Full length article

Sustainable supply chain management: Confirmation of a higher-order model

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\textbf{A R T I C L E   I N F O}

Article history:
Received 28 March 2016
Received in revised form 19 May 2016
Accepted 17 June 2016
Available online xxx

Keywords:
Sustainable supply chain
Scale development
Sustainable development
Survey

\textbf{A B S T R A C T}

Drawing from the research of green supply chain management and corporate social responsibility, this research proposes a hierarchical structure of sustainable supply chain management and develops a multi-item measurement scale to reflect the specific management practices of sustainable supply chain management. In this research, sustainable supply chain management is operationalised as a third-order factor reflected by three second-order factors, namely external green supply chain management, internal green supply chain management and corporate social responsibility. Utilising a rigorous, multi-step scale development method and data from 293 Chinese manufacturers, this research validates a 31-item measurement scale and approves the proposed third-order structure. The results confirm the multidimensionality of sustainable supply chain management, which suggests that it is necessary for the future researches to consider both environmental and social aspects. The valid measurement scales provide managers with a “to do list” to make the specific business decisions to achieve sustainable development in the supply chain.

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1. Introduction

In today's business environment, as well as competing on cost and profitability, organisations have a new focus on sustainability (Tseng, 2013). Many studies suggest that companies with a "sustainability culture" perform better in the long run than other companies (Pagell and Wu, 2009; Lin et al., 2016). Certainly, sustainability is regarded as a key ingredient of competitive advantage. Recent researches indicate that the need for firms to be sustainable is due to pressure from stakeholders, such as government, customers and wider society (Sharman et al., 1997; Christmann and Taylor, 2001; Zhu et al., 2007). For instance, in 2011, Greenpeace identified Apple as the “least green” technology company because of the substantial energy consumption incurred by its cloud data service (Carus, 2011). Then Apple has implemented a series of green management programs to reconstruct the business model towards sustainable consumption and production (Apple, 2015). Recently, Apple announced that 93% of its facilities are running on green energy (Kokalitcheva, 2016). This improvement regarding sustainable management of Apple has been recognised by the market and by society (Hardcastle, 2016).

In China as elsewhere, manufacturers have started to consider how to make their businesses more sustainable, so as to respond to environmental regulations put in place by the government, the increasingly educated society and competitors, and their international customers (Govindan et al., 2014). Moreover, in China, tremendous economic growth has resulted in a precarious ecological situation (Zhu and Sarkis, 2007; Yardley, 2005), which reinforces the awareness of the need for sustainability. According to Zhang et al. (2002), Zhang and Wen (2008), China should implement a strategy of low resource consumption and stable and sustained economic growth. However, the research on the sustainable supply chain in developing countries such as China is not extensive, and it is still a new concept (Zhu et al., 2008a,b,c). Managers still lack holistic guidance on business decision making to deal with the sustainability issues in the current highly competitive business environment.

Over the last decade, researchers have attempted to extend the boundary of sustainable development into the area of supply chain management (SCM), to investigate sustainable supply chain management (SSCM) (Pagell and Wu, 2009; Tseng et al., 2015; Tseng and Chiu, 2013). Based on the triple bottom line (TBL) standard, it
is increasingly clear that SSCM should deal with both environmental and social issues (Kleindorfer et al., 2005; Corbett and Klassen, 2006; Tseng et al., 2008). However, while an increasing number of firms are starting to adopt indicators such as environment, health and safety and social factors to measure the sustainability of production (Tseng, 2013; Tseng et al., 2008; Tseng and Lin, 2008), most focus on the environmental dimension (Seuring and Muller, 2008). Researchers are keen to identify the best practices for improving environmental performance. There are two main research directions, namely examining the impact of existing management systems on companies’ environmental performance, and conceptualising new environmental management practices (Pagell and Wu, 2009). For example, King and Lenox (2001) explore the linkage between lean production, measured by the adoption of ISO 9000, and environmental performance. On the other hand, Zhu et al. (2008b) developed a significant measurement scale of Green Supply Chain Management (GSCM). Most recently, Esfahbodi et al. (2016) have empirically tested the relationship between SSCM practices and organisational performance according to two perspectives – environmental performance and cost performance. However, their model of SSCM is still a modification of the existing GSCM practices, which focus solely on the environmental dimension. Compared with the research of green/environmental issues, there is very little SSCM literature that considers social aspects (Seuring and Muller, 2008). Indeed, Kleindorfer et al. (2005) argue that the current studies of SSCM have ignored the social component of sustainability. Among the few exceptions, some authors have adopted four categories of the social pillar of responsibility, namely Labour Practices, Human Rights, Society and Product Responsibility, to develop social assessment indicators (Jorgensen et al., 2008). To the best of our knowledge, there is limited empirical research that consolidates social and environmental aspects in the investigation of SSCM. The current study mainly argues that SSCM should have a multidimensional consideration that not only focuses on environmental aspects or social aspects individually. In order to close the research gap, this research aims to answer the following questions: Research Question 1: Does SSCM empirically comprise the environmental and social dimensions? Research Question 2: How to measure SSCM?

This research aims to conceptualise and validate the constructs of SSCM in the context of the Chinese manufacturing industry. Drawing upon insights from the literature of GSCM and CSR, this research synthesises a holistic structure of the SSCM and provides a measurement scale for practitioners and for future research. Based on the findings of an extensive literature review and structured interviews with experienced academics and practitioners, SSCM is modelled as a third-order construct. A rigorous scale development process was employed, which has been widely adopted in the literature (such as Shah and Ward, 2007; Cao and Zhang, 2010; Oliveira and Roth, 2012), to validate the proposed structure of SSCM. This proposed structure establishes the key management practices that determine SSCM attributes of three crucial dimensions, namely external GSCM, internal GSCM and CSR.

The current research contributes to SSCM literature by establishing a holistic framework which includes both environmental aspect and social aspect. Using the large-sample from Chinese manufacturers and rigorous measurement development method, this research also contributes SSCM practices the empirically supported measurement scales. Practically, according to the higher-order structure, managers can clearly identify the area need to be improved for achieving sustainable development in the supply chain. Specifically, the validated higher-order model could help managers to recognise the similarity and differences of the management practices under the systematic structure. In addition, the validated measurement indicators can serve as the checklist to assist practitioners in applying the related actions of SSCM in practice.

In the following sections, scale development process for SSCM is presented. In Section 2, this research describes the theoretical background of SSCM and gives the associated hypotheses in the proposed structural model. Section 3 presents the details of the scale development process. That section also provides the data analysis for the measurement model, including the results of content validity, unidimensionality, construct reliability and discriminant validity. Also, Section 3 presents the structural equation modelling (SEM) analysis of the hierarchical structure of SSCM. Section 4 discusses the managerial implications of the study while conclusions and recommendations for future research are given in Section 5.

2. Literature review

Although the debate regarding sustainable supply chain management (SSCM) is still ongoing, there is general agreement as to some key definitions. Sustainability is regarded as a normative notion of how human beings should treat the natural environment, and of how they carry responsibility for one another and future generations (Kates et al., 2001; Clark and Dickson, 2003; Clark, 2007). Evolved from the concept of sustainability, sustainable development is not only the top agenda of many governments (Tan et al., 2014) but also being widely discussed in policy research (Swart and Raes, 2007; Jordan, 2008) and business management research (Hall et al., 2010; Steurer et al., 2005). Specifically, sustainable development is “a development that meets the needs of the present without compromising the ability of future generations to meet their needs” (WCED, 1987). Embracing the concepts of sustainability and sustainable development, SSCM has grown out of the traditional context of supply chain management (SCM), which aims at managing the supply chain relationship and the flow of materials and information to maximise operational performance and the profitability of the supply chain (Lummus and Vokurka, 1999; Li et al., 2006; Mentzer et al., 2001).

Compared with SCM, SSCM has multiple dimensions, and is not focused solely on profits (Seuring and Muller, 2008; Jennings and Zandbergen, 1995; Gladwin et al., 1995). Seuring and Muller (2008) state that a truly sustainable supply chain can produce long-term profitability without harming natural or social systems. The triple bottom line standard is used to operationalise the performance of a sustainable supply chain, which includes economic, environmental and social dimensions (Carter and Rogers, 2008). Thus the term SSCM has been defined by Carter and Rogers (2008, p. 368) as “the strategic, transparent integration and achievement of an organization’s social, environmental, and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chains”.

Building upon the GSCM and CSR research in the supply chain context, this research provides a new measurement scale that evaluates eight synergistic management practices. More specifically, this research views SSCM as a holistic and multidimensional construct that is measured by the following eight management practices from different disciplines: (1) Sustainable Product Design (SPD); (2) Environmental Procurement (EP); (3) Environmental Customer Collaboration (ECC); (4) Internal Green Management (IGM); (5) Investment Recovery (IR); (6) Diversity Management (DM); (7) Community Development and Involvement (CDI); (8) Safety Management (SM).

In order to explain the hierarchical structure of the concept, SSCM is operationalised as a third-order construct. According to Oliveira and Roth (2012), the notion of third-order construct is
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