



International Conference on Asia Pacific Business Innovation and
Technology Management

The relationship of green supply chain management and green innovation concept

Noor Aslinda Abu Seman^a, Norhayati Zakuan^{a*}, Ahmad Jusoh^a, Mohd Shoki
Md Arif^a, Muhamad Zameri Mat Saman^b

^a Faculty of Management and Human Resource Development, Universiti Teknologi Malaysia, 81310, UTM Skudai Malaysia

^b Faculty of Mechanical, Universiti Teknologi Malaysia, 81310, UTM Skudai Malaysia

Abstract

Increasing environmental concern from customers, buyers, communities, and government regulations have forced companies to implement Green Supply Chain Management (GSCM) and green innovation. GSCM and green innovation have strategic interconnection in developing new green product. Little research attention on this relationship cannot boost better understanding for academic and practitioners. The purpose of this paper is to review the recent literatures that discuss the relationship between GSCM and green innovation. The findings of this paper show that GSCM leads to green innovation. However, future studies should be included the whole GSCM practices in exploring the link on green innovation and also directly increase empirical evidence to support the relationship.

© 2012 Published by Elsevier Ltd. Selection and/or peer-review under responsibility of the Asia Pacific Business Innovation and Technology Management Society (APBITM) Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Green supply chain management; green innovation; manufacturing companies; green product

1. Introduction

The rapid of environmental issues throughout the world have increasing much concern from customers, buyers, communities and also government. For instance, both the local or international customers and buyers are now requiring their suppliers to make environmental friendly products [1]. The increasing awareness from communities on the environmental problems also has created this matter become more critical to companies. Besides, the European Union has developed a range of recent environmental regulations such as the Waste Electrical and Electronic Equipment (WEE), Restriction of Hazardous Substances (ROHS), and Eco-design for Energy using Products (EUP) directives [2]. These directives will forbid manufacturers from selling the products that contains hazardous materials onto the markets. As a result, most companies started to execute a number of corporate environmental management [3] that is believed to overcome those problems.

Green supply chain management (GSCM) is one of the corporate environmental management that had been recognized and applied by among manufacturing companies [1]. It aims to reduce or minimize negative environmental impact such as pollution, waste of resources, and product dumping [4].

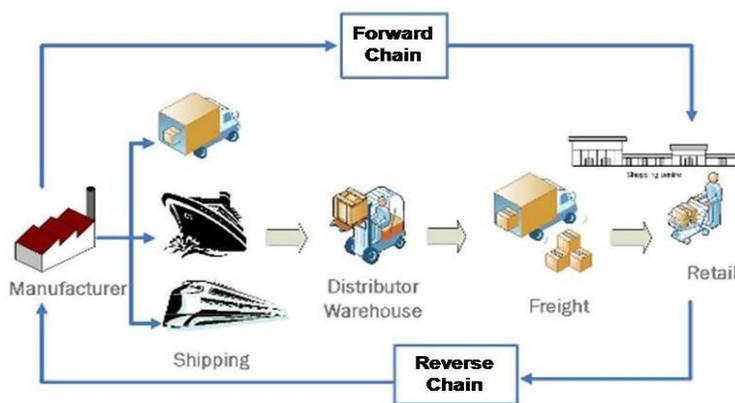
According to Rao [5], GSCM in term of greening the suppliers practice are identified to contribute to greener suppliers and more green innovation. Green innovation is other environmental management concept that are now advocated in order to reduce the issues of environmental pollution [6; 7]. It also can help to improve the performance of GSCM in complying the existing environmental regulations [8]. Innovation that complied with environmental regulation can improve product consistency and quality, reduce product costs and improve resource productivity [9; 8]. Thus, it implies that green innovation is certainly needed in implementation of GSCM practices in order to meet company’s environmental objectives and also increase company’s value add.

There is strategic linkage between GSCM and green innovation in considering the important of life cycle of products [10]. However, the interconnection between both of these concept have received little research attention. There is still insufficient empirical evidence to support that GSCM can lead to green innovation. The purpose of this paper is to discuss the relationship of GSCM and green innovation concept. This paper will then provide some review from previous studies. At the end, this paper will propose the framework of strategic interconnection between GSCM and green innovation for the study.

2. Literature Review

2.1. Green supply chain management

GSCM was starting debated since the quality revolution of the 1980s and supply chain revolution of the 1990s [11]. Zhu and Sarkis [12] defined GSCM has a ranged from green purchasing to integrated supply chains starting from suppliers, to manufacturer, to customer and reverse logistics, which is “closing the loop” as shown in **Fig. 1**. Closing the loop consists of forward chain and reverse chain in supply chain activities. Based on previous literature, GSCM encompassed several practices that have widely discussed including internal environmental management, green purchasing, customer environmental collaboration, and reverse logistics [e.g. 19-24]. With the adopting GSCM in manufacturers’ business operation, it can cope with the pressures from customers, buyers, communities and government regulators who have increasing environmental concern. However, continuous innovation is also needed as important solution to meet those surrounding pressures [9].



Adopted from ECN Group (2012) [18].

Fig. 1. Closing the loop of supply chain

2.2 Green innovation

Chen et al. [8] defined green innovation as hardware or software innovation in technology that is related to green products or process, consists of the innovation in technology like energy-saving, waste recycling, green product designs or corporate environmental management. From the various definition of green innovation existing in previous literature, this paper then concludes it as a new environmental approach, idea, product, process or services that concern on minimizing negative environmental impact and also create differentiation of developed product among competitors. Green innovation are categorized into four types of innovations including product innovation, process innovation, managerial innovation, and marketing innovation (8; 9; 13; 14). Green innovation is used to increase

the performance of environmental management in order to comply the requirement of environmental regulation [8]. Environmental management here is refer to GSCM that is implemented in business' operation. Support and commitment from top management played a key role in the implementation of succesful internal environmental management [12; 15]. The required resources in implementing the new technology and the new knowledge will be more easily available and circulated within the organization if the top person in charge for these resources supports the plans [15].

2.3 The relationship between GSCM and green innovation

The increasing importance of green innovation is becoming promising area in the green supply chain management which companies can eliminate direct and indirect environmental impact of an organization's final product [10]. Green innovation concept can support the implementation of GSCM by providing the new idea, approach or technology to manufacturers in developing new products. Green innovation is believed to provide continuous seeking ways to innovate each stage of supply chain in order to gain competitive advantage and decrease the environmental problems in industry [15]. Hence, it can be considered that green innovation concept is underlying GSCM practices. It is supported by Lee and Kim [10] claimed that the fundamental innovation underlying supplier commitment in green product development in order to enhance competitive advantage and environmental performance. Supplier commitment is one of practice that involve in implementation of GSCM. It relates more to green purchasing whereby supplier commitment is needed in providing manufacturers the material that meet environmental requirement. Then, the green innovation will underlying this practice to develop new green product in more strategically. However, there are still limited research attention has been paid into the relationship of GSCM and green innovation.

Chiou et al. [1] in their study in Taiwan presented an empirical evidence to promote manufacturers to implement green supply chain and green innovation in order to improve environmental performance and increase their competitive advantage in the market. This study found that GSCM practices in term of greening the suppliers have the positive influence on green product innovation, green process innovation, and green managerial innovation. This study also suggested to extend to other GSCM practices in examining more detail about the effect on green innovation.

One study from Malaysia conducted by Zailani et al. [15] investigated the integration of green innovation into logistic services as GSCM practice. This study identified that 76.9% among the companies believed new technology is an important tool in lessening the environmental issues in logistics services. This study implied that new technology as green innovation could help logistic services to reduce the negative environmental impact. The study from Lee and Kim [10] in Korean also examined the role of suppliers in increasing the manufacturer's ability to successfully perform green innovation in product development. This study showed that green innovation can be inspired from the environmental collaboration of manufacturer and key suppliers in managing green new product. This finding also supported by other studies indicated that greening the suppliers lead positively to green innovation [5; 9; 16; 17].

In summary, the literature review indicates that GSCM do lead to green innovation. However, most previous studies only focused on the part of GSCM practices, for instance greening the suppliers and logistics service. Those studies do not take account of the relationship of whole GSCM practices with green innovation. The comprehensive GSCM practices in developing new green product can indirectly stimulate to more green innovation such as product innovation, process innovation, managerial innovation, and marketing innovation. Then, it will represent the full picture of innovation activities in underlying each stage of supply chain in delivering to final product as shown in **Fig. 2.** [25; 26]

3. Conclusion

The purpose of this paper is to discuss the linkage between GSCM and green innovation concept. Although several empirical studies that described in the literature implied GSCM has significant relationship on green innovation, it still cannot provide sufficient evidence to support that relationship in developing of new green product. The whole GSCM practices should be considered in investigating their relationship on green innovation. Then, it is believed that the manufacturers will absolutely see how these GSCM practices can entail the green innovation together in the process of product’s life cycle. Therefore, it is important to understand the role of GSCM practices in improving manufacturer’s skill to successfully carry out new product development with green innovation to comply the requirement of environmental regulations.

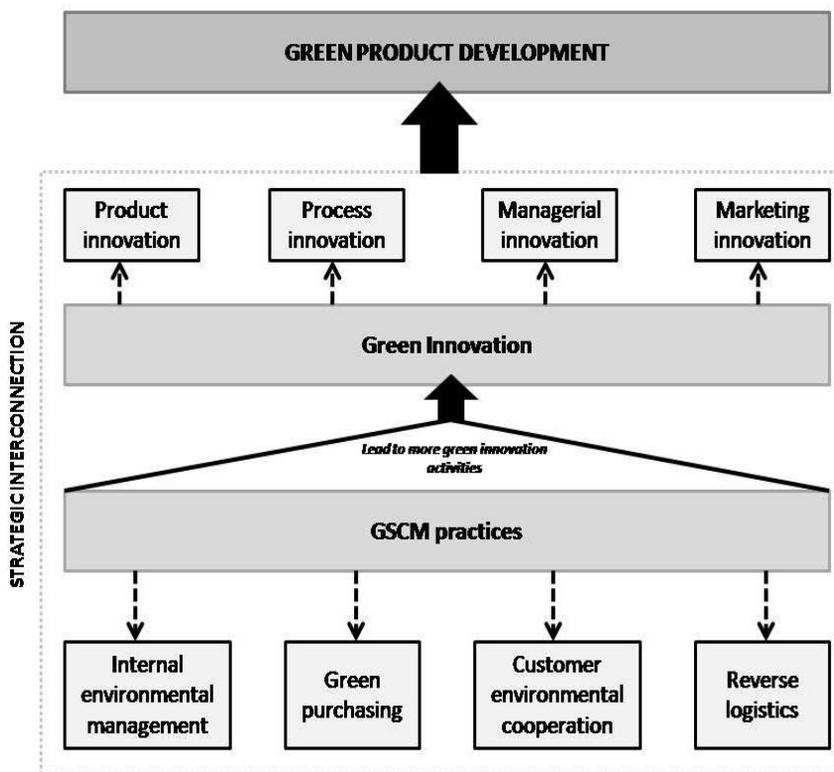


Fig. 2. Strategic interconnection of GSCM and green innovation

Acknowledgements

The authors would like to thank to the Faculty of Management and Human Resource Development, GUP research grant Vot.Q.J130000.7129.03J72 (MOHE) and UTM Johor Bahru.

References

- [1] Chiou, T.-Y., Chan, H. K., Lettice, F., & Chung, S. H. The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan. *Transportation Research Part E* 2011; 47: 822-836.
- [2] Tseng, M., Wang, R., Chiu, A., Geng, Y., & Lin, Y. Improving performance of green innovation practices under uncertainty. *Journal of Cleaner Production* 2012; 1-12.

- [3] Zhu, Q., Sarkis, J., & Lai, K.-h. Green supply chain management implications for "closing the loop". *Transportation Research Part E* 2008; 44: 1-18.
- [4] Hervani, A. A., Helms, M. M., & Sarkis, J. Performance measurement for green supply chain management. *Benchmarking: An International Journal* 2005; 12(4): 330-353.
- [5] Rao, P. Greening the supply chain: a new initiative in South East Asia. *International Journal of Operations and Production Management* 2002; 22(6): 632-655.
- [6] Chen, Y.-S. The driver of green innovation and green image - green core competence. *Journal Business Ethics* 2008; 81(3): 551-543.
- [7] Chen, Y., & Chang, K. The nonlinear effect of green innovation on the corporate competitive advantage. *Quality and Quantity* 2011; 1-16.
- [8] Chen, Y.-S., Lai, S.-B., & Wen, C.-T. The influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics* 2006; 67(4): 331-339.
- [9] Porter, M. E., & Linde, C. Green and competitive. *Harvard Business Review* 1995; 73(5): 120-134.
- [10] Lee, K.-H., & Kim, J.-W. Integrating suppliers into green product innovation development: an empirical case study in the semiconductor industry. *Business Strategy and the Environment* 2011; 20: 527-538.
- [11] Srivastava, S. Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews* 2007; 9(1): 53-80.
- [12] Zhu, Q., & 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* 2004; 22(3): 265-89.
- [13] OECD. *Oslo Manual: Guidelines for collecting and interpreting innovation data*. Paris: OECD/European Communities; 2005.
- [14] Reid, A., & Miedzinski, M. *Eco-innovation: Final report for sectoral watch*. Europe: Technopolis Group; 2008.
- [15] Zailani, S., Amran, A., & Jumadi, H. Green innovation adoption among logistics service providers in Malaysia: An exploratory study on the Manager's Perceptions. *International Business Management* 2011; 5(3): 104-113.
- [16] Chen, J., He, J., Wang, J., & Chen, K. Perspective of green innovation, green supplier capacity explore competitive advantages with green supply chain management. *International Conference on Business and Information* 2008.
- [17] Shrivastava, P. Environmental technologies and competitive advantage. *Strategic Management Journal* 1995; 16(S1): 183-200.
- [18] The ECN Group. *What is ECN round trip logistics?* Retrieved May 13, 2012, from <http://www.ecngroup.com.au/default.asp?pageId=238>; 2012.
- [19] Zhu, Q., Geng, Y., Fujita, T., & Hashimoto, S. Green supply chain management in leading manufacturers: Case studies in Japanese large companies. *Management Research Review* 2010; 33(4): 380-392.
- [20] Zhu, Q., Sarkis, J., & Lai, K. Initiatives and outcomes of green supply chain management implementation by Chinese manufacturers. *Journal Of Environmental Management* 2001; 85: 179-189.
- [21] Zhu, Q., & Sarkis, J. An inter-sectoral comparison of green supply chain management in China: Drivers and practices. *Journal of Cleaner Production* 2006; 14(5): 472-86.
- [22] Alvarez-Gil, M., Berrone, P., Hussillos, F., & Lado, N. Reverse logistics, stakeholders' influence, organizational slack, and managers' posture. *Journal of Business Research* 2007; 60(5): 463-473.
- [23] Bei, W., & Linyan, S. A review of reverse logistics. *Applied Sciences (APPS)* 2005; 7: 16-29.
- [24] Richey, R., Genchev, S., & Daugherty, P. The role of resource commitment and innovation in reverse logistics performance. *International Journal of Physical Distribution & Logistics Management* 2005; 35(4): 233-257.
- [25] Tseng M.L., Lan, L.W., Wang, R., Chiu, A.S.F.; Cheng, H.P. (2011). Using hybrid model to evaluate the green performance in uncertainty. *Environmental Monitoring and Assessment* 175(1), 367-385.
- [26] Tseng, M.L. (2010). An assessment of cause and effect decision making model for firm environmental knowledge management capacities in uncertainty. *Environmental Monitoring and Assessment* 161, 549-564.