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Green multi-tier supply chain management: An enabler investigation

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ABSTRACT

Stakeholder pressure, from actors including regulators, consumers and non-governmental organizations, has made organizations more responsible for poor environmental performance of their direct and sub-suppliers. Thus, green multi-tier supplier management (GMSM) has become an emergent topic. Yet it is still unclear how to enable GMSM practices effectively, i.e. how to enable sub-suppliers' environmental performance improvement. To help address the gap in the literature, this paper aims to identify enablers for sub-suppliers' environmental performance improvement, and it further applies a Decision-Making Trial and Evaluation Laboratory (DEMATEL)-based case study method to evaluate inter-relationships among these enablers and improve the focal company's GMSM practices, by using action research (AR) method principles. The data analysis and discussion with a follow-up evaluation after two years provided insights for the successful implementation of GMSM. The results show that top managers' support from the organizations is a prominent and necessary foundational enabler. An interesting observation is that close proximity of supply chain members is regarded as a very prominent enabler. Evaluation and feedback on these enablers two years later found that the enabler mapping was beneficial, allowing them to address the most influential enablers, and thus the GMSM practices of the focal company has been highly improved. This paper concludes with directions for further research.

1. Introduction

In order to respond to global environmental challenges and maintain competitive advantage, more focal companies in supply chains have engaged in green supplier management (Zhu et al., 2013; Brandenburg et al., 2014). Traditionally, the focus of green supplier management is on first-tier suppliers (Giunipero et al., 2012; Walker and Jones, 2012). However, the increasing pressures from numerous sources such as environmental non-governmental organizations (NGOs) and the media result in going beyond the organizational boundaries into green multi-tier supplier management (GMSM) (Grimm et al., 2014, 2016; Tachizawa and Wong, 2014; Wilhelm et al., 2016a, 2016b). GMSM practices are those practices that focal companies adopt to improve supplier and sub-suppliers' environmental performance. For example, the case of Mattel shows that firms' brands may suffer from unscrupulous sub-suppliers (Lee, 2010). In 2007, the discovery of lead paint on Mattel's toys prompted this company to recall 967,000 Toys (Story, 2007). The following investigation demonstrated that the paint's source could be traced to a third-tier supplier in China. However, external stakeholders often do not distinguish the activities of focal

companies from their direct and sub-suppliers, but identify the focal companies as the responsible party for non-compliant products (Lee, 2010; Hartmann and Moeller, 2014). In fact, the ignorance of its sub-suppliers operations finally damaged Mattel's reputation and resulted in image and financial losses. This example shows that focal companies should carefully consider integrating GMSM practices to improve operational and environmental performance in their supply chains.

The current literature (e.g. Mena et al., 2013; Tachizawa and Wong, 2014; Grimm et al., 2014) recognize that environmental risk may be caused by the second or even lower tier suppliers and that GMSM practices should be encouraged. But in reality the implementation of GMSM practices, mainly including assessment and collaboration (Grimm et al., 2014), are facing numerous difficulties and challenges (Grimm et al., 2011; Tachizawa and Wong, 2014). Therefore, enabling GMSM practices effectively to address sub-suppliers' environmental performance improvement and to more broadly avoid potential damage of corporate reputation deserves special attention by these focal companies. Unfortunately, research to investigate these issues is relatively immature (Tachizawa and Wong, 2014; Grimm et al., 2014). This paper seeks to identify and evaluate enablers for GMSM practices to improve

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sub-suppliers' environmental performance. Focal companies sometimes has direct access to sub-suppliers when implementing GSM practices (Choi and Linton, 2011). This paper focuses on the "direct" approach (see Tachizawa and Wong, 2014; the several approaches to implement GSM practices are briefly described in Section 2.2) to implement GSM practices, aiming to clarify the significant enablers of sub-suppliers' environmental performance improvement thanks for the "direct" GSM practices.

It should be noted that not all the enablers contribute equally to sub-suppliers' performance improvement. The enablers are not necessarily independent as causal inter-relationships exist amongst them. Given the limited resources for many focal companies, it would be more effective and efficient if focal companies pay attention to the key causal and prominent enablers. Therefore, the evaluation and identification of enablers is a necessary and important first step. Moreover, after identifying and recognizing the significant enablers, focal companies may need to change and improve their GSM practices, in order to promote the significant enablers and further to improve sub-suppliers' environmental performance.

An evaluation of the cause-effect interrelationships among the enablers can provide insights into the recognition of foundational enablers. These foundational enablers can play a critical role in influencing other enablers. In order to evaluate the cause-effect interrelationships among the enablers, the Decision-Making Trial and Evaluation Laboratory (DEMATEL) (Gabus and Fontela, 1973; Fontela and Gabus, 1976) is applied in the paper. DEMATEL can also aid in visualizing the structure of obscured causal relationships. In addition, the Action Research (AR) method, being fundamentally about organizational change, is effective in informing how an organization recognizes the need for change, and planning, implementing a new action, and evaluating the impact of the new action on desired outcome (Coughlan and Coughlan, 2002). A novel DEMATEL-based case study method, whilst using the principles of AR, is developed and used in this investigation.

In summary, the salience of implementing GSM practices (assessment and collaboration) has been widely recognized. But the implementation of GSM practices has faced various obstacles. This necessitates the investigation of enablers that aid successful GSM practices, which is yet rarely explored in the existing literature. Consequently, this paper contributes to the existing purchasing and supply management (P & SM) literature by utilizing a novel methodology (i.e. a DEMATEL-based case study method incorporating the principles of action research) in an important and underdeveloped domain of green multi-tier supplier management. The research outcomes are beneficial for P & SM practice by facilitating organizational management to determine the important enablers and improving overall greening of supply chains. In this paper the enablers and theoretical relationships are evaluated and validated longitudinally by revisiting a focal company seeking to manage their sub-suppliers.

This paper firstly discusses the necessity of GSM and the key practices. We then introduce and clarify various potential enablers for sub-suppliers' environmental performance improvement. An overview of the DEMATEL-based case study method incorporating AR is then provided. The following sections propose an exploratory analysis of the inter-relationships among enablers for sub-suppliers' environmental performance improvement. The results will be discussed based on initial information from the case companies and a follow-up evaluation two years later further supported the validity of the novel methodology. Theoretical and practical implications and possible directions for future research are summarized in the conclusion.

2. Background

The current green supplier management literature mainly pays attention to the relationship between a focal company, often the end product producer, and its direct suppliers (Lee, 2008; Walker and Jones,

2012; Grimm et al., 2014). Literature specifically exploring the environmental issues beyond the first-tier level suppliers is relatively limited. We will introduce the necessity of implementing GSM and its key practices in Sections 2.1 and 2.2.

2.1. Necessity of implementing GSM practices

Environmental risk management and/or building competitive advantage are two major motivations for focal companies to implement GSM (Foerstl et al., 2010; Kai et al., 2010; Petersen and Lemke, 2015).

Literature has identified suppliers as an important stakeholder for a focal company (Gauthier, 2005). Global environmental and social concerns have caused increasing numbers of consumer and NGOs to hold focal companies accountable for the poor environmental performance of their upstream supply chain members (Koplin et al., 2007; Lee, 2010). For example, Unilever, one of the largest palm oil buyers, has been tainted by its suppliers and sub-suppliers which greatly influence the destruction of rainforests, and thus it has been forced to pledge to only use palm oil certified as sustainable by 2015 (Zhu et al., 2010).

Some focal companies tend to integrate multi-tier suppliers into their environmental product development, yielding benefits such as reduced cost and time, improved environmental image and a higher competitive advantage (Kuei et al., 2015). For example, Verner Frang has earned higher margins in the eco-friendly textile products through the multi-tier approach (Kogg, 2003).

2.2. GSM practices

GSM practices generally consist of two facets: assessment and collaboration (Grimm et al., 2014). This result arises from similar conclusions of studies on traditional green supplier management (Vachon and Klassen, 2006, 2008). Assessment practices relate to those assessing and monitoring of suppliers' environmental management and performance by means of information gathering. Collaboration refers to the joint collaborative activities between focal companies and their suppliers aiming at environmental performance improvement.

GSM assessment and collaboration practices are often simultaneously employed by focal companies (Grimm et al., 2014). After evaluating and assessing second-tier suppliers through their first-tier suppliers or third-parties, focal companies can determine whether to directly interact with the second-tier suppliers. Once a direct relationship is established with sub-suppliers, focal companies may adopt collaborative practices to help improve environmental performance of sub-suppliers.

GSM practices are difficult to implement for many reasons, a variety barriers may occur when focal companies approach their first-tier and second-tier suppliers (Grimm et al., 2014, 2016; Tachizawa and Wong, 2014). In order to mitigate negative impact on total cost and environmental performance, focal companies should explore the enablers for sub-suppliers' environmental performance improvement.

Literature has also provided several approaches to implement GSM practices, including "direct" (a focal company has direct access to sub-suppliers), "indirect" (a focal company uses its first-tier suppliers to manage sub-suppliers) and "working with third parties (a focal company works with third parties like NGOs to manage sub-suppliers)" (Tachizawa and Wong, 2014). Choi and Linton (2011) state that best-practice companies such as Apple, Dell, Honda, IBM, and Toyota never completely relinquish decisions about a product's components to top-tier suppliers and they often has direct access to sub-suppliers, i.e. adopting the "direct" approach. This current paper focuses on the "direct" approach to implement GSM practices, and tries to understand the critical enablers regarding the "direct" approach to implement GSM practices.

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