondents' answers indicate Company Performance variable (Y4) with indicators such as the increase of sales volume, customer growth and sales including information systems, employee motivation and customer satisfaction shows the questionnaire frequency percentage are in the high range. So, that need to be sustained on the activities of Company Performance indicators (Y4). For more Competitive Advantage Sustainable variable (Y5), indicator above should be given an emphasis in Psychology about the better service (compared to competitors) with quality and unique price also focused so that customers have a positive impression on the purchased products or have impact to the company so it would be the continuous purchase.

## DISCUSSION

The output results which are discussed in this research is the output of modifications, this research has the exogenous variable. Exogenous variable in this case is suppliers, so tiered regression equation will simultaneously generate the following equation:

$$Y_1 = f(X) + Z_1$$

$$Y_1 = 0.262(X) + Z_1$$

$$Y_1 = 0.262 X + Z_1$$

$$Y_2 = f(Y_1) + Z_2$$

$$\begin{aligned}
Y_2 &= ff(Y_1) + Z_2 \\
Y_2 &= 0,600(0,262X) \\
Y_2 &= 0,16 X \\
Y_3 &= ff(Y_2) + Z_3 \\
Y_3 &= 0,283(0,16 X) + Z_3 \\
Y_3 &= 0,05 X \\
Y_4 &= ff(Y_3) + Z_4 \\
Y_4 &= 0,435(0,05 X) + Z_4 \\
Y_4 &= 0,02 X + Z_4 \\
Y_4 &= ff(Y_1) + Z_4 \\
Y_4 &= 0,16 X + Z_4 \\
Y_4 &= ff(Y_2) + Z_4 \\
Y_4 &= 0,05 X + Z_4 \\
Y_{4TOTAL} &= 0,02 X + 0,16X + 0,05 X \\
Y_{4TOTAL} &= 0,23 X \\
Y_5 &= ff(Y_4) + Z_5 \\
Y_5 &= 0,23 X + Z_5
\end{aligned}$$

The overall equation results generate the initial equation  $Y_1 = 0,262 X + Z_1$  becomes  $Y_5 = 0,23 X + Z_5$ . Regression coefficient getting increase but still significant, so that the model equations remain significant modification must be made to see the highest value of modification index (MI) and MI on Regression Weight with notice some exist theories. Researchers make modifications by selecting a correlation between errors in the simultaneous equation so it does not have much meaning, this way make the simultaneous regression become significant.

By looking at the equation above, the researcher suggests to previous researchers to review the MSC concept, because the MSC variable (Supplier to Consumer) has the effect of diminishing even to the insignificant, this is due to every MSC variable has their individual interests and other factors are interest between one variable with another variable which is usually the opposite. Example distribution variable wishes will send the product continuously to the consumer in order to get additional value but consumers' purchasing power is low and consumer behaviour is difficult to predict, this is due to global influences that have an impact on consumer knowledge becomes more widespread and the importance is "money is everything" concept, this statement influence to manufacturing. The researchers suggest, MSC no longer starts from the supplier but starting from the consumer, so become the new management chain consisting of customers, suppliers, manufacturing and distribution, in other words become customer chain management (MCC). When using this concept, the researcher argue that the consumer regression number to suppliers will convince the consumer because the purchase of raw materials, manufacturing and distribution appropriate with the behaviour and consumer demand.

## CONCLUSION

This research process was conducted in three processes, measurement models, structural models and modification models. The results of the mathematical equation of supply chain management model development is  $Y5 = 0.23 X + Z5$ . Suppliers and consumers have influence but not significant, this is because every MSC variable has their individual interests and the interests between one variable with another which is usually the opposite.

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