

## **Green Supply Chain Management and its Impact on Construction Sector Small and Medium Enterprises (SMEs) Performance: A Case of Indonesia**

Wiwiek Rabiatal Adawiyah, Bambang Agus Pramuka, Najmudin and Dian Purnomo Jati  
Faculty of Economics and Business, Universitas Jenderal Soedirman, Purwokerto, Indonesia

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**Abstract:** The purpose of this study is to determine the underlying dimensions of Green Supply Chain Management (GSCM) practices and to empirically test a framework identifying the relationships among GSCM practices, operational performance and GSCM-related organizational performance with special emphasis on Small and Medium size Enterprises (SMEs) in Banyumas Central Java Indonesia. The instrument used in this study is a questionnaire encompassing three major parts. The research framework was tested using multiple regressions. The results indicate that all factors of GSCM have positive impact on operational performance. Moreover, all GSCM practices except outsourcing, significantly influence SCM-related organizational performance. Also, six sigma practice was found significant and it appears to be the most influential factor on SCM-related organizational practices. Perhaps, this study is among the first to bring into surface the issue of green supply chain management practices in the context of small and medium enterprises construction sector in Indonesia.

**Key words:** Supply chain management, organizational performance, small and medium-sized enterprises, instrument, Indonesia

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### **INTRODUCTION**

Supply Chain Management (SCM) is a management area developed from the business practice which is now undergoing a process of transformation (Melnik *et al.*, 2009). Many business practitioners, researchers and academicians begin to realize the importance of effective SCM implementation and recognize the impact of SCM on the functional performance of business such as lead time, cost, quality, flexibility and financial performance of a business (Carr and Pearson, 2002; Elmuti, 2002; Goebel *et al.*, 2003; Ogden *et al.*, 2005; Giunipero *et al.*, 2006). SCM has historically been regarded as the only system-related to problems of purchasing and managing the flow of orders and information with suppliers. Today managers in charge of supply chain are required to: Improve their services; enhance the sustainability of their supply, reduce their business exposure to anticipate the risk of supply chain, improve new product design process; reduce environmental waste, increase environmental awareness and to contribute towards improving the quality of products and services (Goebel *et al.*, 2003; Sheffi, 2005). To achieve these objectives, managers should start to adopt green supply

management. Despite the issue of supply chain management as a form of business development and field of academic study has been around for sometimes, research in this area is still scarce (Gibson *et al.*, 2005; Storey *et al.*, 2006).

Demand for green products is increasing now a days; therefore, the sustainability of a business shall depend heavily upon their concern towards environmental issues (Rao, 2007). Report from the World Bank (2008) revealed that Indonesia has lost about 40% of its tropical forests since the last 50 years with deforestation rate of about 1.8% per year. Between 2000-2005, 1.8 million ha of forests in Indonesia was damage (equivalent to 8 times the size of football fields per minute). Even Jakarta was ranked second after Beijing as a city with the most severe level of pollution.

One form of business awareness on environmental issues is through the implementation of green supply chain management as a business innovation which attract attention lately (Rao, 2007). Every firm is responsible for their employees's actions and the environmental concerns of suppliers and business partners (Bacallan, 2000). Implementation of Green Supply Chain Management (GSCM) can help companies to control and resolve potential environmental problems which may be incurred

by the suppliers. As a consequence, GSCM can minimize the impact of production activities on the environmental damage in Indonesia.

Some researchers conclude that the practice of SCM is a strategic choice of business organization because of its potential in creating value (Watanabe, 2001; Gimenez and Ventura, 2003; Li *et al.*, 2006). Meanwhile Frohlich and Westbrook (2002) conclude that integrated supply chain practice shall improve operational performance, delivery time and transaction cost efficiency. This view is also supported by Gonzalez-Benito (2007) which concluded that SCM practice affects the operational performance from purchasing perspective. A similar phenomenon is found in Indonesia. Nonetheless, not all of SCM practice leads are successful (Kim, 2006). In Indonesia for example, failures in SCM practice are due to weak collaboration, low level of integration and coordination among all elements involved in the SCM. Differences in some previous studies has raised up the need to test the consistency of SCM adoption in different contexts such as on a smaller scale business.

Industrial and household waste are among the main causes of pollution in Indonesia which implies poor business awareness on the environmental safety. High pollution in return shall endanger human life. Therefore, environmental issues should become everybody's concerns that must be addressed immediately. Moreover, there is a need to study the multiplier effect caused by unfriendly environmental behavior of all parties involved in business. Thus, every business activities should be linked to the three R of waste management namely: reducing, re-using and recycling. Go green behavior can be used as one of business strategy in implementing SCM (Kotler, 1997).

Majority of researches on SCM in Indonesia were carried out on large companies (Handayati *et al.*, 2010), despite of the fact that small enterprises are also possessing ability to produce high quality goods and services at a cheaper price similar the products or service offered by large companies. Moreover, SMEs has helped to increase the competitiveness of the supply chain as a whole (Thakkar *et al.*, 2009). To this end, SMEs can no longer be isolated in terms of their technological implementation, management and marketing action.

The purpose of this study is to analyze dimensions of green SCM practice and to empirically test the relationship between GSCM practice, SCM, operational performance and organizational performance-based SCM on SMEs of the construction sector in Banyumas Central Java Indonesia. Although, the environment in which

SMEs operate are very different from that of larger companies, some literatures have discussed the issue of SCM practices by SMES and its impact in developing countries (Koh *et al.*, 2007) such as Indonesia. In some countries, SMEs provide strong support for larger companies (Huin *et al.*, 2002). The success of SMEs has a major impact on economic growth in Indonesia, however the number of research on the implementation of GSCM by SMEs is still limited. Almost all research on SCM in Indonesia were conducted for larger-scale enterprise, therefore, this study aims to enrich the literature by providing data and result of empirical study on the relationship between GSCM and performance of SMEs in the construction sector.

Construction business is not only dealing with property development but also overall environmental development. Along with the increasing expansion of the business, it is necessary to find appropriate ways to face market competition, one of them is by applying the concept of environmental care (Zulhumadi *et al.*, 2010). According to data published by Statistical Beaureau of Central Java Province (2006), the number of construction businesses in Banyumas was 378 SMEs equivalent to 3.6% of the industry in Central Java Province. Its substantial number will certainly raised environmental issues in the region. Based on the phenomena and research gap, the study on the implementation of GSCM and its impact on organizational performance are essential.

### **Literature review**

**Organizational performance related to SCM:** The short-term goal of supply chain management is to increase productivity and to reduce inventory level and lead time while long-term goal of SCM is to increase market share and supply chain integration for all members involved in the supply chain (Li *et al.*, 2006; Lyons *et al.*, 2004). One indicator of effective supply chain in the market is the efficient use of chain resources which result in lower production costs, better quality goods and higher response rate. These advantages shall lead to increase market share. Supply chain benchmarking practice will provide an opportunity for companies to increase sales. If position of companies was not dominant in the market, supply chain benchmarking practice would provide an incentive to move towards a better direction which finally increase sales. The adoption of online purchasing (e-procurement) will assist a company in terms of more accurate cost calculations. This can be achieved through real time evaluation and up to date information about the buyer and seller (Rao, 2007). Cooperating with fewer

suppliers will help to reduce the number of transactions per purchase. The application of just in time supply principle will reduce maintenance costs that are difficult to predict.

Strategic planning will enhance the integration between multiple departments within an organization through acquisition and sharing of information. SCM practice would reduce barriers among departments and result in the overall planning of organization level. The use of fewer suppliers principle would result in close partnership with the suppliers and purchasing practice via online (e-procurement) would improve coordination among suppliers. Through, the establishment of strong partnerships with suppliers, products, processes and technology innovation can be achieved through joint activities in new product development and joint efforts in reducing lead time. Such partnerships are not only benefit for suppliers and customers but also improve the coordination among suppliers as a result of SCM control systems (Helo and Szekely, 2005). With e-procurement practice, the process of order can be streamlined and automated. Transactions can be managed centrally so it can increase in coordination with suppliers through information technology (Rahman, 2004). This can be achieved through the establishment of a close partnership with customers. For example, orders from potential customers can be negotiated and clarified together (Wu *et al.*, 2004). Through this approach, the change in orders and design can be done quickly, so that the product can be shipped to customers faster.

**Green supply chain management:** Issue of GSCM is critical for the successful implementation of industrial ecosystems and industrial ecology. Waste and emissions released by the supply chain has become a major source of environmental issue including global warming and acid rain (Bloemhof-Ruwaard *et al.*, 1995). GSCM practices combine green purchasing, green manufacturing (raw materials management), green distribution (marketing) and reverse logistics.

The company has a variety of reasons for implementing GSCM ranging from just a policy that is reactive to a proactive approach to gain competitive advantage. From the standpoint of environment-friendly organization, it is important to understand the situation and any issues that arise in this environment-friendly management. The main purpose of implementing GSCM principle is to improve environmental and financial performance (Keoy and Hassan, 2009). However, GSCM has a very broad concept that is difficult to define the

limits (Sarkis, 2009). Keoy and Hassan (2009) stated that the scope of GSCM includes management of internal and external environment get back the investment and practice design of environment.

The results of previous studies found that some of terms appear in the last 20 years such as green design, green manufacturing, reverse logistics, green operations and waste management (Srivastava, 2007). The main objective of going green (environmentally friendly behavior) is to increase profit and reduce cost effect and at the same time to concern about environment (Srivastava and Srivastava, 2006; Darnall *et al.*, 2008).

Because the supply chain is an integrative system, it's necessary to discuss all components involved in the supply chain by considering the demand and supply (Welford *et al.*, 1997). Therefore, application of GSCM is not only consideration on processes occurring in the company but also occurring outside the company. In a whole, the components of supply chain are a function of purchase in-bound logistics, production, distribution including out-bound logistics and marketing and reverse logistics. Majority of companies are still focus on activities occurring inside the company (purchasing, in-bound logistics and production). This is understandable considering third elements of supply chain that popular with value chain concept (Porter, 1985) are still in the internal organization so that made it easier to control. The last element, i.e., reverse logistics is a relatively rare component available in the supply chain. This element addresses how the product flow direction opposite to the direction of products movement generally originated from the company to the customer. Recycled products move from customer to manufacturer. This flow is very different from product stream which generally moves from the manufacturer to the customer.

**Supply chain in small and medium enterprises:** One of the most important issues is whether it is possible to implement GSCM in small business? Research by Murphy showed that small companies are less keen to implement green programs than large companies. They have limited resources to implement those programs. Large companies find it is more sensitive to implement environmentally friendly activities for the publication of large companies activities and exposed to the public more easily than small companies (Ahmed *et al.*, 1998). However, it does not mean that small companies did not have opportunity to apply environmentally friendly activities. Larger companies that make small companies as partners or

suppliers are willing to provide mentoring, guidance and consultation through partnership activities (Champion, 1998).

With the difference in character between large and small companies, an investigation into GSCM practices is an interesting topic to be studied in empirical research. In addition also needs to analyze factors driving and constraining that can facilitate small companies to be more involved in environmental concern.

**MATERIALS AND METHODS**

The subjects studied were SMEs in construction sector in Banyumas. The data used were primary data which were collected through questionnaires and interviews. Purposive sampling technique was adopted by involving only those construction companies that has been in operation for at least 1 year.

This research was quantitative in nature. Pearson correlation and Cronbach Alpha were used to test the validity and reliability of the instrument used. Furthermore to analyze the relationship between the independent and dependent variables multiple regression technique was employed. The variables operational definitions are as follows.

Organizational performance-based SCM is an increase in productivity and reduction in inventories and lead time that lead to market domination and supply chain integration for all members involved in the supply chain (Li *et al.*, 2006; Lyons *et al.*, 2004). The following items are indicators used to measure organizational performance relating to SCM: increased sales, more accurate financing, increased coordination among departments, increased coordination among suppliers and increased coordination with customers.

Operational performance is an attempt to create a major source of competitive advantage for company to deliver more value to customers when compared to its competitors through lower production costs to obtain a higher return (Christopher, 1992). Operational performance indicators in this study are flexibility, reduced lead time in production, forecasting, resource planning and cost savings and reduction in inventory levels.

SCM practice involves a series of activities in the organization to achieve effective SCM. SCM measurements in this study are adopted from study of Li *et al.* (2006) which consist of a strategic supplier partnership, customer relationships, information sharing, information quality and internal lean practices. SCM indicators in this study consist of a close partnership with

suppliers, a close partnership with customers, just in time, strategic planning, supplier chain benchmarking, few suppliers have a safety stock and sub contracts, online purchasing (e-procurement), outsourcing and third party logistics and many suppliers.

Green supply chain management is combination of green purchasing, green raw materials management, green distribution/marketing and reverse logistics. Indicators used to measure the GSCM in this study are green marketing, green packaging, green transportation and green waste management.

**RESULTS AND DISCUSSION**

The total numbers of samples in this study are 94 SMEs of construction sector located in Regency Banyumas. Types of products produced by SMEs in construction sector are in the form of property building, apartments, shops, roads and water drainage. Description of SMEs products can be seen in Table 1.

Based on the data in Table 1, it appears that 55.3% of SMEs are developing property (housing), 3.2% specialize in apartments building, 7.4% make shops, 7.4% make roads, 2.1% build water drainage and the remaining 24.5% work on >1 type of products. The types of customers served by SMEs of construction sector are individuals 67%, government 8.5 and 24.5% are serving both individual customers and government agency.

SMEs size classification in construction sector based on the number of employees can be seen in Table 2. A total of 66 SMEs, equivalent to 70.2% have <25 employees, amounting to 23.4% of SMEs have employees between 25 and 50 people and the remaining 6.4% employing >50 people. This shows that the size of companies mostly is categorized in the small business category. Furthermore, asset value of SMEs ranged from IDR 100 million to IDR 1 billion as shown in Table 3.

Based on the length of business operation (age of the business), majority of SMEs (about 66%) has been

**Table 1: Type of products produced by SMEs in construction sector**

Product types	Frequency	Percentage
Property	52	55.3
Apartment	3	3.2
Shops	7	7.4
Roads	7	7.4
Water drainage	2	2.1
>1 product	23	24.5
Total	94	100.0

**Table 2: No. of employees of SMEs in construction sector**

Employees (people)	Frequencies	Percentage	Cumulative (%)
<25	66	70.2	70.2
25-50	22	23.4	93.6
>50	6	6.4	100.0
Total	94	100.0	

Table 3: Asset value of SMEs in construction sector

Asset value (million)	Frequencies	Percentage	Cumulative (%)
<100	2	2.1	2.1
100-150	12	12.8	14.9
150-1,000	45	47.9	62.8
>1,000	35	37.2	100.0
Total	94	100.0	

Table 4: Age of SMEs in construction sector

Age (year)	Frequencies	Percentage	Cumulative (%)
<5	62	66.0	66.0
5-10	15	16.0	81.9
10-15	14	14.9	96.8
>15	3	3.2	100.0
Total	94	100.0	

Table 5: Effect of SCM practices on operational performance of SMEs

Variables	Coefficient	t <sub>statistic</sub>	Probability
Process quality	0.201	6.802	0.000
Green raw material	0.334	13.151	0.000
Supplier quality	0.509	6.990	0.000
Environmental impact	0.334	5.609	0.000
Six sigma practice	0.237	2.519	0.014
Outsourcing	0.175	-5.330	0.000
R <sup>2</sup>	0.960	-	-
F <sub>statistic</sub>	-	340.844	-

operating for <5 years old, amounting to 16% has been around between 5 and 10 years, amounting to 14.9% has conducting their business between 10 and 15 years and the remaining 3.2% has been in action for >15 years as shown in Table 4.

According to Quayle (2003), SMEs performance is determined by the market commercialization and purchasing expansion plan. The ability of SMEs to survive is determined by their ability to produce low cost products in a fastly with minimum errors and fewer usage of raw materials. Therefore, SCM aims to create a major source of competitive advantage for companies in order to provide value added in the customers point of view when compared to its competitors through low production costs to obtain higher earnings (Christopher, 1992). Indicators of operational performance in this study are flexibility, reduced lead time in production, forecasting, resource planning and cost savings and reduced inventory levels.

The result of regression analysis on the effect of SCM practices on operational performance of SMEs was listed in Table 5. From the result, it is proven that the dimension of Supply Chain Management (SCM) practices is able to explain 96% of the company's operational performance. All variables are significant at the level of 0.01, except for six sigma practice which is significant at the level of 0.05. In addition, supplier quality is a factor that mostly affect the company's operational performance with a beta coefficient of 0.509. According to Koh *et al.* (2007), SCM practices is expected to improve the operational performance of the business through

Table 6: Effect of SCM practices on organizational performance related to GSCM

Variables	Coefficient	t <sub>statistic</sub>	Probability
Process quality	0.134	2.423	0.017
Green raw material	0.185	2.558	0.012
Supplier quality	0.360	6.332	0.000
Environmental impact	0.296	4.218	0.000
Six sigma practice	0.437	7.054	0.000
Outsourcing	0.062	0.603	0.548
R <sup>2</sup>	0.914	-	-
F <sub>statistic</sub>	-	154.595	-

flexibility, reduced lead times, forecasting, resource planning, cost efficiency and reduced inventory levels. The result is consistent with a study by Koh *et al.* (2007) concluded that SCM practices affect various aspects of operational performance.

The relationship between financial and non-financial indicators as a proxy for organizational performance has long been discussed in the literature of organization and strategy. York and Miree (2004) argues that non-financial indicators such as quality improvement, innovation and resource planning will reduce costs and therefore, have a positive influence on the financial performance of company.

Table 6 presented the result of regression analysis on the influence of SCM practices on organizational performance related to GSCM. It appears in the study that the dimension of Supply Chain Management (SCM) practices is able to explain 91.4% of the organizational performance related to green supply chain management. Five variables are significant at the level of 0.05 except for outsourcing. In addition, six sigma practices is a factor that mostly affect the company's organizational performance with a beta coefficient of 0.437.

## CONCLUSION

This study provides empirical justification on SCM practices framework for SMEs in construction sector and its relationship with operational performance and GSCM-related organizational performance. The result showed that the SMEs of construction sector has demonstrated some SCM practices such as process quality, green raw material, multi-supplier, environmental impact policy, six sigma practice and outsourcing policy. Furthermore, the result showed a positive relationship between SCM practices and operational performance of SMEs and a positive relationship between SCM practices and GSCM-related organizational performance.

## RECOMMENDATIONS

This research enhances theory development in the field of quality management, especially concerning the

environmental issue. This study can be used as a particular reference on the issue of green supply chain management by SCM managers, production managers and the authority as it brings to surface the issue of environment in supply chain management practices. By developing and validating a multi-dimensional construct of SCM practices and by exhibiting its value in improving operational performance of SMEs, it provides SCM managers with useful tool for evaluating the efficiency of their current SCM practices. Second, the analysis of the relationship between SCM practices and operational performance indicates that SCM practices might influence operational performance of SMEs. Managerial implications of this study are: first, there is a need to develop a multi-dimensional indicator of SCM practices which can later be used as a tool by managers of SMEs to evaluate the efficiency of their current SCM practices; second, a significant relationship between SCM practices and the company's operational performance shows that the success of SCM-related organizational performance is determined by the extend of supply chain managers ability to improve the overall company's operational performance. This study has several limitations, one of which is the focus of study only on SMEs in construction sector. Further study can be directed towards SMEs operating in food sector which is continuously growing in number and therefore shall affect their environment due to careless waste management. Thus, a road map of study on SCM adoption by SMEs are necessary in order to develop a pattern research in kinds for SMEs in other sectors. To get a better result, the method of data collection can be combined with in-depth interviews.

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