The Impact of Supply Chain Management Integration on Operational Performance

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Abstract. The purpose of this study is to confirm the research model related to the impact of supply chain management (SCM) integration on the operational performance based on the previous researches. These studies suggest that SCM integration plays a critical role in generating performance gains for firms. In the study, three constructs are extended, i.e. the information technology infrastructure integration, SCM process integration, and operational performance. A number of 146 large manufacturing companies in Indonesia were selected purposively as the samples. Questionnaires were distributed through email survey, while data were analyzed by structural equation modelling with Partial Least Square software to analyze the causal relationship among variables. The study found that information technology infrastructure integration does not influence significantly to supply chain process integration. Furthermore, supply chain process integration influences significantly to operational firm performance.

Keywords: supply chain integration, information technology infrastructure integration, process integration, and operational firm performance.

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Introduction

In global competition, a business entity has to adopt new approaches to manage products and information flow integrated in Supply Chain Management (SCM), since SCM becomes one of competitive strategies for integrating suppliers, companies and consumers. Since increasingly global competition has caused organizations to rethink the need for cooperative, mutually beneficial supply chain partnerships (Lambert & Cooper, 2000; Wisner & Tan, 2000) and the join improvement of inter-organizational processes has become a high priority (Zhao et al., 2008). Zhao et al., (2008) defines SCM as a set of methods and approaches used to integrate suppliers, manufacturers, warehouses, stores, and consumers efficiently. SCM is a philosophy oriented on the integration of purchase, production, and delivery for materials and products to consumers (Olhager, 2002). The philosophy of SCM is collaboration and integration among partners involved in a supply-chain, in relation information, product and financial flow. Central of collaboration is the exchange of a large amount of information along the supply chain, including planning and operational data, real time information and communication (Stank et al., 2001).

To enhance collaboration and integration, SCM needs information technology (IT), which is used to process data into information, and to transmit information across supply-chain partners for a more effective decision making (Sanders & Premus, 2002). Furthermore, Sanders & Premus (2002) concluded that improvement in IT are significantly changing the role of logistics by breaking organizational barrier and allowing information to flow freely between supply chain partner. Patnayakumi et al., (2002) persuade that digitalization of supply chain can be applied through the use of a workflow tool and an integrated consumer, supplier, and company portal.

Several researchers recommend the adoption of supply chain strategy by using the IT to integrate an end-to-end process among company, consumer, and supplier (Lee, 2000). The adoption of IT in the supply chain could reduce logistics manager’s routine activities, so that the manager could focus on strategy level activities and development of company’s competence (Sanders & Premus, 2002). According to (Patnayakumi et al., 2002) IT plays a critical role in realizing supply chain management objectives. The integrated IT infrastructure enables a real time transfer of information among applications in inter-organizational process SCM to exchange information flow, financial flow, material flow, and product flow (Rai et al., 2006). While, Bagchi & Skjoett-Larsen (2003) pursue the product innovation, ownership flow and reverse product flows in the logistic information system.

The problem arises in using IT is the presence of supply chain fragmentation across different companies (Enslow, 2000). (Bayraktar et al., 2009) conclude that when considering ERP integration between enterprises for a seamless supply chain performance, the differences related to various types of ERP adapted by suppliers and customers in the SCM could create interoperability problem. To solve this problem, several researchers suggest the achievement of supply chain integration by: (1) optimizing integration of information flow (Ho et al., 2002), (2) optimizing material and product distribution flow...
(Lee, 2000); and (3) optimizing financial flow between supply chain partner (Patnayakumi et al., 2002). Therefore, supply chain should emphasize on an integrated information flow, physical flow, and financial flow among companies supported by an integrated compatible IT platform (Rai et al., 2006).

Several studies suggest that the digital platform plays an important role in managing supply chain activities which increases performance gain for the company (Rai et al., 2006). However, there is a limited number of studies that investigate how and why IT could create performance for a company in SCM, especially related to the phenomena of digital supply chain integration (Sahin & Robinson, 2002). An empirical research on supply chain integration was carried out by (Rai et al., 2006), which investigated the influence of supply chain integration digitalization on a company’s performance. This research was focused on the construct of IT integration infrastructure for SCM, which affects a firm’s performance. The result shows that IT infrastructure integration enables a company to develop higher capability processes on supply chain integration. This capability enables a company to separate and share information by using information based approach. Besides that, supply chain integration capability significantly effects on a company’s performance, especially its excellent operational and income growth.

This research adopts to the previous research model by Rai et al. (2006) and Koh et al., (2007) with minor modification on the firm performance measurement which focuses on operational performance dimension. The choice of research topic is in line with the research recommendation which suggests that researchers should focus on inter-organizational capability which integrates companies with a supplier and customer network to create value for the companies (Ho et al., 2002).

**Literature Review and Hypotheses Development**

This research adopts the conceptual review and research model developed by Rai et al. (2006) and Koh et al., (2007). The research model developed by (Rai et al., 2006) can be seen in Figure 1.

Based on the model, IT infrastructure integration is conceptualized as a formative construct with two sub constructs, i.e. data consistence and cross function SCM application integration. The construct supply chain integration process is also conceptualized as a formative construct with three sub constructs, i.e.: information integration flow, physical integration flow, and financial integration flow.
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Performance measurement is also conceptualized as a formative construct with three subdimensions, namely operational excellence, customer relations, and income growth. The research model consists of two hypotheses namely investigating the influence of IT infrastructure integration for SCM towards SC process integration and the influence of SC process integration on company performance.

The research also adopts the research developed by (Koh et al., 2007) as can be seen in Figure 2.

Source: (Koh et al., 2007)

Figure 2. Theoretical Framework of the Research

The research by (Koh et al., 2007) examines three hypotheses, namely the influence of SCM practice on the operational performance and organizational performance as related to SCM, and the influence of operational performance on the organizational performance as related to SCM.
Based on the research models developed by (Rai et al., 2006) and (Koh et al., 2007), this research tries to confirm the model with a focus on performance measurement for operational excellence dimension. The model developed in this research is shown in Figure 3.

The Influence of SCM IT Infrastructure Integration on SCM Process Integration

Flynn & Zhao (2010) define SCM Process Integration as the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes. The goal is to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer at low cost and high speed (Frohlich & Westbrook, 2001).

Kim (2009) use three level of supply chain integration, that are: company integration with supplier, cross functional integration within a company, and company’s integration with customer. While Flynn & Zhao (2010) conduct two type integration of SCM i.e. internal integration and external integration. Internal integration recognizes that different departments and functional areas within a firm should operate as part of an integrated process. Furthermore, Flynn & Zhao (2010) note that as its external environment (in a supply chain, the characteristics of its customers and suppliers) changes, a manufacturer should respond by developing, selecting and implementing strategies to maintain fit, not only among internal structural characteristics, but also with its external environment.

Rai et al. (2006) considered the integration of supply chain planning and execution application using enterprise resources planning (ERP) and customer relationship management (CRM) systems, together with consideration of infrastructure application for end-to-end management of supply chain. (Bagchi & Skjoeett-Larsen, 2003) conclude that SCM consists of the entire set of process, procedure, the supporting institutions, and business practices that link buyer and sellers’ market place. A supply chain involves four distinct as flows. These are: 1) requirement information from buyer to seller which triggers
all later activities, 2) the movement of goods from seller to buyer, 3) transfer of ownership right from seller to buyer, and 4) payment from buyer to seller.

Furthermore, Rai et al. (2006) found that IT integrity capability influences supply chain integration process. The planning application is designed to support on critical functions such as purchasing, production, transportation, and storage. The application is designed to support the execution of order, replacement, production and distribution management. The integrated IT platform needs a standard system for data, application and process integration (Ross, 2003). Fawchett & Magnan (2002) argued that an integrated IT platform is needed for SCM process integration to run efficiently. While Bowersox et al., (2000) suggest that SCM process implementation process needs a better understanding by setting up an integrated IT platform among partners. Furthermore, Qrunfleh & Tarafdar (2014), conclude from their study that particular supply chain strategy is supported by inter-organizational application that compatible with supplier information system. That is, unilateral or one-side adoption of the suggested application may not be an effective facilitator for implementing the particular supply chain strategy.

Consistently, the integrated execution application shows capability to increase supply chain expansion availability from process execution and global coordination. Therefore, supply chain integration, ERP, and CRM application should facilitate coordination of supplier and customer process with the company’s internal process. Based on previous studies, a hypothesis is formulated as follows:

\[ H_1: \text{IT infrastructure integration of SCM influence significantly on supply chain process integration.} \]

The Influence of SCM Process Integration on Operational Performance

Malhotra et al. (2005) states that companies need to achieve market focused performance which includes customer relationship and revenue growth. Customer relationship focuses on relations and loyalty between company and customer, and company awareness on the knowledge about preferences as related customers (Rai et al., 2006). Flynn & Zhao (2010) conclude that manufacturers should maintain a functional organization structure, customer orders flow across functions and activities. When an order is delayed, customers do not care which function caused the delay; they simply want to know whether the order has been fulfilled. This calls for an integrated customer order fulfillment process, in which all involved activities and functions work together. Information sharing, joint planning, cross-functional teams and working together are important elements of this process.

Rai et al., (2006) found that supply chain integration affects three dimensions of performance, namely operational performance, revenue growth, and customer relationship. Supply chain integration can improve a company’s time based competitive edge by shortening cycle time (Hult et al., 2004). Supply chain integration offers operational visibility, planning coordination, and material flow which could shorten time interval between consumer demand for a product or service and its delivery (Hult et al., 2004). This capability also shows positive impact on financial performance at the top level and middle.
area (Simchi-Levi & Wei, 2012), improves customer relationship, and enhances market growth Koh et al. (2007) investigated SCM practice from small and medium enterprises in Turkey by testing the relationship between SCM practice and operational and organizational performance.

There are inconsistency findings in the study relationship of SCM practice to performance. Some authors found no direct relationship between internal integration and operational performance (Gimenez & Ventura, 2005; Koufteros et al., 2005) but, others found a positive relationship between internal integration and operational performance, including process efficiency (Saeed et al., 2005) and logistics service performance (Germain & Iyer, 2006; Stank et al., 2001). Flynn & Zhao (2010) argue that internal integration is the base for SCI and will be positively related to operational performance. The research by Koh et al. (2007) shows that SCM practice has a significant impact on operational performance but it has an insignificant impact on organizational performance.

Speakman (2002) found that effective implementation of supply chain produces lower cost, higher return on investment (ROI), and better return level for stakeholders. Cagliano et al. (2006) tried to determine the empirical relationship between two supply chain integrations, namely information flow integration and physical flow integration with two programs for manufacture production improvement specifically lean manufacturing model and ERP system. The result shows that the adoption of lean manufacturing model brings a strong influence on information and physical integration, but no significant influence from ERP adoption. Based on previous studies, the second hypothesis is formulated as follows:

**H2: Supply chain process integration brings positive impact on a company’s operational performance.**

**Research Method**

**Population and Research Sample**

The population of this research are manufacturing companies operating in Indonesia, based on the manufacturing companies’ directory published by the Central Bureau of Statistics Agency in 2012. The sample is determined by purposive sampling technique under the criteria of having a large scale company and adopting SCM functions by utilizing digital technology. The large scale company definition based on the Central Bureau of Statistics Agency classification that the large scale company consisting of more than 99 employees (BPS, 2012).

Data collection was carried out by distributing questionnaires through an email survey between January to July 2013. The questionnaire was pre-tested several times to ensure that the wording, format, and sequencing of questions were appropriate. The respondents are top managers, and/or production managers, and/or R&D managers.
According Sekaran & Roger (2016), sample sizes larger than 30 and less than 500 are appropriate for most research. Therefore questionnaires was distributed to 500 large scale companies operating in the manufacture as respondents. Data for this study was collected using a self-administered questionnaire. One hundred fifty six of 500 questionnaires were returned in which 5 questionnaires were eliminated due to incomplete, so that 141 questionnaires or 28.2 percent could be further analyzed.

Research Instrument

Data were analyzed by developing a self-report survey instrument based on literatures. A systematic measurement was developed and validated for supply chain integration process and IT integration infrastructure which was first introduced in the research by (Rai et al., 2006). The previous measurement by Rai et al. (2006) and (Koh et al. (2007) has been used in this study.

Likert’s 5-scale was used in the question items of construct in which respondents were asked about his/her agreement by using a scale between 1 until 5. That scale represented by statements between “disagree strongly” to “agree strongly”.

Data Analysis Method

Data were analyzed by using Structural Equation Modelling (SEM), which is the only multivariate technique that gives simultaneous estimation from many equations and gives a comprehensive framework to estimate complex relationships (Hair et al., 2006). The model was analyzed based on SEM by using Smart Partial Least Square (PLS) software Ver.2 M3.

PLS recognizes two types of components in causal model, namely measurement model and structural model. The measurement model consists of relationships among variable items which can be observed by latent constructs measured with such items.

The test on model measurement is carried out using test phases by Moore & Benbasat (1991), namely the test on (a) individual item loading, (b) construct validity, and (c) internal consistency (reliability measurement). The structural relationship model consists of latent constructs that have theoretical relationships. This testing includes estimating track coefficients which identify powers of relationships between dependent and independent variables. The structural model testing to produce value of track relationship significance among latent variables by using bootstrapping function.

Measurement Model

The test of measurement model consists of testing of construct validity and internal consistency (reliability). Testing of construct validity consists of convergent and discriminant validity. Convergent validity refers to the existence of correlations between the different instruments that measure the same constructs. Convergent validity can be seen from the Average Variance Extracted (AVE) that AVE is a variant of the test range between a construct and the indicator. Convergent validity when constructs have AVE fulfilled with a minimum threshold of 0.5 (Fornell & Larcker, 1981). The result of convergent validity...
analysis indicates that all constructs have AVE which are more than 0.5, as shown in Table 1. Referring to the criteria established, it can be said that the convergent validity are valid.

Table 1. Average Variance Extracted, Cronbach Alpha and Composite Reliability

| Construct | AVE   | Composite Reliability | Cronbach Alpha |
|-----------|-------|-----------------------|----------------|
| Infrastructure IT Integration for SCM (ITISCM): | 0.6212 | 0.8909 | 0.8464 |
| Data Consistency (CD) | 0.691 | 0.8153 | 0.578 |
| Cross-functional integration (CFI) | 0.6675 | 0.8889 | 0.8325 |
| SCM Process Integration (SCMPI): | 0.6393 | 0.8417 | 0.718 |
| Financial Flow (FF) | 0.8852 | 0.9391 | 0.8708 |
| Physical Flow (PF) | 0.7059 | 0.8264 | 0.6009 |
| Information Flow (IF) | 0.6455 | 0.845 | 0.7303 |
| Operational Performance (OP) | 0.534 | 0.9015 | 0.8761 |

To assess discriminant validity carried out with the procedures that each item in the construct must have a high loading and cross loading on the constructs should be lower than the loading items in a construct that is measured. Cross-loading values can be seen in Table 2.

Table 2. Value of Item Cross-Loading

| CD | CFI | FF | PF | IF | OP |
|----|-----|----|----|----|----|
| CD1 | 0.9204 | 0.5877 | 0.2849 | 0.2914 | 0.2077 | 0.3701 |
| CD2 | 0.7314 | 0.3787 | 0.0483 | 0.2161 | 0.089 | 0.3064 |
| CFI1 | 0.5259 | 0.8734 | 0.4139 | 0.4501 | 0.4225 | 0.394 |
| CFI2 | 0.4527 | 0.8446 | 0.2867 | 0.457 | 0.3495 | 0.3486 |
| CFI3 | 0.5417 | 0.7973 | 0.2455 | 0.357 | 0.2366 | 0.3397 |
| CFI4 | 0.4407 | 0.7471 | 0.3615 | 0.4623 | 0.3503 | 0.4351 |
| FF1 | 0.2102 | 0.3616 | 0.9336 | 0.3711 | 0.2368 | 0.284 |
| FF2 | 0.228 | 0.3914 | 0.948 | 0.3447 | 0.2911 | 0.3409 |
| PF1 | 0.2727 | 0.4426 | 0.2701 | 0.7601 | 0.4331 | 0.4662 |
| PF2 | 0.2599 | 0.4559 | 0.358 | 0.9133 | 0.5224 | 0.4479 |
| IF1 | 0.1 | 0.3811 | 0.1425 | 0.5148 | 0.833 | 0.4244 |
| IF2 | 0.2039 | 0.3528 | 0.3215 | 0.4842 | 0.822 | 0.4673 |
| IF3 | 0.1688 | 0.2495 | 0.2164 | 0.3496 | 0.7528 | 0.41 |
| OP1 | 0.2855 | 0.3188 | 0.2474 | 0.4032 | 0.4021 | 0.7729 |
| OP2 | 0.3006 | 0.3049 | 0.2603 | 0.2716 | 0.326 | 0.7102 |
| OP3 | 0.267 | 0.2643 | 0.1853 | 0.2617 | 0.3339 | 0.7011 |
| OP4 | 0.0991 | 0.3247 | 0.3188 | 0.3886 | 0.5034 | 0.7126 |
| OP5 | 0.3502 | 0.4731 | 0.3402 | 0.5118 | 0.4421 | 0.7128 |
| OP6 | 0.3793 | 0.3596 | 0.2184 | 0.3574 | 0.3022 | 0.7336 |
| OP7 | 0.3922 | 0.343 | 0.1607 | 0.4064 | 0.3448 | 0.7515 |
| OP8 | 0.3374 | 0.2745 | 0.1773 | 0.4206 | 0.4273 | 0.7482 |

Resources: primary data processing
Loading values are given in bold to indicate items loading with the construct that is measured. Discriminant validity is valid if the value of the items loading on the construct is higher than the value of loading on the other constructs. By looking at the Table 2, it is known that discriminant validity is fulfilled because the value of the items loading with the construct measured (bold) was higher than the value of the items loading with other constructs.

The next test of internal consistency (reliability) is assessment using Cronbach Alpha and Composite Reliability (Fornell & Larcker, 1981). Reliability of measurement to indicate the existence of a sufficient convergence or the existence of internal consistency is a measure of correlation between items. Internal consistency implies the number of items that measure a single construct and interlinked with other items. Based on Table 2 it is known that the requirement of reliability in the composite indicator of reliability have been met as indicated by values greater than 0.7 (Hair et al., 2006).

Based on the indicators in Cronbach alpha, construct consistency of data (KD) has a Cronbach Alpha value below the amount required is equal to 0.578. Nevertheless, the composite reliability indicator is sufficient to assess reliability. Chin & Gopal (1995) suggest that Cronbach Alpha is only a lower limit estimate of internal consistency (lower bound reliability estimate), so that the composite reliability estimates have the better ability to assess reliability. Though these constructs satisfy the internal consistency, it should be emphasized that this is not essential requirements for formative constructs (Jarvis et al., 2003). Thus, from some measurement tests have that been performed, both by conducting the validity test and the reliability test, the data used show a good quality instrument.

**Structural Relationship Model**

The second stage is structural model test by using statistical significance examination to explain the hypothetical relationship and the relative weight of each indicator in creating a formative construct. The significance value is determined based on the statistical t value and p value. The result is significant if the t value is higher than the value of t table, while the p value is less than 0.01 or 0.05. The result of structural model can be seen in Figure 4.

Based on the result of structural relationship model test, it was found that there are two insignificant track coefficients. At the level of indicator construct, there is an insignificant relationship between financial flow (FF) sub construct and SCM process integration construct (SCMPI). It was also found that there is an insignificant relationship between IT integration construct for SCM (IITISCM) and SCM process integration construct (SCMPI), while other path coefficient relation constructs are significant.
Another indicator used for the predictive capability of the model is the form of $R^2$ (Chin & Gopal, 1995; Thompson et al., 1995). The value of $R^2$ is interpreted in the same way as that in a double regression analysis (Rai et al., 2006). This value indicates the number of variants in the construct explained by the path coefficient in the model (Thompson et al., 1995). The result indicates that the model explains 31.2 percent in operational performance, as shown in Table 3.

Table 3. Course Coefficient Result

| Relationship       | T Statistics | P Value       |
|--------------------|--------------|---------------|
| CD -> IITISCM      | 12.2691      | 0.0000000031** |
| CFI -> IITISCM     | 51.2076      | 0.0000000201** |
| IITISCM -> SCMPI   | 0.2805       | 0.3896049730  |
| PF -> IPSCM        | 13.1806      | 0.0000000034** |
| IF -> IPSCM        | 21.5198      | 0.0000000073** |
| FF -> IPSCM        | 0.1183       | 0.4529387340  |
| IPSCM -> OP        | 6.9896       | 0.0000000122** |

Testing was carried out on significance level of one-tile testing
***) significant at $p < 0.01$; *) significant at $p < 0.05$

Results and Discussion

Based on $H_1$ testing, it is shown that IT integration for SCM is not a significantly positive influence on SCM process integration. This result is in line with the research by Rai et al. (2006), where SCM process integration can be implemented without the support of an integrated IT platform. Devaraj & Kohli (2003) and Poirier (2003) also failed to find
clear IT effect, a phenomenon which has been called the “IT paradox”. Similar with this finding, Lim et al. (2004) called this phenomenon as “productivity paradox of information technology”. Dehning & Richardson (2003) also recognition that overarching performance metrics are affected by numerous factors other than the focal IT implementation. Numerous explanation have been offered for it, such as management’s failure to leverage the full potential of IT (Santos & L. Sussman, 2000), ineffective implementation (Stratopoulos & Dehning, 2000), and the presence of a time lag between IT investment and its actual impact on performance (Devaraj & Kohli, 2003). Lia et al., (2009) also add that supply chain integration is not synonymous with IT implementation. Supply chain integration is a result of human interactions which can be supported but not replaced by IT.

Nevertheless, in relation with the significance of two formative indicators, i.e., data consistence and cross-function integration, the result indicates that there are two important elements in IT infrastructure integration for SCM as indicated by the substantial level of significance at p < 0.01, as describe in Figure 4.

Based on of H2 testing, it is shown that SCM process integration gives positive influence significantly on operational performance. This result is in line with the research by Rai et al. (2006) found the influence of SCM Process Integration to SCM on company performance, especially for operational excellence sub construct. Similarly, (Kim, 2009) found that achievement of superior supply chain performance, i.e., cost, quality, flexibility, and time performance, requires cross function internal integration and external integration with supplier or consumer. Patnayakumi et al. (2002) also concluded that the effectiveness of SCM potentially influences organization performance in several dimensions, from operational performance up to strategic performance. The integration across supply chain is able to produce several benefits, such as low inventory, short time order process, on-time delivery, low operational cost, and product-service customization. Low inventory and operational cost can increase productivity and financial gain. Information flow integration not only reduce time and waste in supply chain, but also produce better information quality regarding the customer and improvement of service excellence to the customers.

Furthermore, Flynn & Zhao (2010) also argue that internal integration is the base of Supply Chain Integration and will be positively related to operational performance, customer and supplier integration. For example, a close relationship between customers and the manufacturer offers opportunities for improving the accuracy of demand information, which reduces the manufacturer’s product design and production planning time and inventory obsolescence, allowing it to be more responsive to customer needs. Flynn & Zhao (2010) also conclude that close relationship between customers and the manufacturer offers opportunities for improving the accuracy of demand information, which reduces the manufacturer’s product design and production planning time and inventory obsolescence, allowing it to be more responsive to customer needs. Similarly with another previous scholar Lia et al., (2009) also reported that IT implementation affects SCI directly and SCI has a positive effect on Supply Chain Process. Devaraj et al., 2007 also suggested that supplier integration leads to better supply chain process.
In relation to the three formative indicators of SCM process integration construct, it is found that there is a significant influence on information flow and physical flow sub-constructs, meanwhile, financial flow integration indicator is not found significant in shaping SCM process integration construct. It is mean that financial flow integration does not contribute in the influence of SCM process integration on operational performance. In the study of Rai et al., (2006) conclude that information flow has a higher significance level compared to physical flow. Whereas in this research, the significance level is found similar on both information flow and physical flow.

**Conclusion**

The research found that IT integration for SCM does not significantly influence on SCM process integration. The result indicates that although IT integration for SCM takes place, namely data consistence and cross function application integration, it does not affect SCM process integration since there has not been any internal integration both inter-department within the company.

The research also found that SCM process integration affects company operational performance significantly. The result indicates that combination of information flow and physical flow needs to be optimized, since both of them will increase company operational performance.

**Implication, Limitations and Future Research**

The findings suggest that the company should implement SCM since SCM practices has a significant impact on the operational performance. Managerial initiative should be directed for developing SCM process integrating and creating capability for integration of resource flows between firm and its supply chain partners.

In implementation of SCM, IT infrastructure integration, especially two elements of IT infrastructure, i.e., data consistence and cross function application, is needed for effective communication among company, consumer and supplier to arrange accurate amount of supply and demand. Without information integration, the company tends to communicate with supplier and customer in an asymmetry information, which causes operational inefficiency and higher transaction risk as well as increased operational cost. An asymmetry information potentially reduces the information sharing needed for planning and forecasting. The information flow integration is expected to reduce operational cost, increase productivity that are able to improve company operational performances as well as enhance customer relationships that potentially increase income growth.

There are several research limitations that need to be addressed. First, the research only focused on large scale manufacturing companies operating in Indonesia so that the result tend to limited generalizability. For further research needs to extend in Small and Medium Enterprises (SMEs) as well as in non-manufacturing industry which have
implemented SCM in order to achieve the generalizability for SMEs and non-manufacturing companies. Second, the study was used a subjective measurement of the operational performance. For further research needs to incorporate objective measurements of operational performance. Third, the respondents used a self-report questionnaire of their perception that could be possible biases. For further research, it needs to be combined between self-report questionnaire and interview with some respondents.

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