Abstract ID: AIC-2017-AMOS-710

Influence of Supply Chain Integration and Just In Time Method to Smoothly Process Production at Assembly Company in Batam Riau Islands

Rusda Irawati[a], Shinta Wahyu Hati[b], Bambang Hendrawan[c],

[abc]Applied Business Administration Study Program
Business Management Departement
Batam State Polytechnic Riau Islands Indonesia
Jl. Ahmad Yani Batam Centre, Kota Batam 29400
rusdairawati@gmail.com

Abstract

This research aims (1) to know the influence of supply chain integration to the smoothness of production process of manufacturing company in Batam, (2) to know the influence of just in time method toward the smoothness of production process in Batam, (3) to know the influence of supply chain integration and just in time to smooth manufacturing process of manufacturing company in Batam. Samples were taken as many as 100 manufacturing companies engaged in various assembly fields such as electronics, textiles, pipes, printers, softlense, construction and others. The sampling technique used is purposive random sampling and using questionnaire as data collection method. Technique Analysis of data used is multiple linear regression. The results showed that there is a positive influence between the variables of Supply Chain Integration (X1) partially to the smoothness of production process at the manufacturing company in Batam, there is a positive influence between the variables of the method just in time (X2) partially to the smoothness of production process in the manufacturing company in Batam, and there is a positive and simultaneous influence between the supply chain integration variables (X1) and the just in time (X2) method for the smoothness of the production process (Y).

Keywords: supply chain; just in time; smooth production process; manufacturing company

1 Introduction

Business competition in the era of globalization is increasing, companies compete to meet high market demand. Especially in manufacturing companies that are required to produce a quality product with the cost, the right time and at the time required. The success of a company can be judged from the smoothness of a company to perform the production process, therefore the company thinks the right way and method for raw material procurement process and cooperation from all integrated supply chain to achieve that goal.

For the procurement of raw materials, one of the ways often used by manufacturing companies is to use the system just in time that was first triggered by a Toyota Company that is famous for the system of Toyota Production System (TPS) or Lean Manufacture. According to Taiichi Ohno, Vice President of Toyota in Sajida Nuril (Zunariah, 2015), Just In Time is producing and delivering necessary items when needed and necessary quantities, to improve work efficiency and eliminate young jobs in the workplace.

The company sees just in time as a way to manage the delivery of material needs at the right time so that the smoothness of the production process can be maintained. All activities are well integrated and work together with each other, so that procedures, communication and cooperation in all aspects run smoothly. The activity that governs it is supply chain integration. Batam is a City Industrial area which most of the manufacturing industry will certainly more and more activity of material supply almost in the whole industry, This process is very dependent on supply chain activity and application of supply chain integration very good. Cooperation built through an integration of raw material procurement information, material planning, material arrival on the supply chain is essential for the smoothness of the production process.

This research aims (1) to know the influence of supply chain integration to the smoothness of production process of manufacturing company in Batam, (2) to know the influence of just in time method toward the smoothness of production process in Batam, (3) to know the influence of supply chain integration and just in time to smooth manufacturing process of manufacturing company in Batam.

2 Literature Review

2.1. Empirical Study

Research by Nuno Sutrisno (Sutrisno, 2014) The Effect of Supply Chain Integration Implementation, Just In Time Purchasing, Just In Time Manufacturig to Logistic Performance. This research uses variable Supply Chain Integration, Just In Time Purchasing, Just In Time Manufacturing Logistic Performance with SEM analysis tool. The result is Supply Chain Integration and Just In Time Manufacturing directly affect the logistics performance, while the implementation of Just In Time Purchasing indirectly affect the Logistic Performance.

Research Anis Rachma Utary and M.Ikbal (Utary & Ikbal, 2014) Effect of Supply Chain Integration Implementation, Just In Time Purchasing, Just In Time Manufacturing to Logistic Performance. Supply Chain Integration, Just In Time Purchasing, Just In Time Manufacturing Logistic Performance. Supply Chain Integration and Just In Time Manufacturing directly influence the logistics performance, while the implementation of Just In Time Purchasing indirectly affect the Logistic Performance.

Research by Kenneth (Jr., Inman, Birou, & Whitten, 2014), examine the impact of a T-JIT strategy within a supply chain context, and analyze a model incorporating T-JIT as the focal construct with supply chain management strategy (SCMS) as an antecedent and supply chain competency (SCC) and organizational performance as consequences. Study results indicate significant, positive relationships between a supply chain management strategy and T-JIT, T-JIT and supply chain competency, and supply chain competency and organizational performance.

Pius Alphonce Katua (Katua, 2014), The Impact of Supply Integration on the Supply Chain Performance in the Manufacturing Firm in Kenya. Study result that, the organizations have realized significant supply chain coordination through supply chain integration.

Sajida Nuril (Zunariah, 2015), Applied Just In Time (JIT) implementation analysis as an alternative to raw material inventory control to assess cost efficiency at PT Kediri Tani Sejahtera. Just in time, raw material inventory, cost efficiency. Companies should apply JIT calculations in the management and remaning of raw materials in ordering must be able to know the conditions and suppliers of raw materials.

Paper by Zurita Mohd Saleha and Rosmimah Mohd Roslin (Saleh & Roslin, 2015), Supply Chain Integration Strategy: A Conceptual Model of Supply Chain Relational Capital Enabler in the Malaysian Food Processing Industry is to propose a framework in investigating the influence of SCRC on the execution of SCI by adopting relational capital theory. Through a review of related literature and formal interview, relational elements such as trust, commitment and socialization have become significant elements to facilitate the execution of SCI practices among firms in food processing industry.

2.2. Definition of Variables

According to Indrajit and Djokopranoto in Nuno Sutrisno (Sutrisno, 2014), Supply Chain Integration is a system to integrate all areas of organizational functions ranging from suppliers, manufacturing, retailers to end-users. The purpose of this integration is to facilitate the flow of communication and material flow throughout the supply chain, especially between supply chain members to facilitate the production process. According to Donk and Van Der Vaart (Vaart & Donk, 2004), Supply chain integration can be divided into 4 different sections of which are material flow, planning and controlling, organization and information flow. Conceptually Supply Chain integration means that the legally independent participating firms coordinate seamlessly as if they one company in order to achieve the common goal (Lu, 2011). Futhermore, Lu (2011) explained a framework of supply chain integration. It looks at the product flow that goes through a typical supply chain, which has the manufacturer as the focal company in the middle, involving two tiers of suppliers upstream and two tiers of customers downstream. On top of everything else, the information flow through the supply chain is the essential infrastructure for the integration.

According to Tita Deitiana (Detiana, 2011), Just in time (JIT) is a philosophy of sustainable problem solving and it must be faced that can cause something to be wasted. Activities in Just in time are a reduction of futility and a reduction in variability. According to Lu (Lu, 2011), Just in time is an approach to control the material to be implemented if a company needs material for a production process. Just in time is done when the material is needed and will be delivered on the spot. Meanwhile, according to Cachon and Terwiesch (2009)(Cachon & Terwiesch), Just-in-time (JIT) is about matching supply with demand. The goal is to create a supply process that forms a smooth flow with its demand, thereby giving customers exactly what they need, when they need it.

According to Assauri(Assauri, 2008), the production process can be defined as ways, methods and techniques to create or add to the usefulness of a good or service by using available resources (labor, machinery, materials and funds). The production process can be said to be smooth if supported by elements of the preparation of production and operation plans, inventory planning and control as well as material procurement, machinery and equipment maintenance, quality control, and labor management. According to Eilon in Assauri (Assauri, 2008), Production, planning and control has the role of organizing and coordinating materials or raw materials to achieve production objectives, and is responsible for ensuring every material and assembly has arrived at the right time and place. By doing Production, proper planning and control will affect the smoothness of production process in order to run effectively and efficiently.

2.3. Hypothesis

Implementation of supply chain integration will be a framework to improve the organization's overall effectiveness and just in time functionality. The purpose of the framework of supply chain integration is to improve the effectiveness of just in time and the entire organization Gunasekaran in Sutrisno (Othman, Sundram, Sayuti, & Bahrin, 2016; Sutrisno, 2014). Implementation of supply chain integration will be the foundation in the implementation of just in time and jointly maximize the smooth production process to get the right raw materials and quickly so as to meet market demand. According to research conducted by Indrajit and Djokropranoto in Sutrisno (Banerjee, Kim, & Burton, 2007; Sutrisno, 2014) stating that supply chain integration aims to integrate all organizational functions ranging from suppliers, companies and consumers. So that the flow of materials and raw materials and production plans will arrive at all the functions of the organization and will help the production process. From the results of this study shows that the implementation of supply chain integration becomes the foundation and has an influence for the smoothness of the production process. Based on that opinion, it can be proposed the first hypothesis as follows:

H1: Supply chain integration has a positive and significant effect on the smoothness of production process.

According to Russell & Taylor (Taylor, 2011), the just in time method is used to minimize inventory and facilitate the flow of material so that the necessary material will come just in time. So that materials will be ready for production process without any waiting period. Based on the above opinion, it can be seen that the just in time method affects the smoothness of the production process, so it can be proposed the second hypothesis:

H2: Just in time method has a positive and significant effect on the smoothness of production process.

According to Gunasekaran in Sutrisno (Sutrisno, 2014), the purpose of the framework of supply chain integration is to improve the effectiveness of just in time functions and overall organizational functions. In the research can be seen that supply chain integration and just in time can increase the effectiveness of the company including in the smoothness of production process. Based on the research and supported by the first hypothesis and the second hypothesis can be concluded that Supply chain integration and just in time method have positive effect and impact on the smoothness of production process, so it can be proposed the third hypothesis:

H3: Supply chain integration and just in time method simultaneously have a positive effect on the smoothness of the production process

3 Methodology

The approach used in this research is survey method, with object in this research is Supply chain integration and just in time method to smooth production process of Manufacturing Company in Batam. This research consists of 3 (three) variables that are supply chain integration variables, just in time variable and variable of production process smoothness.

3.1 Constructing Measurements

Supply chain integration variables were measured using the definitions of Indrajit and Djokopranoto cited by Anatan (Anatan), which consisted of material flow, planning and control, Organization and Information flow. The Just in Time variable is measured using the definition of Taiichi Ohno cited by Nuril (Zunariah, 2015). Consists of quality, inventory, flexible production lines, changes in organizational structure that lead to products and the use of information technology effectively. While the variables The smoothness of the production process is measured based on the concept of Assauri (Assauri, 2008). Indicators include the preparation of production and operation plans, inventory planning and control as well as material procurement, Maintenance of machinery and equipment, quality control, labor management (human resources).

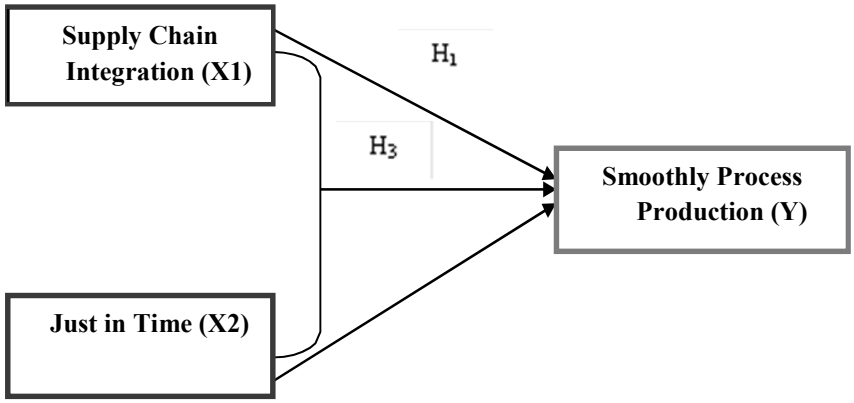

Figure 1. Model for Paper

Population in this research is employees of manufacturing company part of production, purchasing, scheduling, planner and logistic. Total amounted to 100 people from various manufacturing companies that do the assembly business process, sampling method in this study using purposive sampling technique. Observations and questionnaires were used as instruments of data collection. The previous questionnaire tested its validity and reliability. Validity test using Pearson's Product Moment method, that is by correlating the score of item on the questionnaire with total score value. While test Reliability using Cronbach Alpha method.

3.2 Statistic analysis

The data analysis techniques used in data processing are descriptive statistics and inferential statistics. Descriptive analysis is a statistic used to analyze data by describing or describing the data that has been collected as it is. To test hypothesis 1 and hypothesis 2 use t test. While to test the hypothesis 3 used the F test. Inferential statistics using multiple linear regression analysis, with the model as follows:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + e$$

Y_i	Smooth Process of Production
X_1	Supply Chain Integration
X_2	Methods Just in Time
b_0	Constants
$b_1 – b_2$	Regression coefficient of independent variables
e	Estimation error

4 Results and Findings

Respondents in this study are employees who work in manufacturing companies engaged in the field of assembly. The company consists of manufacturers that produce electronic, pipe, printer, softlense, textile and construction. The location of the company spread in several industrial areas located in Batam.

Table 4.1. Profile of Respondents

Profile of Respondent	Classification	Number
Gender	Male	40
	Female	60

Age	18-25	51
	26-36	34
	37-47	11
	> 47	4
Years of Service	< 5 years	64
	5-10 years	19
	>10 years	17
Employee Category	Permanent employees	54
	Contract employees	46
Division	Purchasing	24
	Logistic	27
	Planner	13
	Scheduling	14
	Production	22
Supplier type	Local	49
	Overseas	51
Material Waiting Time	Less than 1 week	16
	More than 1 week	44
	1 month	40
Number of Suppliers in Each Production Process	1-3 suppliers	26
	4-6 suppliers	30
	8-10 suppliers	24
	More than 10 suppliers	20
Level of education	High school	42
	Diploma	47
	Bachelor	11

4.1 Description of Variables

Questionnaire distributed to respondents consisted of closed questions with Likert techniques and using five scales, each variable consists of eight questions. The average assessment of respondents to each indicator in each supply chain integration variables, JIT and smooth production process is in the range 3.31-3.99. It can be said that the assessment is at a neutral level to strongly agree. Result show that, good and sustained cooperation in supply chain integration in assembly manufacturing Companies will create data and information transparency for all areas of the supply chain organization. Continuity of production process supported by the availability of materials in accordance with the time required. It can be said that Suppy Chain Integration Manufacturing company in Batam is quite good. Respondents are able to plan and implement supply chain integration on schedule of production process. The result of data processing shows that just in time method applied in assembly manufacturing company in Batam is very influential to the availability of material for continuity of production process. Implementation of just in time method can increase productivity facilitate the process of material supply and minimize inventory to avoid stockpile of goods that can impact on operational efficiency. For each indicator on the variable smoothness of the production process, the average respondent answered in the range strongly agree with all statements contained in the questionnaire.

4.2. Multiple Linear Regression Analysis Test Results

Testing of variable regression coefficients Supply chain integration (X1) shows that the variables of Supply Chain Integration have a positive and significant influence on the smoothness of production process. Table 4.2 shows the result that, arithmetic for supply chain Integration variables of 2.326 and t table of 0.1703. This means that t count> t table or 2.326> 0.1703 and the sig value of 0.022 is smaller than sig 0.05. Based on the results of t test analysis of just-time method variables in the same table, that there is a significance value (Sig.) 0.000 <0.05 and the value of t test for 0.56> t table of 0.1703, it can be concluded that the variables just in time effect positive and significant to the smoothness of the production process.

Table 4.2. Multiple Linear Regression Analysis Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Bet		
1	(Constant)	8.742	2.349		3.722	.000
	Supply Chain Integration	.199	.086	.199	2.326	.022
	Just in Time Method	.481	.086	.478	5.600	.000

Further test results show F calculated by 40.226 with F table 3.07 and significant value 0.000. Because F arithmetic> F table or 40.226> 3.07 and the value of sig 0.000 <0.05. So it can be stated that there is a significant influence between Supply chain integration Just in time method together to Smooth production process.

Table 4.3. ANOVA[a] F Test Result

Model		Sum of Squares	df	Mean Square	F	Sig.
tisitas 1	Regression	901.325	2	450.662	40.226	.000[b]
	Residual	1467.630	131	11.203		
	Total	2368.955	133			

4.3. Result of hypothesis test

Hypothesis 1 states Supply chain integration has a positive and significant effect on the smoothness of the production process. Result of hypothesis test yield positive value equal to 0199 and t test with t value 2,2326> t table 0,1703. This means that the supply chain integration variables have a positive and significant effect on the smoothness of the production process. The results of this study are also supported by previous research used by Pius Katua (Katua, 2014), that there is a positive and significant influence between supply integration in supply chain performance in manufacturing companies in Kenya.

Hypothesis 2 states Just-time method has a positive and significant effect on the smoothness of the production process. The test results produce a positive value of 0.481 and t test with a value of t arithmetic of 0.56> t table of 0.1703 which means a positive and significant effect on the dependent variable Smoothness of the production process. It is also supported by Sutrisno (Sutrisno, 2014) , that the implementation of just in time purchasing to just in time manufacture has a direct influence on the company.

Hypothesis 3 states Supply chain integration and just in time method simultaneously have a positive and significant effect on the smoothness of the production process. The result of hypothesis test is proved by R test of 0.617 indicating that there is a strong relationship between Supply chain integration and Just in Time method simultaneously to smooth production process. And the influence of variables Supply chain integration and just in time method to Variables Smooth production process of 33.8%. While the rest of 66.2% influenced or explained by other variables. Also strengthened by the F test with F arithmetic> F table that is equal to 40.226> 3.07, which means there is a significant influence between Supply chain Integration Just in time method together to Smooth production process. The results of this study are supported by previous research used by Sutrisno (Sutrisno, 2014), on the implementation of supply chain integration to just in time purchasing significantly at the supplier companies.

5 Conclusion

Based on the results of the analysis that has been done, the conclusions that can be taken in this study are as follows: (1) There is a positive and significant influence between the variables of Supply Chain Integration (X1) partially to the smoothness of production process in assembly-based manufacturing company. In addition, the implementation of supply chain integration in the assembly manufacturing company in Batam has a positive effect on the smoothness of the production process, because with integrated information and communication system such as sharing plan production, database and e-business that already exists make the performance between organizational functions, and manufacturing runs smoothly. (2) There is a positive and significant influence between the variables of just in time (X2) method partially to the smoothness of the production process in the assembly-based manufacturing company. The method of just in time has been going on for a long time in the assembly manufacturing company in Batam and has been proven by a special database system created to create just in time method for easy operation and procurement of materials so as to help smooth the production process. (3) There is a positive and simultaneous influence between the Supply Chain Integration (X1) and Just in Time (X2) on the smoothness of the production process (Y), this implies the application of Supply Chain Integration and the Just in Time method together in order to improve the smooth process of production process that will improve product competitiveness. Implementation of supply chain integration and just in time method in assembly manufacturing company in Batam, mutually related to each other and assist in the smoothness of production process. With an integrated system and just in time method that has been created, then between supply chain organizations such as purchasing, planner and planning production can access data and information about the material needed in a timely and on the spot. Relationships with suppliers are more efficient at communicating and accurate data for material procurement.

Based on the results obtained, to the company can be suggested things as follows: Companies need to improve facilities that will support supply chain integration well, such as facilities in exchange of data and information. Systems and networks are good for the creation of good communication relationships between organizational functions within the company; Establish good relationships

with all related parties including the manufacturers, suppliers and costumer. So that the flow of material that will support the smoothness of production can be controlled and companies need to maintain cooperation between supply chain organizations with manufacturing and customer so that supply chain integration function and just in time method can run optimally and can affect the smoothness of production process.

Acknowledgement:
This study includes a research group of Regional Competitiveness Study Center funded by Grants Competition Batam State Polytechnic research funding in 2016.

References

Anatan, L. Managing Integrated Supply Chain For Manufacturing Competitiveness

Assauri, S. (2008). *Manajemen Produksi dan Operasi* (Revisi 2008 ed.). Jakarta Indonesia: Fakultas Ekonomi Universitas Indonesia.

Banerjee, A., Kim, S.-L., & Burton, J. (2007). Supply chain coordination through effective multi-stage inventory linkages in a JIT environment. *Int. J. Production Economics, 108*, 271–280. doi:10.1016/j.ijpe.2006.12.015

Cachon, G., & Terwiesch, C. *Matching Supply with Demand: An Introduction to Operations Management* (3rd ed.): Mc Graw Hill.

Detiana, T. (2011). *Manajemen Operasional Strategi dan Analisa (Service dan Manufaktur)*. Jakarta Indonesia: Mitra Wacana Media.

Jr., K. W. G., Inman, R. A., Birou, L. M., & Whitten, D. (2014). Total JIT (T-JIT) and its impact on supply chain competency and organizational performance. *Int. J. Production Economics, 147*, 125–135. doi:http://dx.doi.org/10.1016/j.ijpe.2013.08.02

Katua, P. A. (2014). *The Impact Of Supply Integration On The Supply Chain Performance In The Manufacturing Firms In Kenya* (Master), University Of Nairobi

Lu, D. (2011). *Fundamental of Supply Chain Management*: bookboon.com the ebook Company.

Othman, A. A., Sundram, V. P. K., Sayuti, N. M., & Bahrin, A. S. (2016). The Relationship between Supply Chain Integration, Just-In-Time and Logistics Performance: A Supplier's Perspective on the Automotive Industry in Malaysia *International Journal of Supply Chain Management, 5*.

Saleh, Z. M., & Roslin, R. M. (2015). Supply Chain Integration Strategy:A Conceptual Model of Supply Chain Relational Capital Enabler in the Malaysian Food Processing Industry. *Procedia - Social and Behavioral Sciences, 172*(Global Conference on Business & Social Science), 585-590. doi:10.1016/j.sbspro.2015.01.406

Sutrisno, N. (2014). Pengaruh Implementasi Supply Chain Integration Just in Time Purchasing dan Just in Time Manufacturing terhadap Logistic Performance. *Bisnis dan Akuntansi, 16*. Retrieved from www.tsm.ac.id/JBA

Taylor, R. a. (2011). *Operation Management*. Alaska: John Wiley and Son Pte Ltd.

Utary, A. R., & Ikbal, M. (2014). Kinerja Supplier, Just In Time Dan Kinerja Produksi Industri Elektronik Di Indonesia.

Vaart, T. V. D., & Donk, D. P. v. (2004). Buyer focus: Evaluation of a new concept for supply chain integration. *INternational Journal of Production Economics, 92*(1). doi:https://doi.org/10.1016/j.ijpe.2003.10.002

Zunariah, S. N. A. (2015). Analisis Penerapan Just In Time (Jit) Sebagai Alternatif Pengendalian Persediaan Bahan Baku Untuk Menilai Efisiensi Biaya Pada Pt Kediri Tani Sejahtera. Retrieved from simki.unpkediri.ac.id