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Sustainable supply chain management: framework and further research directions

Rameshwar Dubey [a, 1], Angappa Gunasekaran [b, *], Thanos Papadopoulos [c, 2], Stephen J. Childe [d], K.T. Shibin [e, 3], Samuel Fosso Wamba [f]

[a] Symbiosis Institute of Operations Management, Symbiosis International University, Plot No. A-23, Shravan Sector, CIDCO, New Nashik, 422008, India
[b] Charlton College of Business, University of Massachusetts Dartmouth, North Dartmouth, MA, 02747-2300, USA
[c] Kent Business School, University of Kent, Sail and Colour Loft, The Historic Dockyard, Chatham, Kent, ME4 4TE, United Kingdom
[d] Plymouth Business School, Plymouth University, Plymouth, PL4 8AA, United Kingdom
[e] Symbiosis International University, Pune, India
[f] NEOMA Business School, Rouen, 1 Rue du Maréchal Juin, BP 215, Mont Saint Aignan Cedex, 76825, France

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ABSTRACT

This paper argues for the use of Total Interpretive Structural Modeling (TISM) in sustainable supply chain management (SSCM). The literature has identified antecedents and drivers for the adoption of SSCM. However, there is relatively little research on methodological approaches and techniques that take into account the dynamic nature of SSCM and bridge the existing quantitative/qualitative divide. To address this gap, this paper firstly systematically reviews the literature on SSCM drivers; secondly, it argues for the use of alternative methods research to address questions related to SSCM drivers; and thirdly, it proposes and illustrates the use of TISM and Cross Impact Matrix-multiplication applied to classification (MICMAC) analysis to test a framework that extrapolates SSCM drivers and their relationships. The framework depicts how drivers are distributed in various levels and how a particular driver influences the other through transitive links. The paper concludes with limitations and further research directions.

1. Introduction

In recent times, sustainable supply chain management (SSCM) has become a topic of interest for academics and practitioners (Carter and Rogers, 2008; Seuring and Müller, 2008; Pagell and Wu, 2009; Carter and Easton, 2011; Ahi and Searcy, 2013; Pagell and Shevchenko, 2014; Marshall et al., 2015; Li et al., 2015). According to Walmart, over 90% of its total emissions related to its operations are from its supply chain (Birchall, 2010). The interesting fact is that more than 20% of global greenhouse gases emissions are made by about 2500 largest global companies, and their supply chains are responsible for a major proportion of emissions resulting from corporate operations (Carbon Disclosure Project, 2011). Because of globalization, distribution channels of goods and services have become very complex (Reuter et al., 2010), and subsequently the socio-economic conditions of the respective regions are a major success factor of supply chain networks (Beske et al., 2008). This has led to competition between corporates based on sustainability-oriented innovations (Nidumolu et al., 2009; Hansen et al., 2009). Literature has also looked into the importance of safety, diversity, equity, and other social and economic issues within the supply chain (e.g. Maloni and Brown, 2006; Chin and Tat, 2015).

Though there is a rich body of literature on drivers of SSCM (e.g. Walker and Jones, 2012; Ahi and Searcy, 2013; Diabat et al., 2014), the majority of the scholars have been engaging with empirical methods, either quantitative or qualitative, to create theoretical frameworks that entail drivers (Binder and Edwards, 2010; Soltani et al., 2014). In recent years some scholars have argued that in its majority, literature on SSCM has been following a dichotomist view

* Corresponding author. Tel.: +1 508 999 9187.
E-mail addresses: rameshwardubey@gmail.com (R. Dubey), agunasekaran@umassd.edu (A. Gunasekaran), A.Papadopoulos@kent.ac.uk (T. Papadopoulos), stephen.childe@plymouth.ac.uk (S.J. Childe), shibin143kt@gmail.com (K.T. Shibin), Samuel.FOSSO.WAMBA@neoma-bs.fr (S.F. Wamba).
[1] Tel.: +91 8600417738 (mobile), +91 253 2379960x39.
[2] Tel.: +44 (0) 1634 88 8494.
[3] Tel.: +91 9028992955.

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on creating frameworks for SSCM drivers, following either deductive empirical research (e.g. Markman and Krause, 2014), or case study approaches (e.g. Meredith, 1998; Pagell and Wu, 2009; Ketokivi and Choi, 2014). Wells (1993) argues that over-reliance on quantitative methods hampers the theoretical framework development process, since qualitative methods may do in-depth analysis of a problem through an inductive process, while theory generated by using qualitative methods remains untested (Hyde, 2000). Deductive approaches are highly reliable, but may fail to give new insights (Markman and Krause, 2014). Cases that build theory are often regarded as "most interesting" researches (Bartunek et al., 2006). There are a considerable amount of case study researches in SSCM area, but there is no clarity or criteria mentioned for the selection of case, data collection methodology or number of cases under study (Giunipero et al., 2006). Hence, in many situations, case studies may not become an effective tool for developing a strategic framework for a philosophical idea. The use of case studies for theory building has been criticized on the grounds of "ambiguity of inferred hypotheses" and the "selective bias" (Bitektine, 2008: 161; Barratt et al., 2011), especially by those scholars who are not familiar with qualitative methods (Bitektine, 2008; Roth, 2007).

This paper aims to bridge this debate by arguing for the use of Total Interpretive Structural Modeling (TISM). We are driven by the endorsement of scholars such as Barratt et al. (2011) and Taylor and Taylor (2009) to (i) utilize alternative research methods and frameworks to explain OM and SCM related phenomena; and (ii) to build robust approaches and techniques that consider the dynamic environment of SCM (and in our case SSCM) instead of following either deductive or inductive approaches. We draw on Systems Theory and use TISM to develop and test a framework that extrapolates SSCM drivers and their relationships, based on a systematic literature review of SSCM drivers. Sushil (2012) argues that systems theory and systems engineering based methods may provide a helping hand to organizational researchers on this front. Identification of structure within a system is of great value in dealing effectively with the system and better decision-making. Structural models may include interaction matrices and graphs; delta charts; signal flow graphs, etc., which lack an interpretation of the embedded object or representation system. However the TISM based approach offers flexibility to enhance interpretive logic of systems engineering tools not only in delineating a hierarchical structure of the intended organizational theory, but also to interpret the links in order to explain the causality of the conceptual model by using the strengths of the paired-comparison methodology.

According to Nasim (2011) and Sushil (2012), Interpretive Structural Modeling fails to explain the causal relationships or transitive links between the constructs of the model. TISM is considered to be an extension of ISM, which helps to overcome these limitations. But even though there is a growing attention on TISM methodology, there are limited studies that used TISM as a methodology to develop theoretical frameworks (Goyal and Grover, 2012; Mangla et al., 2014; Prasad and Suri, 2011; Singh and Sushil, 2013; Srivastava and Sushil, 2014; Yadav and Sushil, 2014) and Dubey et al. (2015a,b) who suggest its use for theory building in sustainable manufacturing.

Therefore, in this paper we: (i) undertake an extensive literature review and identify key drivers of SSCM practices; and (ii) use TISM and MICMAC analysis to understand the relationship among drivers of SSCM practices and develop a theoretical SSCM drivers' framework.

The rest of the paper is organized as follows. In the following section we outline our systematic literature review. In the third section we outline our research theoretical framework and research methodology. In Section 4, we present our SSCM theoretical framework as the outcome of the MICMAC analysis. We relate this to literature in the Discussion, Section 5, and in Section 6, we conclude our research and provide further research directions.

2. Literature review

2.1. Sustainable supply chain and drivers

Sustainable supply chain concerns the "management of material, in-formation and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements" (Seuring and Müller, 2008: p. 1700). Reviews of the literature on the definitions of SSCM (e.g. Carter and Easton, 2011; Ahi and Searcy, 2013; Pagell and Shevchenko, 2014) suggest that SSCM is the voluntary integration of social, economic, and environmental considerations with the key inter organizational business systems to create a coordinated supply chain to effectively manage the material, information and capital flows associated with the procurement, production and distribution of products or services to fulfill short term and long term profitability, stakeholder requirements, competitiveness and resilience of the organization. Therefore, SSCM can be understood as SCM focusing on maintaining environmental, economic, and social stability for long-term sustainable growth (Linton et al., 2007; Ahi and Searcy, 2013; Leppelt et al., 2013).

A literature review was conducted for the purposes of this research following the tenets of systematic literature review (SLR) explained by Tranfield et al. (2003) and later studies (e.g. Rowley and Slack, 2004; Burgess et al., 2006; Cousins et al., 2006; Chen et al., 2014; Gunasekaran et al., 2015). The literature review aimed to identify and classify drivers of SSCM. The papers were derived using keywords from following databases: Proquest, Science Direct, EBSCO, SCOPUS, Emerald, Springer, Inspec, and Compendex. The keywords we included were: 'sustainable supply chain', 'green supply chain', 'sustainability', 'drivers', and 'strategic framework'. Within these databases, we accessed reputable journals in the field of operations and sustainable supply chain management, as well as edited books and reports. These papers were further scanned and analyzed (Chen et al., 2010; Merali et al., 2012) to identify and interpret themes and features. This process yielded 102 articles that we have included in our research. From this literature we classified the key drivers of SSCM. Twelve themes arose, as described in the following sub-sections.

2.1.1. Green warehousing

Warehouses generate much of the packaging waste in the supply chain. The use of standard re-usable containers is a solution for this to reduce cost and eliminate waste. Maximizing storage area utilization, minimizing storage and retrieval cost, and minimizing energy usage are the important objectives that are to be taken care of at warehouses (Wu and Dunn, 1995).

Harris et al. (2011) emphasize the importance of a proper warehouse management system for sustainability performance. Wang et al. (2015) underline the importance of recycling facilities at warehouses. Other scholars (see, Rizzo, 2006; Colicchia et al., 2011; McKinnon et al., 2010) have recognized the importance of warehouse sustainability and suggest that green warehouses and issues related to the use of green energy sources and strategies as well as the adoption of energy-efficient handling technologies are important topics for future sustainability research. Therefore, we identify green warehousing as one of the main SSCM drivers.