Analysis of Supply Chain Performance Based on the Supply Chain Management Maturity Level in Manufacturing Industry

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Abstract

Transformation in the manufacturing industry followed by the development of globalization, requiring performance improvements along the supply chain. Supply chain management is one of competitive strategy to enhance the company's productivity and profitability. Supply chain management maturity models is present to propose the best practices in supply chain management. A basic idea from these models is that increased maturity will improve supply chain performance. This study investigates the relationship between supply chain management maturity and supply chain performance based on the five key supply chain management maturity dimensions consisting of strategy; asset and facility; human resource; information and technology system; and process areas provided in SCOR model derived from previous literature. They were collected by web-survey from relatively manufacturing industry in various company size. The study results may be limited by the size of collected sample. The research framework and hypothesis in this study were tested using Partial Least Square approach. The results specifically highlight the contribution implementation of supply chain management maturity which can improve supply chain operational and supply chain organizational performance. This study provides useful planning information in the manufacturing industry.

Keywords
Safety Risk Perception, Structural Equation Modelling, Oil and Gas Industry.

1. Introduction

The manufacturing industry has experienced changes in recent years, including management change, technological processes, customer expectations, supplier attitudes, competition, and other aspects. Current global economic trends with liberalization by all countries in the world have significantly reduced trade barriers. The biggest impact is increased trade in the manufacturing industry so manufacturing companies are more competitive. Globalization, specialization, and ownership in various components of the supply chain in the manufacturing industry have become increasingly complex and extensive in the fields of logistics and inventory as well as other related matters related to customer satisfaction. Because of this change, manufacturing companies are required to support the market and promote competitors by increasing the speed and efficiency of shipping, and must be able to produce the goods needed by the global market by ensuring the best quality.

Supply chain management offers a management philosophy for managing activities and integrating upstream and downstream parties and the company's internal supply chain (Ross 1998). Supply chain management is identified as a strategic tool for companies to improve performance and ensure their competitiveness. From some literature can be summarized into several points of definitions (Handfield and Nichols 1999; Cooper et al. 1997; Mentzer et al. 2001)

First, supply chain management views the supply chain as a single entity that requires cross-functional integration in an organization and across companies in the supply chain. Second, supply chain management aims to improve the performance of each company as well as the entire supply chain. Third, companies must establish and maintain the practical management such as integrated behaviour, information sharing, mutual risk sharing and appreciation, cooperation, common goals and the same focus in serving customers, process integration, and building and maintaining long-term relationships. Although the definition of SCM itself leads to a supply chain integration, in practice this has not been achieved much. Therefore, the improvement of SCM implementation becomes very important in the manufacturing industry to provide better customer service.

Supply chain management maturity models are intended to model, analyse, and improve a company's supply chain management operations. Supply chain management maturity aims to assist companies in measuring the maturity of their operations relative to industry best practices. The supply chain management maturity model plays an important role when a company wants to take appropriate actions to move toward its goals. This model can help the organization to assess the current conditions of the SCM process and focus on areas of improvement that make sense for their current stage of maturity (McCormack and Johnson 2002). These models are used to evaluate the company's current situation based on the main competitive features and identify more important factors, for the necessary corrective actions as well as for the allocation of resources.

From a number of previous studies, it was found that there was no direct implementation in some industries, but only a conceptual framework obtained from the results of several literature studies in order to provide assessment recommendations that could be used by companies in implementing supply chain management strategies. The output of most research only focuses on the supply chain best practice proposals and takes the form of self-assessment to measure supply chain management maturity. So, the current research aims at implementing supply chain management maturity and supply chain best practices in the manufacturing industry, especially in Indonesia, which adopted a number of supply chain management maturity test models used in previous studies. This research is focused on the application of these models and see how far the implementation of supply chain concepts in Indonesia's manufacturing companies contributes to company performance.

The methodology to be used is a web-based questionnaire designed to collect information about the current condition of manufacturing companies in Indonesia that are random chosen. The question in the questionnaire comes from the previous research reference model. Descriptive statistics are used to measure the extent implementation of supply chain concepts in Indonesia and PLS- SEM analysis will be used to measure the relationship between dimensions. Some basic considerations for choosing the PLS-SEM method in this study because it works efficiently with small sample sizes and complicated models while practically not making assumptions of data distribution, meaning that the sample data are not refers to one particular distribution (for example: normal distribution). Analysis of test results is used as a reference in determining the causal relationship model between dimensions and the relationship between dimensions and indicators can be accepted or rejected.

The research framework includes the hypotheses will be discussed in the next section. The research methodology is discussed in the third section. Results and discussion are discussed in section four followed by conclusion and implications.

2. Literature Review and Hypothesis

The supply chain management framework developed in this study is shown in Figure 1. The framework proposes that supply chain management maturity dimensions implemented in manufacturing industry will influence supply chain organizational performance and also through operational performance. Supply chain management practices construct, and hypotheses related to the variables of supply chain operational performance and organizational performance are developed with a detailed description.

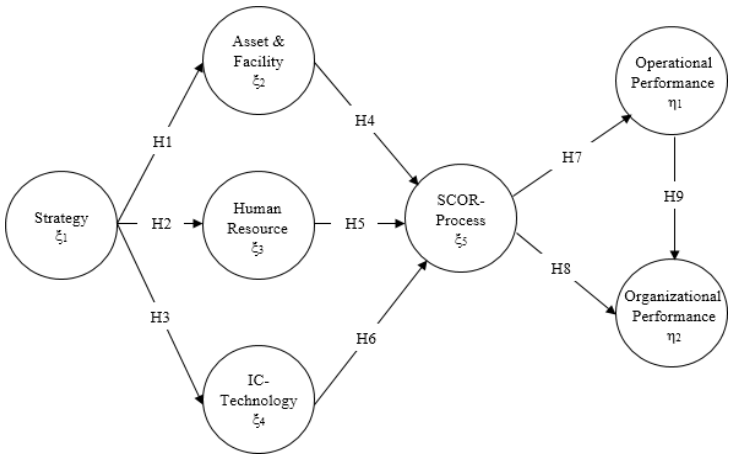

Figure 1. Research conceptual framework

2.1. Hypothesis

The point of view from the basic framework's research is when processes in a supply chain are well controlled and practiced through the application of best practices in the industry will lead to higher levels of supply chain management maturity and better supply chain performance as well. The concept of maturity in supply chain networks based on understanding that a network has a life cycle that can be clearly defined, managed, measured and controlled over time. By controlling all processes in the supply chain will lead to a higher level of maturity. Supply chain process and SCM operational performance are also influenced by the company's strategy and facilities. The better company's strategy will also improve the company's facilities in terms of quality and availability, so that it can support the work of the supply chain process. A higher level of maturity will represent the higher supply chain performance and supply chain organization performance. And the hypotheses of this research as follows:

H1. Company with better strategic practice implementation will have better asset and facility.
The operations strategy must also discuss the types of resources needed at each company facility, especially the types of production technology are needed to improve competitiveness (Christopher 1992). The operations strategy becomes the total decision pattern that forms the long-term capability of all types of operations and the company's contribution to the overall strategy through aligning market needs with operating resources (Slack and Lewis 2002). The main focus is to ensure a strategic fit between the facility and the company's needs. The prerequisite for achieving that match is the close relationship between facility management and corporate strategic planning.

H2. Company with better strategic practice implementation will have better human resource.
The operations strategy not only addresses facility decisions but must also address the overall resource capacity That include a decision about how many resources are needed, and where those resources must be placed. This relates to human resource planning which plays an important role in translating organizational goals into the number of workers needed by determining the human resources needed by the organization to achieve its strategic goals (Christopher 1992). In addition, human resource management is related to strategic choices of quality, flexibility and cost reduction using a functional approach. An appropriate and in line strategy will prepare human resources for innovation, business development, and understanding what decisions will be made to achieve the company's targets.

H3. Company with better strategic practice implementation will have better information technology.
The strategy is related to information technology strategic planning which is the first step of the organizational process such as determining perspectives and mission objectives, determining strategic requirements, and providing strategic documents of information technology. The purpose of information technology strategy is to create harmony between information technology applications and the organization's business strategy (Rezaei et al. 2016).

H4. Company with better asset and facility practice will have better supply chain process.
Raw material flow and production level which will determine the location or physical facilities that will transform it. Simply put, the company considers its facilities and layout, which decides the location of all facilities, machinery, equipment and staff in operation. This determines how the transformation of resources (materials and information) flow during the operation process (Tracey et al. 2005). Company facilities that operate well with the support of the right layout of facilities will greatly affect the productivity of all supply chain processes.

H5. Company with better human resource practice will have better supply chain process.
The role of human resources is the most important strategic thing in the organization because no organization can achieve its objectives without the role of humans. So that the organization must provide an appropriate utilization of human resources to achieve high performance standards (Lunenburg 2012) and all organizational goals are achieved through effective human resource planning. Supply chain synchronization depends on the individuals involved in it because they play a role in the processes and technology used (Tracey et al. 2005).

H6. Company with better of information technology will have higher better supply chain process.
The direct relationship between the use of technology in SCM that organizations use IT will get more operational benefits; like reducing costs and cycle times (Sanders and Premus 2002). A more relevant IT system for SCM can improve production and process control (Narasimhan and Kim 2001). IT integration supports better supply chain integration and flexibility (Ngai et al, 2011). IT in the supply chain can affect company performance in a number of ways. One of them is allowing companies to respond better the customer problems and requests (Rogers et al 1992).

H7. Company with better supply chain process will have better supply chain operational performance.
The various of SCM practices, such as strategic supplier partnerships, customer relationship building, can provide organizations with a competitive advantage in terms of cost, quality, reliability, flexibility, and time dimensions to consumers. The successful application of SCM practices provides an opportunity to improve operational performance along the supply chain (Harrison and New 2002).

H8. Company with better supply chain process will have better supply chain organizational performance
An organization with a high level of supply chain management practices also has a high level of organizational performance (Karimi and Rafiee 2014). The implementation of SCM practice can directly improve an organization's financial and marketing performance in the long term. Organizational performance can be evaluated by service and product quality, customer satisfaction, market performance, service innovation, and employee relations. Quality improvement helps companies to retain current customers and create greater customer loyalty, instead increasing market share and organizational performance.

H9. Company with better levels of supply chain operational performance will have better supply chain organizational performance.
Increase in operational performance will lead to high levels of organizational performance in terms of business profitability such as increased sales, organization-wide coordination and supply chain integration (Lenny Koh et al. 2007).

2.2. Supply Chain Management Maturity

Supply chain management maturity is described as a model that shows extraordinary predictability, ability, effectiveness, and efficiency control to achieve organization goals (Skinner 1999). These definitions show that maturity is a of ability of the supply chain. The supply chain management maturity model is a tool to sketch a high organization in achieving excellence in the supply chain. A higher level of maturity in the management of business processes will result in higher authority for operational results (Söderberg and Bengtsson 2010). This implies that there is a direct relationship between the practices applied to supply chain management and the level of supply chain capability and performance.

Some supply chain management maturity models that will be discussed below are also reference models that will be used in this study. Other research developed a model that considers aspects of Business Process Orientation (Lockamy and McCormack 2004). The Business Process Orientation concept shows that companies can improve their overall performance by adopting a strategic view of their processes. A very important aspect of this model is the use of SCOR to identify process maturity. In this model also establishes five levels of supply chain management maturity. Other model is called the Supply Chain Process Management Maturity Model ($SCPM^3$) considering several constructs including strategic behavior, and strategic planning team (De Oliviera and Bronzo 2011).

Best practice on the $SCPM^3$ model at each level of maturity is indicated at the level where the practice increases with the progress of the company. SCMAT model developed considers all factors of the management operations process (Netland et al. 2007). SCMAT itself has three main objectives, namely mapping the level of maturity of the company's supply chain activities in strategic and operational levels. In SCMAT there are 50 statements that indicate the best supply chain practices. Another literature proposes a methodology and outline the main phases of developing a management maturity model that can be applied in any company, namely Business Process Maturity Management Model (BPMMM) (Rosemann and De Bruin 2005). According to this model, success factors for business management consist of six factors, namely strategic alignment, governance, people, methods, culture, and information technology. This model is embedded into a large number of maturity models at the company level but can also be used as a framework for assessment and improvement at the maturity level of supply chain management.

The supply chain management maturity in this study refers to SCMAT model (Netland et al. 2007) and Business Process Orientation Model (Lockamy and McCormack 2004). The supply chain management maturity model introduced here allows companies to quantitatively identify their position within an industry maturity and best practice framework. The Business Process Orientation concept shows that companies can improve their overall performance by adopting a strategic view of their processes. Companies with good business process guidance for their processes will achieve a greater level of organizational performance and have a much better environment with more collaboration and less conflict (Lockamy and McCormack 2004). A very important aspect of this model is also the use of SCOR to identify process maturity.

2.3. Supply Chain Management Maturity Dimension

Dimensions of supply chain management maturity in this study adopted the previous research (Netland et al. 2007; Alfnes 2005) among others as follows.

1. *Strategy*. Strategies can be described as company goals or policies, even philosophies for achieving goals. Strategy is a main direction which is include company's decision and action to achieve long-term goals. Both action and decision need to be covered by available resources. Other definition about strategy is a policy which aims to benefit from its competitors, and as a way of linking operations with corporate strategy (Skinner 1999).
2. *Asset & Facility*. Not only the availability of facilities, but the capacity of these facilities must also be taken into account. Capacity decisions cover all aspects which have a wide-ranging impact on current and future strategies. Facilities and task locations must also consider level of technology required, location of product development, skills are availability, production level, transportation routes, and so on. Production process technology is also a key decision that links operations with business strategies.
3. *Human Resources*. Human resources related to company employees, their integration in the company and the work environment. In manufacturing, the operations strategy must address capacity and overall human resource decisions. It is all about how much human resources are needed, and where these human resources must be located. The quality of human resources determines the quality of the company in the long run in any respect. Efforts such as training, rewards, work supervision, will help in improving the performance and knowledge of company employees.
4. *Information, Communication, and Technology.* The operations strategy must define the company's information system to support the core transformation process, and also the information system is used to communicate with other actors along the supply chain. Having accurate information about operations into delivery makes it more efficiently and effectively than before.
5. *Process*. At the value chain level, operations strategies must address the integration of processes throughout the company. The aim is to reduce resource consumption and improve performance. In this study, the operation process and its integration are seen using the SCOR model consisting of plan, source, make, deliver, and return.

2.4. Supply Chain Performance

Supply chain performance measurement is a system that provides a formal definition of supply chain performance models based on mutually agreed steps, measurement methods that determine the procedures, responsibilities and accountability of supply chain players and the regulation of measurement systems by supply chain players (Eccles and Pyburn 1992; Holmberg 2000). Many companies adopt strategic performance measurement systems to identify strategies that offer the highest potential for achieving company goals and align management processes with the achievement of selected strategic goals. The main purpose of measuring supply chain performance is to obtain information for management needs, and to know how efficient supply chain management is. The performance measurement system provides information for monitoring, control, evaluation and feedback functions for operations management. Based on the references of several previous studies (Lenny Koh et al. 2007), the supply chain performance measurement metrics used in the study are supply chain operational performance and supply chain organizational performance.

1. *Supply Chain Operational Performance.* A central objective of effective SCM is to create a a competitive advantage for the enterprise to differentiate itself from its competitors by hence at a greater profit (Christopher 1992). The measures of operational performance construct used in this study are flexibility, reduced lead time in production, forecasting, resource planning, cost saving and reduced inventory levels.
2. *Supply Chain Organizational Performance*. Organizational performance is measured by relying on financial and non-financial criteria. Other indicators such as innovation performance (Lloréns Montes et al. 2003), market share and other non-financial performance indicators are equally important for evaluate the impact of SCM practices. This is in line with long term goal which is to increase market share and supply chain integration for all supply chain members (Lockamy and McCormack 2004; Lyons et al 2004; Tan et al. 1998).

3. Research Methodology

The steps of the research begin from the stages of identification, data processing, to analysis and conclusions.

3.1. Sample and Data Collection

A survey instrument was developed and pre-tested several times to ensure that the content of questions was appropriate. Determination of the number of respondents adjusted to the conditions of each company. The data processed is only based on the number of valid questionnaires return. The survey technique seeks to obtain data from 11 SCM variables through a questionnaire. Data for this study was collected from 350 industries in the all sectors of manufacturing within Indonesia.

The sample was selected randomly from the database of Badan Pusat Statistik and Kementerian Perdagangan.

The questionnaire was made with Google Form and question paper, as well as the process of dissemination, namely through e-mail that has been contacted previously, through the LinkedIn application, and the manual method, which is to visit the company directly but is limited to the SIER factory area in Surabaya, East Java (based on company approval). Of the 350 questionnaires posted, a total of 57 questionnaires were returned after one follow-up.

3.2. Measurement of Variables

The variables in the questionnaire were taken from various literature which are summarized according to the model used in this study. This research model refers to the best practice supply chain model and SCOR. The model questionnaire in this study was designed to answer how companies work with their processes, how companies define and document their processes, and how they measure and connect each function and process horizontally.

In measuring the answers to the questionnaire, the scale used is the Likert scale. The response format on a Likert scale can be empirically considered to represent the response of interval data. Based on this theory, this research does not convert questionnaire data in the form of Likert scale into interval form. The assessment results from the statements in each supply chain best practice and supply chain performance indicators are directly summed and then mapped to the value of maturity level. The Likert scale used to measure the level of maturity of the supply chain in this study is five-point scales (Lockamy and McCormack 2004) ranging from 1 = “Not all implemented” to 5 = “Fully implemented”.

Manufacturing industries performance in this study was measured at two constructs. A list of six operational (OPER) and five organizational performance (ORG) measures were identified. Respondents were asked to indicate on a five-point scale, ranging from 1= "definitely worse" to 5 = "definitely better" how their business had performed over the last three years relative to their major competitors on each of the operational and organizational performance criteria.

4. Result and Discussion

Based on the results of processing the questionnaire based on respondents' perceptions, from the 57 results of the questionnaire that has been processed shows that the average level of implementation of the supply chain best practice is at the maturity level of three / linked and four / integrated. The result is shown in Table 1.
From the survey results explained in each variable, it can be concluded that the respondent who has answered has the ability to understand the concept of supply chain management is quite mature. But the full implementation of supply chain best practices still needs to be improved and further developed. Improvement is not only from the strategic level, but improvement in terms of procedures, level of cooperation, information systems, technology used, the selection of methods for continuous improvement needs to be done. Although customer satisfaction has begun to notice a real improvement and customers have begun to be included in the improvement of the process, the concepts of supply chain best practices need to be implemented more and better as an effort to improve performance. While in the small and household industries, there are still many tasks that need to be done, seeing the current situation on the ground still applying the traditional situation. So that before the selection of improvement methods, it is better to have an understanding of the supply chain concept that should have started to be heard by SMEs to improve the quality of their products and performance.

Table 1. Maturity level of supply chain management concepts implementation

Variable	Mean	Range Level	Maturity Level
Strategy	3.722	3.000-3.999	Linked
Asset & Facility	4.111	4.000-4.999	Integrated
Human Resource	3.732	3.000-3.999	Linked
Information, Communication, Technology	3.813	3.000-3.999	Linked
Plan	3.711	3.000-3.999	Linked
Source	3.706	3.000-3.999	Linked
Make	3.446	3.000-3.999	Linked
Deliver	3.825	3.000-3.999	Linked
Return	3.749	3.000-3.999	Linked

Based on 57 results of the questionnaire that has been processed shows that the average level of supply chain performance of manufacturing companies is at the level of performance of three (enough) as shown in Table 2.

Table 2. Performance level of supply chain performance

Variable	Mean	Range Level	Performance Level
SC Operational Performance	3.585	3.000-3.999	Quite Good
SC Organizational Performance	3.807	3.000-3.999	Quite Good

Operational supply chain performance is at a level of three or good enough. The level of performance is quite well interpreted that the company has a level of flexibility that starts to increase from before, especially on the company's ability to change according to customer demand or market conditions. Whereas the performance of supply chains as an organization shows the results that the average Indonesian manufacturing company is currently at good enough level performance. But the level of coordination between departments, suppliers and customers in this stage still needs a lot of development and improvement by most companies.

4.1. Partial Least Square

In order to avoid the multi-collinearity and measurement errors, while addressing the cause-effect relationships among the research constructs, we utilized partial least squares (PLS) method. The PLS procedure, uses two stage. The first stage is model evaluation, consist of outer model evaluation include unidimensionality test for the latent variables. The second stage involves the non-iterative application of PLS regression which is inner model evaluation such as obtaining loadings, path coefficients, and hypotheses test for the latent and manifest variables.

Unidimensionality Test, The validity and reliability of path constructs can be assessed by checking the unidimensionality test of each construct using two tools: loading factor or Average Variance Extract (AVE), Cronbach's α, and composite reliability. Based on PLS result with SmartPLS, loading factor met the threshold a value of 0.50. As shown in Table 3 all of the Cronbach's α and AVE values met the threshold a value of 0.50, also composite reliability met the threshold a value of 0.70 (Hair et al. 1998).

Table 3. Undimensionality test result

Variable	AVE	*Cronbach's Alpha*	*Composite Reliability*
Strategy	0.714	0.919	0.937
Asset & Facility	0.644	0.723	0.844
Human Resource	0.766	0.897	0.929
Information & Technology	0.822	0.891	0.933
Plan	0.717	0.867	0.910
Source	0.770	0.899	0.930
Make	0.709	0.896	0.924
Deliver	0.708	0.862	0.906
Return	0.676	0.761	0.862
SC Operational Performance	0.587	0.854	0.893
SC Organizational Performance	0.558	0.802	0.862

4.2. Path Model and Hypotheses Test

The relationships between the path constructs as shown in Figure 1 were tested. The estimation results for both outer and inner models were shown in Table 4 and Figure 2. Outer model, also known as measurement model, links the manifest variables to their latent variables. The regression weights between the manifest variables and their related latent variables were found to be significant at p-value < 0.05 level. Significance testing is used to test the effect of exogenous variables on endogenous variables. The significance testing criteria use standardized value path coefficients between -1 to +1. While the criteria test the hypothesis using statistics that question the assessment of the value of T- value ≥ T-table (1.96) or p-value < significant alpha 5% or 0.05, then expressed as exogenous significant variables exogenous to endogenous variables.

Table 4. Path model result

Construct	Path Coefficient	*t-value*	*p-value*
Strategy - Asset & Facility	0.722	12.018	0.000
Strategy - Human Resource	0.746	12.729	0.000
Strategy - Information & Technology	0.844	21.420	0.000
Asset & Facility - SCOR Process	0.253	2.348	0.019
Human Resource - SCOR Process	0.445	5.647	0.000
Information & Technology - SCOR Process	0.302	3.324	0.001
SCOR Process - SC Operational Performance	0.734	14.736	0.000
SCOR Process - SC Organization Performance	0.496	3.911	0.000
SC Operational Performance - SC Organization Performance	0.270	1.703	0.089

In Table 4, it can be seen that hypotheses H1 through H8 have a t-value ≥ 1.96 and p-value <0.05, so it can be concluded that the hypothesis is accepted. Whereas in the H9 hypothesis, has the highest p- value compared to other hypotheses namely p-value > 0.05 and t-value < 1.96, then the H9 hypothesis is rejected.

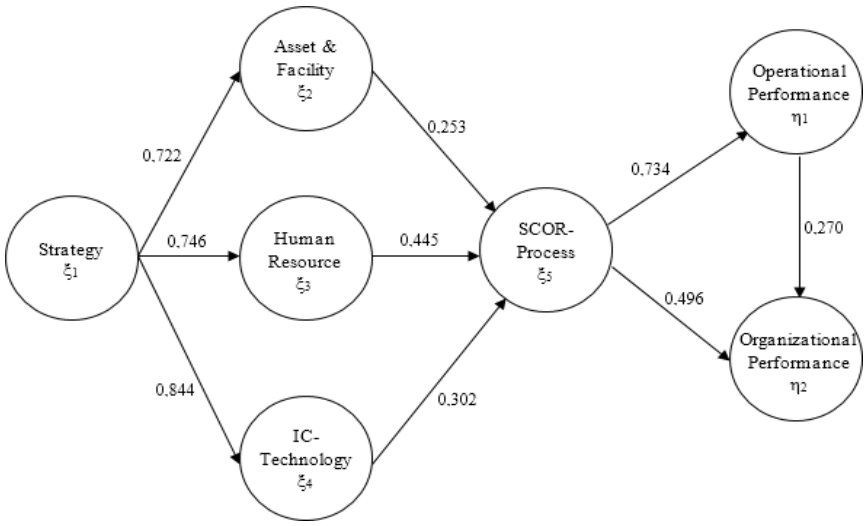

Figure 2. Results of the path model.

Figure 2 shows the results of path model which is the part of inner model evaluation. The circle in the path model is five exogenous variables (independent variables), which are strategy; human resource; asset & facility; ICT; SCOR process and endogenous variable (dependent variable), which is operational performance (OPER); organizational performance (ORG). This model evaluates the impact of each variable. Both factors of strategy and asset & facility were found to have direct positive and significant impact on operational performance (p-value < 0.05). This result supports H1, which states that companies with higher levels of SCM strategy will have higher levels of asset and facility, as well as other hypothetical relationships. In contrast, to the causal relationship in the last hypothesis, both SC operational performance and organizational performance did not have a significant and direct impact on ORG (p-value > 0.05), though the sign on the coefficient was positive. Although a number of previous studies have shown a positive relationship between operational performance dimensions, this finding does not provide support for H9. This might be explained by the fact that indeed the data collected failed to prove the hypothesis in terms of the sample that is now used is too small to prove the relationship between two variables, especially if the relationship of both variables is small. The existence of a positive relationship but the absence of a significant relationship in this case the possibility of data collected did not succeed in proving the link between SC operational performance and organizational performance related to SCM, and that does not mean SC operational performance has no effect on organizational performance related to SCM.

5. Conclusion and Implications

This paper has provided empirical study that identifies two SCM maturity and describes the relationship among SCM maturity, operational performance and organizational performance within the context of manufacturing industries. It sought answers to the main research questions that is how the level of maturity of SCM practices in the manufacturing industry is.

The current implementation of supply chain management concepts in manufacturing companies is shown in the results of a survey that shows the level of maturity of each application of supply chain best practice. From 57 results of the questionnaire that have been processed show that the average level of implementation of the implementation of supply chain best practice is in the development stage and there needs to be some improvement in some practices. For companies engaged in the manufacturing industry, attention should be directed more towards the factors of increasing cooperation and collaboration both in terms of internal and external with suppliers and customers, as well as increasing the use of information technology at all sizes of the industrial scale. Data for the study were collected was tested using partial least squares method, which is a structural equation modelling approach. Based on previous literature, SCM maturity were grouped in five dimensions: strategy, asset and facility, human resources, ICT, and SCOR process. The results indicate that five factors of SCM maturity dimension have direct positive and significant impact on operational performance and also organizational performance. In contrast, the relationship between the two performance-constructs was found direct positive effect but not significant effect on organizational performance.

The present study has some limitations, the most serious limitation of this study was its small sample used in this research. Data is collected from one respondent in an organization that might be a cause for response bias. The next research is expected to be able to increase the number of samples so that the indicators have good validity and reliability and can provide a better picture tangible to the objectives and issues in research. It is hoped that future research can provide input on how to evaluate the maturity level of supply chain management practices in the form of a framework design that has been adapted to the current condition of manufacturing companies in Indonesia, so that it can be used as an appropriate reference for other manufacturing companies when implementing a supply chain best practice. Future studies can also investigate the proposed relationship by integrating some contextual variables into the model including industry type, supply chain structure, and length of the supply chain.

References

Ross, D.F., *Competing Through Supply Chain Management*, Springer US,1998.

Handfield, R.B., and Nichols Jr. E.L., *Introduction to. Supply Chain Management,* New Jersey: Prentice Hall, 1999.

Cooper MC, Lambert DM, and Pagh JD. Supply Chain Management: More Than a New Name for Logistics. *International Journal of Logistic Management*, Emerald; 1997.

Mentzer, J.T., DeWitt, W., Keebler, J.S., Soonhong M., Nix, N.W., Smith, C.D., and Zacharia, Z.G., Defining Supply Chain Management*, Journal of Business Logistics*, vol. 22, no. 2, 2001.

McCormack, K.P., and Johnson, W.C., *Supply Chain Networks and Business Process Orientation,* CRC Press, 2002.

Lockamy, A., and McCormack, K., The development of a supply chain management process maturity model using the concepts of business process orientation, *Supply Chain Management*, Emerald, 2004.

De Oliveira, M.P.V., and Bronzo, M.P.K., The Supply Chain Process Management Maturity Model – SCPM3, *Supply Chain Management - Pathways for Research and Practice,* InTech, 2011.

Netland, H., Alfnes, E.T., and Fauske H. How mature is your supply chain?-A supply chain maturity assessment tes. *Proceeding 14th International Conference,* 2007.

Söderberg, L., and Bengtsson, L., Supply chain management maturity and performance in SMEs, *Operation Management Research.* Springer Science and Business Media LLC, 2010.

Rosemann, M., and De Bruin, T., *Application Of A Holistic Model For Determining BPM Maturity.* BP Trends, 2005.

Alfnes, E., *Enterprise Reengineering–A Strategic Framework And Methodology*. Norwegian University of Science and Technology, 2005.

Skinner, W., Manufacturing: Missing Link in Corporate Strategy, *Harvard Business Review*, 1969.

Eccles, R.G., and Pyburn, P.J., Creating A Comprehensive System To Measure Performance, *Management Accounting,* 1992.

Holmberg, S.A., Systems Perspective On Supply Chain Measurements. *International Journal of Physical Distribution & Logistics Management*, 2000.

Lenny Koh, S.C., Demirbag, M., Bayraktar, E., Tatoglu, E., Zaim, S., The impact of supply chain management

practices on performance of SMEs, *Industrial Management Data System,* Emerald, 2007.
Christopher, M., *Logistics and Supply Chain Management,* London: Pitman Publishing, 1992.
Lloréns Montes, F.J., Ruiz Moreno, A., and Miguel Molina, L., An analysis of the relationship between quality and perceived innovation: "the case of financial firms", *Industrial Management Data System,* Emerald; 2003.
Lyons, A., Coleman, J., Kehoe, D., and Coronado, A., Performance observation and analysis of an information re-engineered supply chain: a case study of an automotive firm, *Industrial Management Data System*, Emerald, 2004.
Tan, K.C., Kannan, V.R., and Handfield, R. B., Supply Chain Management: Supplier Performance And Firm Performance. *International Journal of Purchasing and Materials Management*, vol 34 no 3 pp 2-9.
Hair, J.F., Anderson, R.E., Tatham, R.L., and Black., W.C., *Multivariate Data Analysis,* Englewood Cliffs, New Jersey: Prentice-Hall, 1998.
Slack, N., and Lewis, M., *Operations Strategy,* London: Prentice-Hall, 2002.
Rezaei, E., Rostami, Y., Ghafouri, M., Fashkhorani, and A., Ahmadi, M., The infrastructure attitude to strategic planning of information technology in organizations, *Marketing and Branding Research. Canadian Institute for Knowledge Development*, 2016.
Lunenburg, F.C., Compliance Theory and Organizational Effectiveness, *International Journal Of Scholarly Academic Intellectual Diversity*, vol. 14, no. 1, 2012.
Tracey, M., Lim, J.S., and Vonderembse, M.A., The Impact Of Supply-Chain Management Capabilities On Business Performance*, An International Journal Supply Chain Management*, vol. 10, no. 3, pp 179-191, 2005.
Sanders, N.R., and Premus, R., I.T., Applications in Supply Chain Oragnizations: A Link Between Competitive Priorities and Oragnizational Benefits, *Journal of Business Logistics,* Wiley, 2002.
Narasimhan, R., and Kim, S.W., Information System Utilization Strategy for Supply Chain Integration, *Journal of Business Logistics,* Wiley, 2001.
Ngai, E.W.T., Chau, D.C.K., and Chan, T.L.A., Information technology, operational, and management competencies for supply chain agility: Findings from case studies, *Journal of Strategic Information Systems,* Elsevier BV, 2011.
Rogers, D.S., Daugherty, P.J., and Stank, T.P., Enhancing Service Responsiveness: The Strategic Potential of EDI, *International Journal of Physics Distribution Logistics Management*, Emerald, 1992.
Harrison, A., and New, C., The role of coherent supply chain strategy and performance management in achieving competitive advantage: an international survey, *Journal of Operation Reserach Society*, Informa UK Limited, 2002.
Karimi, E., and Rafiee, M., Analyzing the Impact of Supply Chain Management Practices on Organizational Performance through Competitive Priorities (Case Study: Iran Pumps Company), *International Journal of Academic Research in Accounting, Finance and Management Sciences*, Human Resources Management Academic Research Society, 2014.