

Effect of Internal Green Supply Chain Practices on Environmental Performance of SMEs of Wooden Furniture Industry

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Abstract— This study has two objectives. First, this study aims to find out the current situation regarding the implementation of GSCM practices among Small and Medium Enterprises (SMEs) of wooden furniture industry in three regions in Central Java Province (Semarang, Jepara, and Kudus). Second, this study aims to explore the differences of the effect of the implementation of GSCM practices on environmental performance. The study used primary data through questionnaires enclosed with the Likert scale 1-5 at 142 SMEs of wooden furniture. There are 6 hypotheses and each hypothesis will be tested on the different scale (small and medium scale of the enterprise) and type of enterprise (enterprise with the indoor and outdoor product). Hypothesis testing is done by multiple linear regression and operated by SPSS 16. The rate of implementation of GSCM practices shown in our investigation is still moderate. In this case, on average, the surveyed SMEs has been reaching the stage of considering to implement for more than 90% of proposed GSCM practice. Only two of GSCM practices is in the stage of initiated to implement and only one of GSCM practices has been reaching the stage implementing successfully. Thus, this study also found that the relationship between implementation of GSCM practices and environmental performance do not always significance..

Index Terms— GSCM practices, environmental performance, Semarang, Jepara, Kudus

I. INTRODUCTION

THE furniture industry has emerged as one of the manufacturing sectors which largely contributes to the national economy in Indonesia and it has a socioeconomic importance in terms of workforce. The total value of Indonesian furniture and related products exports reached \$1.79 billion USD in 2012 [1], [2]. Thus, related with the number of workforces, the furniture industry employs approximately two million people directly, and an additional eight million workers indirectly [3].

Recently, the furniture industry faced with the issues of

the environmental impact as the consumers both at home and abroad seek out environmentally friendly products. Environmental consideration has a major influence on many people in their daily life, including the way consumers buy and use products [4]. Moreover, abroad markets need not only cheap products with a high variation but also that manufactured by companies that guarantee the environmental sustainability in which importers can conduct more stringent oversight [5]. Basically, the environmental impact of the furniture are many and varied and depend on the nature of the furniture and raw material used in furniture manufacturing. As an example, one of the important issues of the environmental impact faced by the wooden furniture industry is using the timber as raw material. The use of timber is accused as one of the important factors that contributed to the illegal logging that has been increasing the rate of the deforestation in Indonesia to 1.8 million hectares per year [6]. In general, according to the life cycle approach, the most important environmental impacts of furniture industry can be divided into three group, namely energy and raw material consumption, emission of chemical substances, and waste generation [7], [8], [9]. To overcome the environmental impact of the furniture industry, there are currently various voluntary instruments that can help enterprise in the furniture industry to improve the environmental performance of their product and production processes, such as eco-design, reuse and recycle the wood waste, environmental management systems, or to encourage the purchase of products that are environmental-friendly like eco-labeling. Eco-labelling is a relatively new trend and one of the effort to inform the customer about the environmental friendliness of a product [10].

It seems that the various voluntary instruments to help furniture industry for improving their environmental performance are related to the implementation of green supply chain management practices. It can be seen from the definition of green supply chain management and its practices. According to reference [11], green supply chain management (GSCM) can be seen as integrating environmental thinking into supply chain management, including product design, material sourcing, and selection, manufacturing process, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life. Thus, the GSCM practice is a multi-dimensional concept which can be measured from different perspectives and the different dimensions of GSCM practices have been highlighted in the past literature according to several researchers, such as [12], [13], [14], [15], [16], [17]. The most popular concept of the dimension of GSCM practice was expressed by Zhu and Sarkis [18]

Manuscript received Jan 21, 2017; revised April 13 2017. This work was supported in part by the Indonesia Ministry of Research, Technology and Higher Education under Hibah Strategis Nasional (sponsor and financial support acknowledgment goes here).

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and Zhu et al [19]. According to reference [8] and [19], there were a five-dimension of GSCM practices, namely internal environmental management (IEM), green purchasing (GP), cooperation with the customer (CC), eco-design (ECO), and investment recovery (IR). Whatever the dimension of GSCM practices, as we have explained before, the main objective of implementation of GSCM practices, as well as the main measure of its effectiveness, must be its ability to improve the environmental performance of the companies that adopt this approach and of their business partners [20]. Reference [18] analyzed survey data from 186 respondents on GSCM practices in Chinese manufacturing enterprises and found that higher levels of adoption of GSCM practices lead to better environmental performance. Moreover, a recent study carried out by reference [21], based on a sample of 100 interviewed organizations, found evidence of the effect of a proactive GSCM on environmental performance.

Basically, from the preliminary study, the implementation of GSCM practices has been done by several Small and Medium Enterprises (SMEs) in Semarang, Jepara, and Kudus to improve the environmental performance of their production process. According to our preliminary survey, some of SMEs of wooden furniture industry in Semarang, Jepara, and Kudus had reuse and recycle the waste from wood to make an accessory of the furniture, or combine the waste to make another product, or use the waste to make a handicraft. Besides that, without they realize, some of SMEs has been considering the environmental impact when they make the decision regarding product design or purchasing. So, related to several implementations of GSCM practice by SMEs of wooden furniture in Semarang, Jepara, and Kudus and the effect of GSCM practice on environmental performance from the previous researchers, this study has two purposes. First, this study aims to find out the current situation regarding the implementation of GSCM practices among enterprise of wooden furniture industry in three regions in Central Java Province (Semarang, Jepara, and Kudus). Second, this study aims to explore the differences of the effect of the implementation of GSCM practices on environmental performance. This study chooses Semarang, Jepara, and Kudus as an object of study because their capacity on wooden furniture; Semarang, Jepara, and Kudus are some area in Central Java Province with rapid growth in the wooden furniture industry [22], [23]. Thus, the SMEs is chosen as an object of this study because of two reasons. First, SMEs are the major players in the wooden furniture industry in Indonesia [24]; with this large proportion, it is no surprise about the ability of SMEs to generate more impact to the environment than the large firm. Second, usually, SMEs follow business instincts to reduce resource use and waste; in this case, when faced with the prospect of no short term gains, SMEs may find these investments as a non-priority expense [25]. The cumulative contribution of SMEs to pollution and environmental concerns is not documented, yet is suggested to be equal, if not more, by some researchers [26]. Based on this condition, the potential contribution of SMEs to cleaner environment may not be realized yet,

II. LITERATURE REVIEW

A. Study about Green Supply Chain Management

Green Supply Chain Management (GSCM) is evolved from Supply Chain Management (SCM). GSCM was preliminarily discussed since the quality revolution of the 1980s and supply chain revolution of the 1990s [11]. In the beginning of 1995, GSCM has attracted considerable scholarly interest; GSCM received the highest attention in 2010 [27]. According to reference [18], GSCM can be defined from green purchasing to integrated chains, and GSCM will start from supplier to manufacture, to customer and reverse logistics, which is form the "closing loop" The past literature shows that most researchers have studied the GSCM adoption and implementation in developed countries such as Japan, Germany, Portuguese, UK and Taiwan and so on. However, the study about GSCM adoption and implementation in developing countries was still limited. In developing countries, most researchers starting to investigate the adoption and implementation of GSCM in East Asian Region especially China as developing country, such as reference [28] and reference [29]. Besides China, concern about the environmental issue has also risen the interest of researchers to investigate the adoption and implementation of GSCM practices in another Asian Countries such as Thailand, India, and Malaysia, such as the study conducted by reference [16], [30], and [31]. So, since the focus of this study is investigating the implementation of GSCM practice by the SMEs of wooden furniture in some region in the Central Java Province-Indonesia, this study will embrace the research about the adoption and implementation of GSCM practices in developing countries, particularly in Asian Countries.

B. Green Supply Chain Management Practice and Environmental Performance

Literature review shows that various study has recommended different concept related to the implementation of GSCM practices. Several authors though give recommendations on the actions to perform to best adjust the existing practices. According to reference [32], there is a lack of a single concept about the implementation of GSCM practices. Moreover, the emphasis of implementation of GSCM practices can be different because those practices will depend on the character of supply chain and the enterprise [33]. Among several concepts related to the implementation of GSCM practices, this study prefers to use five dimensions of implementation of GSCM practices developed by reference [18] and [19] in order to understand the contribution of SMEs of wooden furniture industry in reducing the negative effect of the production process. So, the GSCM practices investigated in this study includes internal environmental management (IEM), green purchasing (GP), customer cooperation (CC), eco-design (ECO), and investment recovery (IR) dimensions. Then, according to reference [15], [19], [34], and [35], there were some indicators can be used to measure the effect of implementation of GSCM practice on the environmental performance, such as saving energy, reducing water waste, solid waste, pollution, and emissions.

- Internal Environmental Management (IEM). Internal Environmental Management (IEM) refer to fully commitment and support from the top and middle-level management in developing environmental sustainability as the strategic organizational imperative. Top and middle management need to identify the environmental problems along with a supply chain and supports the initial assessment by taking a full responsibility for the environmental monitoring efforts [33], [36]. Much literature pointed out top management's commitment to environmental initiatives is one of the most important prerequisites for a successful environmental strategy, which in turn, this condition can make the enterprise achieve better environmental performance [37], [38], [39].
- Green Purchasing (GP). According to reference [30] and [40], green purchasing can be defined as the practice of choosing suppliers that provide eco-friendly materials and services. In actuality, the enterprise adopts green purchasing strategies in response to the increased concern about sustainability the environment [41]. Min and Galle [42] claimed that one of the benefits of implementing green purchasing is source reduction and waste elimination.
- Customer Cooperation (CC). Cooperation from customers is very important for an enterprise to invest in any strategic change in practices [16],[43],[44]. Environmental practices in the supply chain requires high cooperation from the customer and in today's customer-driven market any change in organizational practices could be successful only if they are substantiated by good cooperation from the customers [45]
- Eco-design is one of the practices of GSCM and is known by other names which includes; design for environment, green design, environmentally conscious design, life cycle design, clean design and sustainable design. It usually takes place early in the product's design so as to ensure that environmental consequences of the product's entire life cycle are well known before manufacturing decisions are made put into action [46]. Eco-design can improve environmental performance by reduction of environmental footprint, reduction of wastes and re-use of materials, and also results in the use of scarce natural resources efficiently and effectively, while keeping the environment free from pressure [47].\
- Investment Recovery (IR). Investment recovery refers to an enterprise's strategic use of reverse logistics recycling, redeployment, reselling and similar techniques to derive greater value from materials and products [48]. Investment recovery is a traditional business practice, but it can also be considered a green practice since it can reduce waste that may have otherwise been disposed of. Even though investment recovery may not be the most sustainable practice, it does lengthen the life of the product or material where it can be recycled into other products or material [18].

So, based on the previous study about the relationship between IEM, GP, CC, ECO, IR and environmental performance, this study propose the following hypothesis

- H1: There is a significant impact of internal environmental on the environment performance of SMEs in the wooden furniture industry
- H2: There is a significant impact of green purchasing on the environment performance of SMEs in the wooden furniture industry
- H3: There is a significant impact of customer cooperation on the environment performance of SMEs in the wooden furniture industry
- H4: There is a significant impact of eco-design on the environment performance of SMEs in the wooden furniture industry
- H5: There is a significant impact of investment recovery on the environment performance of SMEs in the wooden furniture industry
- H6: there is no significant impact of green supply chain management practices (combined) (internal environmental management, green purchasing, customer cooperation, eco-design, and investment recovery) on the environment performance of SMEs in the wooden furniture industry

III. . METHOD OF THE RESEARCH

A. Study area and sample of research

This study was conducted in three regions in Central Java Province (Semarang, Jepara, and Kudus). According to Roscoe [49], the minimum sample size should be ten times the number of the variable used in the study. Since this study use, five dependent variables (IEM, GP, CC, ECO, and IR) and one independent variable (environmental performance), the minimum sample of this study should be ten times six or sixty enterprises. Moreover, this study needs sixty small enterprises, sixty medium enterprises, sixty enterprises with the outdoor product and sixty enterprises with the indoor product since the hypothesis would be tested for each scale of enterprises (small and medium enterprise) and each type of enterprise (enterprise with outdoor product and enterprise with the indoor product). According to reference [18], the size of the enterprise will have the impact on the practice of GSCM because large enterprises typically have more available resources and well-developed GSCM practices. Thus, a not only size of the enterprises, the implementation of GSCM practice also influence by the activities conducted by the enterprises. Most of the environmental influence of any product or material is 'locked' into the product at the design stage of a product when materials and processes are selected and product environmental performance is largely determined [50]

B. Instruments and Measures

This study used 30 items for measuring the implementation of GSCM practices and 5 items for measuring the environmental performance. Items for measuring the implementation of GSCM practices are developed by Zhu et al [29]., [51]; whereas items for measuring the environmental performance are developed from Zhu et al [51], Generation 4 Global Reporting Initiative [52], Sloan [53], and Varsei et al [54]. This study use 5-level Likert Scale in measuring the implementation of GSCM practice, whereas 1 = not considering it, 2 = planning to consider it, 3 = considering it currently, 4 =

initiate implementation, 5 = implementing successfully [51]. This study also uses 5-level Likert Scale to measure economic performance, but with the different meaning. In this case, there is a range of values for each value in Likert Scale. As example, for item that asking about the amount of recycle material used for production process, 1=0% ≤ X < 10%; 2= 10% ≤ X < 20%; 3= 20% ≤ X < 30%; 4= 30% ≤ X < 40%; 5=40% ≤ X < 50%.

IV. RESULT AND DISCUSSION

A. Result of Measurement of Implementation of GSCM Practice

Most of the items used to measure the implementation of GSCM practices have mean value above 3.00 with small deviation standard (0.4 to 0.6). Among the 29 items used to measure the implementation of GSCM practices, only two items have the mean value below 3.00. First, the enterprises give the specific training to their employee about environmental awareness through wood waste management. Second, the enterprises give the specific training to their employee about the knowledge and skill for managing the wood waste. So, based on this condition, the result of measurement indicated that, on average, the surveyed SMEs has been considering to implement more than 90% of proposed GSCM practice since the value of 3 indicated that the enterprise has been considering the practices currently [51]. In this case, on average, the surveyed SMEs is just planning to consider a specific training to their employee which is related to environmental awareness and knowledge and skill for managing the wood waste. Then, there is one item with the highest mean value (=4.635), the enterprises asked the supplier to only provide them with the legal timber. This condition told us that, on average, the surveyed SMEs had initiated to give terms and condition to their supplier that they must supply the enterprise with legal timber since the value of 4 indicated that the enterprise had initiated to implementation

B. Result of Hypothesis Testing

The result of hypothesis testing for each scale of enterprise can be seen in Table 1 until Table 4. For small scale of enterprise, the multiple regression results revealed that at the level of significance of 0.05, the environmental depend on internal environmental management, customer cooperation, and investment recovery; whereas, at the level of significance 0.01, the environmental performance only depend on customer cooperation and investment recovery. For the medium scale of enterprise, the multiple regression results revealed that, at the level significance of 0.05, the environmental performance of medium enterprise only depend on investment recovery. Nevertheless, simultaneously, all the implementation of GSCM practices by the small and medium scale of enterprise had the significant effect on the environmental performance. The value of R² indicated that all of the implementation of GSCM practices by the small scale of enterprise accounted for 52.7% of the change in the environmental performance and the implementation of GSCM practices by the medium scale of enterprise accounted for only 38.9% of the change in the environmental performance

The result of hypothesis testing for each type of enterprise based on product resulted can be seen in Table 5

TABLE 1
THE RESULT OF HYPOTHESIS TESTING 1-5 FOR SMALL SCALE OF ENTERPRISE

	Relationship	β	p-value	Result
H1	IEM --> Env. Perf. (+)	0.285	0.039**	Accepted
H2	GP--> Env. Perf. (+)	0.089	0.584	Rejected
H3	CC--> Env. Perf. (+)	0.554	0.000***	Accepted
H4	ECO --> Env. Perf. (+)	0.357	0.059*	Accepted
H5	IR--> Env. Perf. (+)	0.527	0.01***	Accepted

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

TABLE 2
THE RESULT OF HYPOTHESIS TESTING 6 FOR SMALL SCALE OF ENTERPRISE

	df	SS	MS	F	Sig. F	Result
IEM,GP, Regression	5	20.38171	4.076342	16.91307	3.31497E-11***	Accepted
CC,ECO, Residual	76	18.31731	0.241017			
IR-->						
Env.Perf Total	81	38.69902				

$$Y = -3.076 + 0.357ECO + 0.285IEM + 0.089GP + 0.527IR + 0.554CC; R^2 = 0.527$$

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

TABLE 3
THE RESULT OF HYPOTHESIS TESTING 1-5 FOR MEDIUM SCALE OF ENTERPRISE

	Relationship	β	p-value	Result
H1	IEM --> Env. Perf. (+)	0.128	0.649	Rejected
H2	GP--> Env. Perf. (+)	0.302	0.054*	Accepted
H3	CC--> Env. Perf. (+)	0.217	0.080*	Accepted
H4	ECO --> Env. Perf. (+)	0.204	0.533	Rejected
H5	IR--> Env. Perf. (+)	0.418	0.011**	Accepted

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

TABLE 4
THE RESULT OF HYPOTHESIS TESTING 6 FOR MEDIUM SCALE OF ENTERPRISE

	df	SS	MS	F	Sig. F	Result
IEM,GP, Regression	5	5.732378	1.146476	6.86237258	5.07E-5***	Accepted
CC,ECO, Residual	54	9.021622	0.167067			
IR-->						
Env.Perf Total	59	14.754				

$$Y = -1.108 + 0.024ECO + 0.128IEM + 0.302GP + 0.418IR + 0.217CC; R^2 = 0.389$$

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

until Table 8.

For the enterprise with indoor product, the multiple regression results revealed that, at the level significance of 0.05, the environmental performance of enterprise with indoor product depend on internal environmental management, green purchasing, customer cooperation, eco-design, and internal recovery; whereas, for the level of significance 0.01, the environmental performance of enterprise with indoor product only depend on internal environmental management and internal recovery. For enterprise with outdoor product, the multiple regression results revealed that, at the level significance of 0.05, the environmental performance of enterprise with outdoor product depend on customer cooperation and internal recovery; whereas, for the level of significance 0.01, the environmental performance of enterprise with outdoor product only depend on customer cooperation. Nevertheless, simultaneously, all the implementation of GSCM practices by the enterprise with indoor product enterprise and by the enterprise with outdoor product had the significant effect on the environmental performance. The value of R² indicated that all of the implementation of GSCM practices by the enterprise with indoor product accounted for 76.3% of the

change in the environmental performance all of the implementation of GSCM practices by the enterprise with outdoor product accounted for only 64.3% of the change in the environmental performance

V. CONCLUSION

TABLE 5
THE RESULT OF HYPOTHESIS TESTING 1-5 FOR ENTERPRISE WITH INDOOR PRODUCT

	Relationship	β	p-value	Result
H1	IEM --> Env. Perf. (+)	0.405	0.003***	Accepted
H2	GP--> Env. Perf. (+)	0.390	0.008***	Accepted
H3	CC--> Env. Perf. (+)	0.275	0.029**	Accepted
H4	ECO --> Env. Perf. (+)	0.344	0.061*	Accepted
H5	IR--> Env. Perf. (+)	0.525	0.017**	Accepted

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

Implementation of GSCM practices is still a new concept

TABLE 6
THE RESULT OF HYPOTHESIS TESTING 6 FOR ENTERPRISE WITH INDOOR PRODUCT

	df	SS	MS	F	Sig. F	Result
IEM,GP, Regres:	5	19.43323	3.886647	19.193129	6.41E-12***	Accepted
CC, ECO, Residu:	69	13.97263	0.202502			
IR--> Env.Perf	Total	74	3340587			

$$Y = -3.5628 + 0.344 \text{ECO} + 0.405 \text{IEM} + 0.390 \text{GP} + 0.525 \text{IR} + 0.275 \text{CC}; R^2 = 0.763$$

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

for SMEs of wooden furniture in Semarang, Kudus, and

TABLE 7
THE RESULT OF HYPOTHESIS TESTING 1-5 FOR SMALL SCALE ENTERPRISE WITH OUTDOOR PRODUCT

	Relationship	β	p-value	Result
H1	IEM --> Env. Perf. (+)	0.089	0.089*	Accepted
H2	GP--> Env. Perf. (+)	0.073	0.731	Rejected
H3	CC--> Env. Perf. (+)	0.587	0.000***	Accepted
H4	ECO --> Env. Perf. (+)	0.220	0.336	Rejected

Jepara. The implementation rates shown in our investigation

TABLE 8
THE RESULT OF HYPOTHESIS TESTING 1-5 FOR SMALL SCALE ENTERPRISE WITH OUTDOOR PRODUCT

	df	SS	MS	F	Sig. F	Result
IEM,GP,CC, Regres:	5	9.80205	1.960430	8.591037	3.31E-06***	Accepted
ECO, IR--> Residu:	61	13.91974	0.22819248			
Env.Perf	Total	66	29.72179			

$$Y = -1.304 + 0.220 \text{ECO} + 0.089 \text{IEM} + 0.372 \text{R} + 0.525 \text{IR} + 0.587 \text{CC}; R^2 = 0.643$$

*accepted at α 0.1; ** accepted at α 0.05; accepted at α 0.01

are still moderate. In this case, on average, the surveyed SMEs has been reaching the stage of considering to implement for more than 90% of proposed GSCM practice. Thus, related with the relationship between implementation of GSCM practices and environmental performance, this study found that the relationship do not always significance, In this case, the customer cooperation and internal recovery have a positive significance effect on environmental performance for all condition (small scale of enterprise, the medium scale of enterprise, the enterprise with the indoor, and outdoor product). Internal environmental only give a positive significance effect on environmental performance for the small scale of enterprise, the enterprise with indoor, and enterprise with the outdoor product. Green purchasing

only give a positive significant on environmental performance for the medium scale of enterprise and enterprise with the indoor product; whereas, eco-design only give a positive significance effect on environmental performance for the small scale of enterprise and enterprise with the indoor product.

ACKNOWLEDGMENT

This work has been funded by the Ministry of Research, Technology, and Higher Education through grand for "Strategis Nasional". The authors wish to acknowledge to Head of Research and Community Service for giving the authors the opportunity to conduct this research and attend the World Congress Engineering 2017 (WCE 2017). The authors also wish to acknowledge our gratitude and appreciation to all the partners in grand of "Strategis Nasional" for their contribution to the development of various ideas and concepts presented in this paper

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