Impact of Internal Driver on Implementation of GSCM Practice

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Abstract

The purpose of this study was to investigate the effect of internal driver to the successful of implementation of GSCM practice by SMEs of furniture industry. Thirty-five items were selected to test those relationship and ninety SMEs of furniture in Semarang, Kudus, and Jepara was chosen as a sample of this study. Data was collected using self-administered questionnaire and personal interviews. The data collected was analyzed using Partial Least Square (PLS) with help of SmartPLS software. The result of hypothesis testing indicated that all of internal driver have significant positive effect on the implementation of GSCM practices by SMEs of furniture in Semarang, Kudus, and Pekalongan. The effect of knowledge on the implementation of GSCM practices is higher compare to the other factors (involvement and support from top management and employee, technology, and financial).

Keywords
Involvement and support from management and employee; knowledge; financial; GSCM practices; SMEs of furniture industry; technology

1. Introduction

Green supply chain management (GSCM) is developed from traditional supply chain management (SCM). The increased awareness of green practices in 1990s has triggered the enterprises to act an ethically and socially responsible manner in their supply chain (Diabat and Govindan, 2011). The concept of GSCM differ from traditional SCM, in that GSCM is integrated the environmental thinking into the whole process of supply chain management including design of the product, sourcing and selection of the material, process of manufacturing, delivery of the final product to the customer as well as end -of life management of the product after its useful life (Srivastava, 2007). The concept of GSCM attracted the intention of scholarly in the beginning of 1995 and, in 2010, this concept received the highest intention of scholarly (Luthra et al, 2014). There are so many definition of GSCM since this concept is developed. The definition of green supply chain management varies as researchers stand at different angles. One of definition of GSCM is revealed by Patrick in 2010. According to Patrick, GSCM can be define as the process of using environmentally friendly inputs and transforming these inputs into outputs that can be reclaimed and re-used at the end of their lifecycle thus, creating a sustainable supply chain (Gardas and Narkhede, 2013). The other researchers have own definition.

Moreover, there is also lack of a single consensus about the emphasis of the implementation of GSCM practices (Murphy and Poist, 2003). It can be happen because the emphasis of the implementation of GSCM will be depends on the character of supply chain and the enterprise (Zhu et al., 2007). According to Zhu and Sarkis (2004) and Zhu et al (2005), the practices of implementation of GSCM can be differentiated into five dimensions, namely internal environmental management (IEM), green purchasing (GP), customer cooperation (CC), eco-design (ECO), and investment recovery (IR).Then, the phase of implementation of five dimensions of GSCM practice of each enterprise is measured using five-level Likert Scale, whereas 1= not considering it, 2 = planning to consider it, 3 = considering it currently, 4 = initiate implementation, 5 = implementing successfully (Zhu et al, 2005; Zhu et al, 2013) Using a sample of 396 Chinese manufacturers, study conducted by Zhu et al (2013) revealed that the implementation of GSCM practices by those manufactures were varies. On the average, the implementation of

internal GSCM practices by Chinese manufacturers had score above 3.00. This condition indicated that, on average, the Chinese manufacturers only consider on internal GSCM practice which is consist of eco design and internal environmental management dimensions. Different with internal GSCM practices, on the average, the implementation of external GSCM practice by Chinese manufacturers had score between 2.50 and 3.00. This condition indicated that, Chinese manufactures just planning to consider until considering to implement the external GSCM practices which is consist of green purchasing, costumer cooperation, and investment recovery dimensions. Using the same dimensions and scale of measurement, Susanty et al (2017) tried to measure the implementation of GSCM practices by 142 Small and Medium Enterprises (SMEs) of Wooden Furniture Industry in three regions located in Central Java Province, Indonesia (Semarang, Jepara, and Kudus). Study conducted by Susanty et al (2017) also revealed that the implementation of GSCM practices were varies among SMEs. Difference with the result of study conducted by Zhu et al (2013), on average, the implementation of internal and external GSCM practices had score above 3.00.This condition indicated that, on average, SMEs of wooden furniture consider on internal and external GSCM practices which is consist of five dimensions.

The varying of the level of implementation of GSCM practices among the enterprises and also SMEs has raised a question about the driver or antecedent factors that makes some enterprises or SMEs more success than the others. In this case, literature shows that there is so many antecedent factors become an important factor for successful the implementation of GSCM practices (see Trowbridge, 2001; Walker et al, 2008; and Huang et al., 2015; Bowen et al, 2001; Hu and Hsu, Diabat and Govindan, 2011; and Govindan et al., 2014). Based on this condition, this study aims to investigate the effect of some drivers (especially the drives that belongs to internal organization) on the successful of the implementation of GSCM practice.

2. Literature Review

Some drivers for the successful of the implementation of GSCM practices can be seen from the several authors.
- Bowen et al (2001) identified the important of several factors for implementing GSCM practices such as corporate environmental proactivity, greening the supply process, strategic purchasing and supply, product based green supply, and supply management capabilities.
- Trowbridge (2001) distinguished between internal and external drivers for the implementation of GSCM practices at a chip manufacturer. Internal drivers consist of the desire to better manage the risk of a potential supply chain or business interruption, the desire to work together with suppliers to identify alternative materials and equipment that minimize environmental impact, and the recognized advantage of a strong corporate program. The external drivers consist of customers' requests and the increased interest of investors and non-governmental organisations (NGO) groups in environmental issues
- Hu and Hsu (2010) emphasize 20 factors along four dimensions (supplier management, product recycling, organization involvement and life cycle management) that are important drivers for implementing GSCM practice in the Taiwanese electrical and electronics industries. Among 20 factors, some items can be categorized as the critical factors for GSCM practices in the Taiwanese electrical and electronics industries because those factors have much higher ratings, i.e. top management support, compliance statement, product testing report, green purchasing, environmental auditing for suppliers, establishing environmental requirements for purchasing items; and supplier evaluation and selection.
- Walker et al (2008) emphasize organizational factors as internal drivers. Included in organizational factors are the personal commitment of leaders, middle management, 'policy entrepreneurs', and investors, cost reduction through minimizing waste and pollution. Included in external factors are regulations pressure, customer's pressure, competitor's pressure, society pressure, and supplier's pressure.
- According to Diabat and Govindan (2011), the important several factors for implementing the GSCM practice consist of certification of suppliers environmental management system, environmental collaboration with suppliers, collaboration between product designers and suppliers, government regulation and legislation, green design, ISO 14000 certification, integrating quality management into planning and operation process, reducing energy consumption, reusing and recycling material and packaging, environmental collaboration with consumers, and reverse logistics.
- Govindan et al (2014) emphasize the important several factors as driver for successful the implementation of GSCM practices, i.e. outsourcing, technology, knowledge, financial, and involvement and support. In line with Hu and Hsu (2010), Govindan et al (2014) also did not differentiate the important factor as internal and external driver. Moreover, basically, Govindan et al (2014) did not mention the drivers for implementing the GSCM

practices instead of the barriers to overcome. In this case, those barriers will turn become the driver for implementing the GSCM practices when the enterprise can overcome those barriers.

- Huang et al (2015) emphasize several factors as internal driver for the successful the implementation of GSCM practices, i.e. personal commitment of individuals (such as enterprise's environmental vision, support of the green strategy from the top management, support of the green strategy from the middle management, implementation of green strategy from employees, specialized human resource for GSCM), the aspiration to build up a positive environmental-friendly image (such as corporate green marks and corporate green trademarks), and the desire to reduce cost and save energy within an enterprise (such as specialized budget for green product development, specialized budget for environmental improvement, specialized budget for environmental improvement, specialized budget for pollution preventive, specialization budget for pollution disposal, and specialized budget for by-product disposal), specialized). The external drivers consist of regulatory pressures, customer pressures, public pressures, and supplier pressures.

Conceptual model

Shortly, this study will combine the factor related with the successful of the implementation of SCM practices from Huang et al (2015) and Govindan et al (2014) in determining the internal drivers. This study use some items which belongs to internal driver described by Huang et al (2015), especially the items that related with factor of personal commitment of individual. This study also use some items which belongs to factors of technology, knowledge, financial, and involvement and support described by Govindan et al (2014) for internal drivers. So, in this study, the internal drivers will be consist of four factors, namely personal commitment of individuals or involvement and support from management and employee, technology, knowledge, and financial.
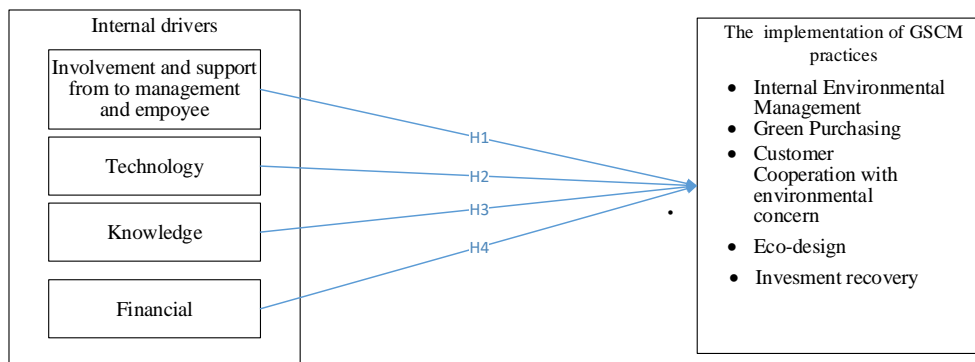

Figure 1. The Conceptual Model

Based on those conceptual model, the hypothesis used in this study can be describe as follow
H1   Involvement and support from management and employee have positive significant effect on the implementation of GSCM practices
H2   Technology factor owned by the enterprises has positive significant effect on the implementation of GSCM practices
H3   Knowledge factor owned by the enterprises has positive significant effect on the implementation of GSCM practices
H4   Financial factor perceived by the enterprises has positive significant effect on the implementation of GSCM practices

3. Method of Research

3.1 Sample of Research

The research was done in three region in the province of Central Java, namely Semarang, Kudus, and Jepara. The sample size of this research follows the rule of thumb of partial least squares (PLS) method. The number of 90 samples of SMEs of furniture industry consist of 35 SMEs from Semarang, 44 SMEs for Kudus, and 21 SMEs from Jepara. Sampling technique used in this study for chosen 90 samples of SMEs is non-probability purposive

sampling. Hence the SMEs were selected in the sample is based upon some appropriate characteristic of the sample members. The authors chose to conduct purposive sampling on SMEs that having known about the implementation of GSCM practices in furniture industry.

3.2 Instrument and Measurement

Forty-eight items were selected to measure the relationship between involvement and support from management and employee, knowledge, technology, financial, and the implementation of GSCM practices. Out of these forty-eight items, five items were used to measure the involvement and support from management and employee, six items were used to measure technology factor, ten items were used to measure knowledge factor, six items were used to measure financial factor, and twenty-one items were used to measure the implementation of GSCM practices. In a measure of support from management and employee, technology, knowledge, and financial, this study use 5-level Likert scale (1= strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5= strongly agree). This study also use 5-Likert scale for measuring the implementation of GSCM practices, but with a different meaning. In this case, 1= not consider at all, 2= plan to consider, 3=currently consider, 4= start to implement, and 5= full implementation. In detail, all of items used in this research can be seen in the Table 1.

3.3 Data Analysis Tool

The study used Partial Least Square (PLS) with help of SmartPLS software for processing the data obtained from questionnaire.

4. Result and Discussion

4.1 Result of Validity and Reliability Test

The items for testing test the relationship the involvement and support from management and employee, technology, knowledge, and financial and the successful of the implementation of GSCM was assessed by convergent and discriminant validity and reliability. This study use the value of loading factor of each item to assess the convergent validity. According to Fornell and Larcker (1981), to ensure the convergent validity, the value of loading factor of each item should be more than 0.5 and the item with loading factor less than 0.5 should be deleted. After deleted some items with the value of loading factor less than 0.5, the value of loading factor of each items is re-calculated. Finally, after several re-calculation, the final value of loading factor of each items can be seen in Table 1. Then, to test discriminant validity, this research has used the cross-loading criterion. The loading factor of each indicator should be greater than all of its cross-loadings (Chin, 1998). The results of the discriminant validity check can be seen in Table 2. Comparing the loading factor across the columns in Table 2, we can see the existence of discriminant validity between all the constructs.

Table 1. Result of convergent validity and reliability test

No	Statements	Initial Loading Factors	Final Loading Factors	AVE	CR
A. The involvement and support from management and employee (INV)					
1	The top management support for green strategy (INV1)	0.797	0.804		
2	The employee support in implementing the GSCM practices (INV2)	0.773	0.768		
3.	The enterprise has been allocating specialized human resource for implementing the GSCM practices (INV3)	0.652	0.669	**0.513**	**0.839**
4.	The enterprise's environmental vision (INV4)	0.738	0.730		
5.	The aspiration of the enterprise to build up a positive environmental-friendly image (INV5)	0.595	0.588		
B. Technology (TECH)					
1	The enterprises have an effective environmental measures (TECH1)	0.845	0.900		
2	The competency of human resources owned by enterprise is adequate for implementing the new technology or new process related with the GSCM practices (TECH2)	0.820	0.773		
3	The enterprises have a technical expertise to help the implementation of the new technology or new process related with the GSCM practices (TECH3)	0.500	0.881	**0.693**	**0.900**
4	The easiness to design the furniture which can reduce the consumption of resource/energy (TECH4)	0.838	0.767		
5	The current production process practice is very flexible to switch over to new system	0.824	0.900		

No	Statements	Initial Loading Factors	Final Loading Factors	AVE	CR
	(TECH5)				
6	There is so many a new technology related with reuse/recycle used product in furniture industry that can used by the enterprises (TECH6)	0.491	Deleted		
C. Knowledge (KNOW)					
1	Awareness about reverse logistics adoption (KNOW1)	0.829	0.846		
2	Believes about environmental benefits (KNOW2)	0.509	0.520		
3	Perception that GSCM practices "part-of responsibility" zone (KNOW3)	0.369	Deleted		
4	Easiness in identifying environmental opportunities (KNOW4)	0.507	0.520		
5	The availability of eco-literacy amongst supply chain members (KNOW5)	0.378	Deleted		
6	The availability of environmental knowledge (KNOW6)	0.290	Deleted	**0.556**	**0.856**
7	Easiness in identifying third parties to recollect used products (KNOW7)	0.860	0.886		
8	The availability of a specific environmental goals (KNOW8)	0.812	0.860		
9	Easiness in obtaining information on potential environmental improvements (KNOW9)	0.092	Deleted		
10	Willingness to convert to new systems (KNOW10)	0.358	Deleted		
D. Financial (FINA)					
1	Low investments and more return-on-Investments (FINA1)	0.678	0.664		
2	Collection of used products do not burden the enterprise with high cost (FINA2)	0.811	0.807		
3	The availability of bank loans to encourage green products/ processes (FINA3)	0.761	0.785		
4	Do not need extra cost for extra human resources for implementing the GSCM practices (FINA4)	0.429	Deleted	**0.517**	**0.808**
5	Low cost of hazardous waste disposal (FINA5)	0.254	Deleted		
6	Lower cost of switching to new production system which is related to reuse/ recycle used product (FINA6)	0.603	0.599		
J. The implementation of GSCM practices (GSCM)					
	The level of implementation Internal Environmental Management (IEM) which is consist of				
1	Total quality environmental management (IEM1)	0.552	0.587		
2	Environmental compliance and auditing programs (IEM2)	0.496	Deleted		
3	ISO 14001 certification (IEM3)	0.260	Deleted		
4	Environmental management systems (IEM4)	0.407	Deleted		
	The level of implementation Green Purchasing (GP) which is consist of				
1	Providing specification to suppliers that include environmental requirements (GPU1)	0.721	0.729		
2	Cooperation with suppliers for environmental objectives (GPU2)	0.643	0.703		
3	Environmental audit for suppliers' inner management (GPU3)	0.701	0.772		
4	Suppliers' ISO 14000 certification (GP4)	0.670	0.699		
5	Suppliers are selected using environmental criteria (GPU5)	0.718	0.778		
	The level of implementation the Customer Cooperation with environmental (CCO) concern which is consist of				
1	Cooperation with customer for eco-design (CCO1)	0.721	0.774		
2	Cooperation with customers for cleaner production (CCO2)	0.401	Deleted	**0.480**	**0.901**
3	Cooperation with customers for using less energy during product transportation (CCO3)	0.424	Deleted		
4	Cooperation with customers for product take back (CCO4)	0.561	Deleted		
	The level of implementation Eco-design (ECO) which is consist of				
1	Design of products for reduced consumption of material/energy (ECO1)	0.498	Deleted		
2	Design of products for reuse, recycle, recovery of material, component parts (ECO2)	0.508	Deleted		
3	Design of products to avoid or reduce use of hazardous of products (ECO3)	0.400	Deleted		
4	Design of processes for minimization of waste (ECO4)	0.632	0.612		
	The level of implementation of Investment Recovery (IR) which is consist of				
1	Investment recovery (sale) of excess inventories/ materials (IRE1)	0.691	0.663		
2	Sale of scrap and used materials (IRE2)	0.625	0.569		
3	Collecting and recycling end-of-life products and materials (IRE3)	0.389	Deleted		
4	Establishing a recycling system for used and defective products (IRE4)	-0.053	Deleted		

Table 2. Result of discriminant validity

	Implementation of GSCM	Financial	Involvement and support from to management and employee	Knowledge	Technology
CCO1	0.774	0.092	0.389	0.480	0.284
ECO4	0.612	0.270	0.238	0.309	0.228
GPU1	0.729	0.045	0.381	0.444	0.243
GPU2	0.703	0.056	0.325	0.504	0.195
GPU3	0.772	0.175	0.397	0.508	0.269
GPU4	0.699	0.032	0.185	0.325	0.237
GPU5	0.778	0.079	0.317	0.479	0.345
IEM1	0.587	0.058	0.214	0.256	0.721
IRE1	0.663	0.260	0.340	0.389	0.199
IRE2	0.569	0.248	0.193	0.292	0.319
FINA1	0.090	0.664	0.007	-0.005	-0.111
FINA2	0.162	0.807	0.012	-0.084	0.042
FINA3	0.144	0.785	0.166	0.018	-0.026
FINA6	0.123	0.599	0.091	-0.004	-0.023
INV1	0.393	0.177	0.804	0.131	-0.015

	Implementation of GSCM	Financial	Involvement and support from to management and employee	Knowledge	Technology
INV2	0.283	0.087	0.768	0.155	0.053
INV3	0.238	-0.059	0.669	0.234	0.104
INV4	0.364	0.057	0.730	0.149	0.053
INV5	0.254	0.037	0.588	0.198	0.121
KNOW1	0.452	-0.081	0.160	0.846	0.253
KNOW2	0.201	-0.057	0.043	0.520	-0.150
KNOW4	0.254	-0.103	0.083	0.520	-0.038
KNOW7	0.511	-0.066	0.243	0.886	0.268
KNOW8	0.599	0.096	0.233	0.860	0.118
TECH1	0.444	0.021	0.097	0.243	0.900
TECH2	0.286	0.047	0.034	0.071	0.773
TECH4	0.447	-0.078	0.099	0.180	0.881
TECH5	0.243	-0.079	-0.026	0.021	0.767

In this research, the AVE-value and CR value have used to test the reliability of each construct. The construct with AVE-value less than 0.5 is still accepted as the reliable construct, if that construct has a CR-value higher than 0.6 (Fornell and Larcker, 1981). As shown in Table 1, except construct technology, all of the construct used in this study have the AVE-value less than 0.5 but that constructs have CR-value higher than 0.6. It means, although the construct of involvement and support from management and employee, the construct of knowledge, the construct of financial, and the construct of implementation of GSCM practices are not able to explain more than half of the variance of its indicators on average, that construct are still accepted since that they have CR-value higher than 0.6. So, based on the result of validity and reliability test, it can be conclude that the value of final loading factor indicated an adequate of convergent validity of each item and the cross-loading criterion indicated an adequate of discriminant validity, and the CR-value values indicated the satisfactory reliability of each construct.

4.3. Structural Model Assessment

The coefficient of determinant (R^2) and Goodness of Fit (GoF) is used to assess the validity of structural model. The value of R^2 and GoF can be seen in the Table 3. The value of R^2 indicates the amount of variance in the dependent variables explained by the independent variables. According to Chin (1998), the R^2 value of 0.63 indicates substantial level of determination, the R^2 value of 0.33 indicates moderate level of determination, and the value of R^2 0.19 indicates weak levels of determination. Thus, GoF index is crucial to assess the global validity of a PLS based complex model. PLS does not have a formal GoF since it is a variance based Structural Equation Modelling (SEM). The formula for calculating GoF was proposed by Wetzels et al (2009). According to Wetzels et al (2009), GoF is a square root of (average AVE) x (average R-square). Then, according to Tenenhaus et al. (2005), the GoF values of 0.1 indicates small global validity, the GoF value of 0.25 indicates moderate global validity, and the GoF value of 0.36 indicates high global validity.

Table 3. The R^2 value and GoF index for hypothesized model

	R^2	GoF
INV, TECH, KNOW, FINA → GSCM	0.588 (tend to substantial level of determination)	
Complete (main effects) model		0.570 (high global validity)

4.2. Result of Hypothesis Testing

Table 4 represent the result of hypothesis testing. In this research, the result of hypothesis testing may clearly show the significant relationship between involvement and support from management and employee, knowledge, technology, financial, and the implementation of GSCM practices if the p-value is less than 0.05 or less than 0.01 (Henseler et al, 2009).

Table 4. The result of hypothesis testing

	Relationship	Loading Factor	t-value (p-val.)	Result
H1	INV → GSCM	0.290	5.009 (0.000)	Accepted
H2	TECH → GSCM	0.348	5.454 (0.000)	Accepted
H3	KNOW → GSCM	0.462	8.271 (0.000)	Accepted
H4	FINA → GSCM	0.181	2.222 (0.027)	Accepted

The result of hypothesis testing in Table 4 indicated that involvement and support from management and employee, technology, knowledge, and financial were significantly associated with the successful of the implementation of GSCM practices.

5. Conclusion

The purpose of this study was to clarify the effect of involvement and support from management and employee, technology, knowledge, and financial- on the implementation of GSCM practices. It emerged that all of internal driver have significant positive effect on the implementation of GSCM practices by SMEs of furniture in Semarang, Kudus, and Pekalongan. The effect of knowledge on the implementation of GSCM practices is higher compare to the other factors (involvement and support from top management and employee, technology, and financial)

References
Bowen, F. E., Cousins, P. D., Lamming, R. C., and Farukt, A. C., The role of supply management capabilities in green supply. *Production and operations management*, vol.10, no.2, pp.174-189, 2001.

Chin, W.W., The partial least squares approach to structural equation modeling, in Marcoulides, G.A. (Ed.), *Modern Methods for Business Research*, Lawrence Erlbaum Associates, Mahwah, New Jersey, pp.295–358, 1998

Diabat, A., and Govindan, K,. An analysis of the drivers affecting the implementation of green supply chain management. *Resources, Conservation and Recycling*, vol.55, no.6, pp.659-667, 2011

Fornell, C. and Larcker, D.F., Evaluating structural equation models with unobservable variables and measurement error, *Journal of Marketing Research*, vol.18, no.1, pp.39–50. 1981.

Gardas, B. B., and Narkhede, B. E., Exploring the green supply chain management: A technical review, *International Journal of Application or Innovation in Engineering and Management*, vol.*2,* no.5, pp.441-450, 2013.

Govindan, K., Kaliyan, M., Kannan, D., and Haq, A. N., Barriers analysis for green supply chain management implementation in Indian industries using analytic hierarchy process, *International Journal of Production Economics*, vol.147, pp.555-568, 2014

Henseler, J., Ringle, C.M. and Sinkovics, R.R., The use of partial least squares path modeling in international marketing, *Advances in International Marketing,* vol.20, no.1, pp.277-319, 2009.

Hu, A. H., and Hsu, C. W., Critical factors for implementing green supply chain management practice: an empirical study of electrical and electronics industries in Taiwan. *Management research review*, vol.33, no.6, pp.586-608, 2010

Huang, X., Tan, B. L., and Ding, X. An exploratory survey of green supply chain management in Chinese manufacturing small and medium-sized enterprises: Pressures and drivers, *Journal of Manufacturing Technology Management*, vol.26, no.1, pp.80-103, 2015

Luthra, S., Garg, D., and Haleem, A., Green supply chain management: Implementation and performance–a literature review and some issues. *Journal of Advances in Management Research*, vol.11, no.1, pp.20-46, .2014

Murphy, P. R., and Poist, R. F. Green perspectives and practices: a "comparative logistics" study. *Supply chain Management: An International Journal*, vol.8*,* no.2, pp.122-131, 2003

Srivastava, S. K., Green supply-chain management: a state-of-the-art literature review. *International journal of management reviews*, vol.9, no.1, pp.53-80, .2007

Susanty, A., Santoso, H., Sari, D. P., and Parasayu, S., Effect of internal green supply chain practices on environmental performance of SMEs of wooden furniture industry, *Proceedings of the World Congress on Engineering* vol. 2, London, United Kingdom, 5-7 July, 2017

Tenenhaus, M., Vinzi, V.E., Chatelin, Y.M. and Lauro, C., PLS path modeling, *Computational Statistics & Data Analysis,* vol.48, no.1, pp.159-205, 2005.

Trowbridge, P., A Case Study of Green Supply-Chain Management at Advanced Micro Devices, *Greener Management International,* vol.35, pp. pp.121-135, 2001.

Walker, H., Di Sisto, L., and McBain, D., Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors, *Journal of Purchasing and Supply management*, vol.14, no.1, pp.69-85, 2008.

Wetzels, M., Oderkerken-Schroder, G., and van Oppen, C., Using PLS path modeling for assessing hierarchical construct model: Guidelines and empirical illustration, *MIS Quarterly,* vol.33, no. 1, pp.177-196, 2009

Zhu, Q., and Sarkis, J., Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*, vol.22, no.3, pp.265-289, 2004

Zhu, Q., Sarkis, J., and Geng, Y. Green supply chain management in China: pressures, practices and performance, *International Journal of Operations & Production Management*, vol.*25,* no.5, pp.449-468, 2005

Zhu, Q., Sarkis, J., and Lai, K. H., Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, vol.15, no.11, pp.1041-1052, 2007

Zhu, Q., Sarkis, L., and Lai, K., Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices, *Journal of Purchasing Supply Management,* vol.19, no.2, pp.106–117, 2013

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