



Assessing the competitive priorities within sustainable supply chain management under uncertainty



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ABSTRACT

Sustainable supply chain management (SSCM) is driving firms to extend their social, economic and environmental efforts across their supply chain. Competitive priorities are a strategic integration in SSCM and thus to firm performance. However, the literature has not thoroughly examined the hierarchical structure among the competitive priorities and SSCM under uncertainty. This study adapts a hierarchical structure and linguistic preferences to identify the competitive priorities under SSCM in electronic focal manufacturing firms in Taiwan. This study formed an expert team with industrial experience and proposed to apply interval-valued triangular fuzzy numbers to represent the linguistic preferences and used multi-criteria decision making to assess the hierarchical structure in identifying the ranking of competitive priorities and the tradeoffs. Specifically, the result found that innovation is a top priority for all SSCM aspects. Likewise, businesses should be aware of suppliers, customers and dependability aspects. The implications and conclusions are discussed.

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1. Introduction

Sustainability drives firms not only to develop competitive priorities but also to enact a move toward sustainable development (Tan and Platts, 2003; Seuring and Muller, 2008). Delmas and Toffel (2004) indicated that competitive forces and industry characteristics may influence the environmental policies of a firm. Sustainable supply chain management (SSCM) suggests that proactive sustainability yields competitiveness, economic benefits, and better corporate social responsibility. However, only limited studies address how competitive priorities interact with SSCM under uncertainty. In past decades, firms have adopted environmental friendly practices, such as resource and internal process management, learning and growth management, stakeholder management and supply chain management (Sarkis et al., 2010; Zhu et al., 2010; Tseng, 2011; Tseng et al., 2013a, b). The implementation of environmental management involves numerous variables in the supply chain, which may lead to managerial challenges related to broader organizational complexities, high costs, risks and effective control

over the supply chains (Simpson and Power, 2005; Carter and Rogers, 2008; Molina-Azorin et al., 2009; Carter and Easton, 2011). These different outcomes could occur because sustainability broadens supply chain management to a wider and integrated perspective rather than a single-dimensional and dichotomous view (Linton et al., 2007; Seuring and Muller, 2008).

In the literature, there are important decisive factors that determine business environments and subsequently company strategies: customers, suppliers, regulations, society and natural resources (Svensson, 2007). Gupta and Palsule-Desai (2011) suggested that SSCM adopts a firm perspective, rather than a societal or a policy-maker perspective, and focuses on organizational decisions related to the entire product life-cycle, which involves design, production, distribution, consumer use, post-use recovery and reuse. Atasu et al. (2008) emphasized the important characteristics of a remanufactured product, such as low cost, lower valuation and supply constraints. In addition to analyzing the profitability of remanufacturing systems for a different cost, technology and logistics structures address demand-related issues. However, the competitive advantage can be further enlightened by a new source of competitive-edged tangible values from the physical side and intangible values from the information side of supply chain management toward sustainability. Porter and van der Linde (1995) viewed pollution from the perspective of resource

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inefficiency and discussed green initiatives in terms of their implications on the competitiveness of a firm.

From the competitiveness perspective, studies have argued that business leaders and environmentalists have focused on the static cost impact of environmental regulations and have ignored the offsetting productivity benefits from innovation (Tseng et al., 2013). Moreover, prior studies have attempted to explore the relationship among priorities, especially the sequence by means of which firms develop various operational capabilities corresponding to the priorities (Flynn and Flynn, 2004; Schroeder et al., 2011). Slack and Lewis (2008) affirmed that a better performance must be achieved in those competitive priorities that are important for the market. Diaz-Garrido et al. (2011) noted that the competitive priorities in SSCM refer to those objectives that manufacturing units must reach if the firms are to be able to compete, achieve the capabilities established for the activity, and reinforce the competitive advantage of the firm. Cai and Yang (2014) realized that the operating frontier and environmental factors affect the tradeoff of the competitive priorities, such as cost, quality, and delivery, and exert the asset frontier direct effects on delivery and flexibility through the operating frontier. In sum, less attention has been given to competitive priorities in SSCM and to the impact of SSCM on building up the competitiveness and the tradeoff of competitive priorities in a hierarchical structure under the linguistic preferences.

The nature of SSCM exists with multi-hierarchical structures from previous studies (Diaz-Garrido et al., 2011; Cai and Yang, 2014; Brindley and Oxborrow, 2014). The literature lacks analysis through the hierarchical structure in the SSCM studies. The prior studies are usually applied to a set of assessment attributes, generally resulting in a highly subjective and unstructured evaluation of the criteria due to a reliance on the experience and knowledge of the assessment. Therefore, this study applies the interval-valued triangular fuzzy number (TFN) to assess the vague and subjective qualitative measures. Additionally, this study has given a significant competitive advantage to firms and is expected to remain an important component of their business. This quantitative model is often applied practically in a hierarchical structure. The hybrid multi-criteria decision making (MCDM) method is proposed to identify the competitive priority under SSCM in a hierarchical structure. In this context, this study focuses on evaluation to fill the existing gaps in the SSCM literature (Linton et al., 2007; Matos and Hall, 2007; Abbasi and Nilsson, 2012; Tseng and Chiu, 2013; Zhu et al., 2013; Tseng et al., 2014). A further understanding of the common and unique SSCM evaluation characteristics is necessary to help further catalyze this study, which offers numerous opportunities to improve the performance of the firm.

The theoretical contributions have therefore aimed to clarify this concept. The firms are faced with the need to coordinate SSCM in this intensive market. Therefore, this analysis needs to be carried out to reveal the current situation of industrial firms with regard to those developments in SSCM that allow these firms to achieve sustainable competitive advantages. From a conceptual perspective, this proposed set of aspects and criteria offers an improvement over all those developed from the previous traditional supply chain management and the sustainable development literature together because this effort evaluates electronic focal manufacturing firms and evaluates of the importance of competitive priority as the weighting under the SSCM. In addition, from a practical perspective, the proposed aspects and criteria allow managers to determine the degree to which firms have developed their importance in the competitive priorities that currently constitute the basis of competence, as well as their effect on business performance.

The objective of this study is to aid management in analyzing SSCM in a hierarchical structure to determine competitive priority.

Such a hybrid method can assist the firms in making decisions in a systematic, clear and wide-ranging manner and in considering a wider and more diversified base of primary aspects and criteria that critically influence the choices and recommendations of the managers. To demonstrate the effectiveness of the developed hybrid MCDM analysis in facilitating the evaluation process, this study was conducted on focal electronic manufacturing firms that develop green processes by frequently applying new technologies that are critical for successful sustainable management.

Lastly, this study provides a theoretical evaluation of the role of SSCM. Increased SSCM development and competition have pushed electronic industries to operate on their supply chain management in sustainability. This study is organized as follows. First, the literature focuses on the theoretical determination of competitive priorities and their previous approaches. Section 2 reviews the literature on the development of a theoretical framework for SSCM. Section 3 presents methods and an analysis of the data. Data from an expert linguistic preference questionnaire in electronic manufacturing firms were analyzed using the interval-valued triangular fuzzy number and multi-criteria decision making methods. The results are discussed in Section 4. This discussion revolves around a hierarchical model in which the aspects, criteria and alternatives are presented. Section 5 presents the managerial and theoretical implications. The discussion, contributions, limitations and conclusions are presented in Section 6.

2. Theoretical background

This section reviews related work addressing how the literature supports SSCM to satisfy the competitiveness and how the SSCM has presented new opportunities to business. This review is particularly focused on three areas: competitive priorities, SSCM, and the method and the development of aspects and criteria.

2.1. Competitive priorities

Competitive priorities are used to describe the priority of operations selected from among the key competitive capabilities of organizational functions. Competitive priorities refer to reaching the competitiveness, achieving the capabilities and reinforcing its competitive advantage. Skinner (1969) presented competitive priorities as short delivery cycles, quality, on-time delivery, flexibility, and low cost. In addition, other competitive priorities are presented in the literature, including innovation (Tan et al., 2007), customer service (Da Silveira, 2005), environmental management (Tseng et al., 2014) and marketing (Tseng et al., 2006). This study considers recent sustainable literature, such as the competitive priorities of cost, quality, flexibility and delivery (Hayes and Wheelwright, 1984).

Continuous innovation is a vital solution to overcome pressures from customers, competitors, and regulators. The adoption of innovation and the implementation of SSCM within the value chain of a firm is very important. Hence, this study includes innovation, which involves introducing new products and production processes as a competitive priority (understood as minimizing the repercussions of production activity in the various components of the environment in SSCM and four classical competitive priorities (Tseng et al., 2013). The inclusion of this factor is justified because concern for the environment is growing, and multiple repercussions of SSCM are involved (social, economic and environment). In business, the competitive priorities have become strategic variables because firms are simultaneous causes of operational decisions (Chiou et al., 2011).

Firms respond to the level of advantage and internal capabilities achieved by their competitive priorities in business that have been

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