



A literature review and a case study of sustainable supply chains with a focus on metrics

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ABSTRACT

We review the literature on sustainable supply chains during the last decade; 2000–2010. We analyze the literature from different perspectives. We then provide frameworks for sustainable supply chain management and performance measures. We also provide a case study to illustrate the experience of a utility supply chain in setting performance indicators.

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1. Introduction

The topic of supply chain sustainability has been of great interest for the last decade both in academia and the practitioners' world. Due largely to pressures from various stakeholders, especially government regulators, community activists, non-governmental organizations (NGOs), and global competition, many companies have adopted a certain level of commitment to sustainability practices. Some of these commitments are sometimes superficial and non-compulsory, for example including the motto "Think before you print" in a company's electronic mail communications. Other companies are still hesitant to commit to sustainability measures, as long as they are not forced to do so by law. The common trait between these companies is that they do not have a common standard for evaluating sustainability initiatives (e.g., Searcy et al., 2009; Tweed, 2010). Some authors even argue that there are incompatibilities between the known principles of performance measures and supply chain dynamics (e.g., see Lehtinen and Ahola, 2010). Thus, there is a need for more research on developing an appropriate framework for performance measurements in supply chains. It is our goal in this paper to survey the literature and extract a common framework for sustainable supply chain performance measures and metrics.

The rest of the paper is organized as follows. In the next section we outline the review objectives and methodology. In Section 3 we provide a definition of sustainable supply chain management. The results of our review are presented in Section 4. In Section 5 we describe two frameworks: one for managing

sustainable supply chains and the other for the development of performance measures for sustainable supply chains. A case study to illustrate the experience of an electric utility company in setting performance indicators is reported in Section 6. Finally, in Section 7 we conclude and suggest a future research agenda for the field of sustainable supply chain management.

2. Objectives and methodology

The purpose of our research is to (i) review sustainable supply chain management research in the last decade and analyze it from different perspectives, (ii) propose a unified conceptual framework for sustainable supply chain management, (iii) highlight the importance of reliable supply chain performance measures and develop and propose a composite index metric, (iv) present a case study of sustainable supply chain performance indicators in the energy sector, and (v) highlight the gaps in the literature that need further investigation.

We reviewed papers from journals and sources that cater mainly to social and applied sciences, unless the work discussed a general and imitable "sustainable" practice, it was excluded from the review. The focus of this paper is to analyze and extract relevant literature from journals that can help both academics and practitioners formulate a response tailored to their business needs. Thus this paper is focused on the tactical and the operational aspect of sustainable supply chains.

We started the review process by searching Title, Abstract and Keyword in SCOPUS with keywords (sustainable OR green) AND (supply AND chain) and further restricting results to just peer reviewed articles published in English language journals after 1999. This gave us a total of 707 articles in various subject area categories.

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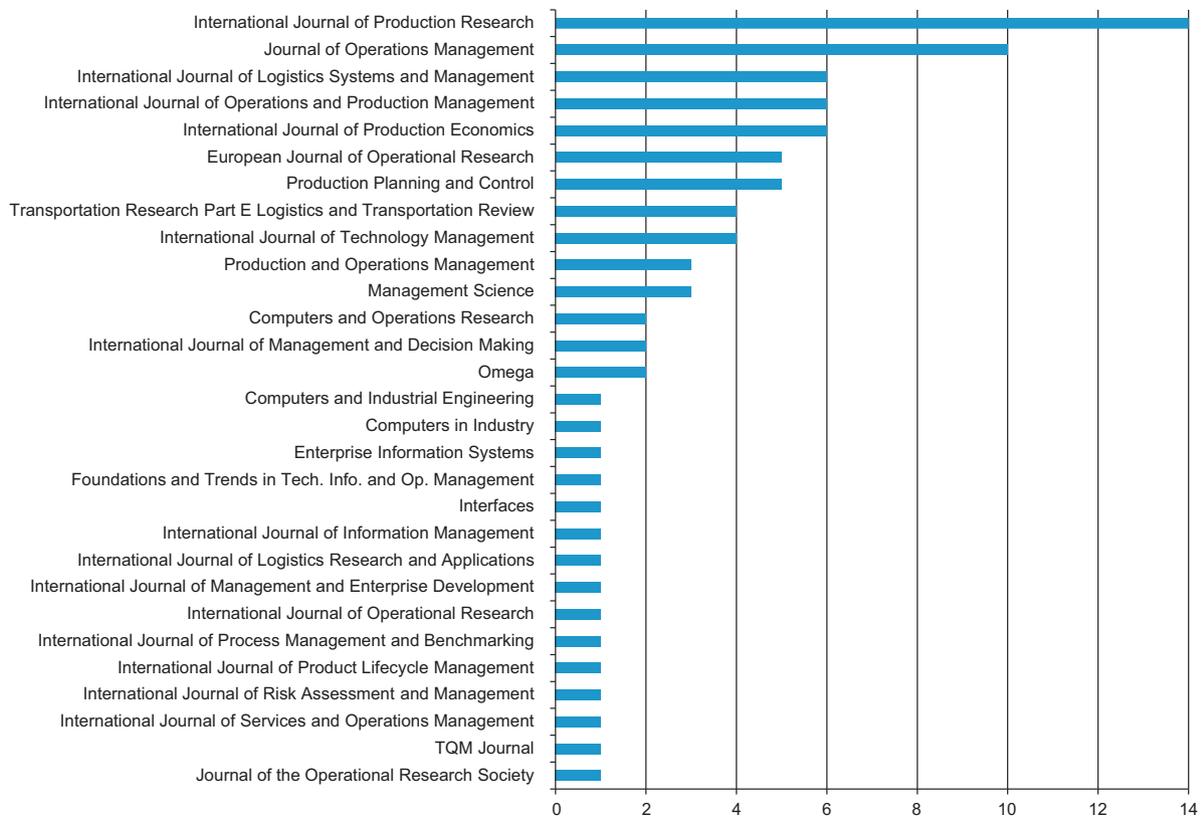


Fig. 1. Distribution of reviewed papers by journal.

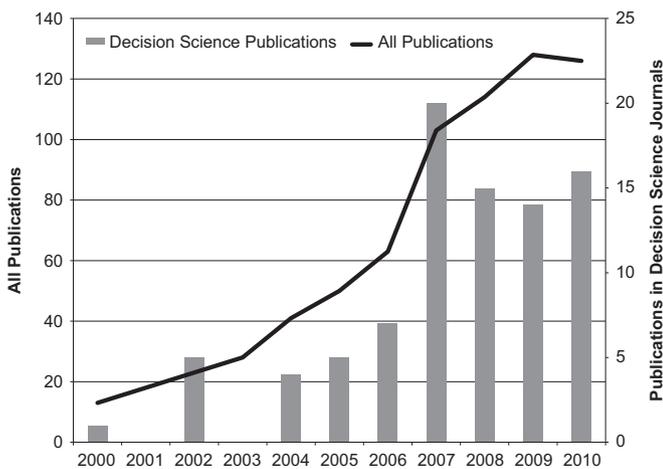


Fig. 2. Distribution of reviewed and other relevant papers by publication year.

Next, we restricted the articles by subject area, requiring that they be only published in category Decision Sciences resulting in 87 articles. We chose to focus on the Decision Sciences subject area because we are targeting to publish the review in journals that are within this subject area. Fig. 1 shows the distribution of reviewed papers by journal. It is worth noting that five journals account for about 50% of the reviewed publications.

Fig. 2 shows the distribution by publication year of the reviewed papers as well as all the articles that fell under our search criteria. Barring the distribution at the right tail, due to the possibility of additional publications in the pipeline, it is evident that there is an increasing trend manifesting the increasing interest in this research area.

While including all the 707 papers in the review is not practical, we also realize that restricting our study to the 87 papers may not

allow us to cover all the important issues related to sustainable supply chains. Thus, whenever we find that the 87 pool of papers does not include a sufficient number of studies on a particular issue, we extend our search to the larger database of 707 papers. For example, to study publications in different industry sectors and firm sizes we have enlarged our papers pool to the 707 papers. To help the reader distinguish between the two pools of papers we include them in different sections in the bibliography.

3. Definition of sustainable supply chain management

As in Chopra and Meindl (2007), we define a supply chain as all parties involved in fulfilling a customer order. In particular, we stress the fact that more than one decision maker is involved in managing resources, information, and/or processes that may not be entirely under the control of their company. In addition we define supply chain management as the control of the supply chain operations, resources, information and funds in order to maximize the supply chain profitability or surplus—the difference between the revenue generated from a customer's order and all the costs incurred by the supply chain while satisfying that customer's order. We define business sustainability as the ability to conduct business with a long term goal of maintaining the well-being of the economy, environment and society. Elkington (1997) is credited with popularizing the latter three dimensions, which he called the triple bottom line (TBL) principle (also known as the three pillars: profit, planet, and people). As a sign of their sustainability practices companies issue periodic TBL reports to their stakeholders. We are now ready to provide a unified definition for sustainable supply chain management as the management of supply chain operations, resources, information, and funds in order to maximize the supply chain profitability while at the same time minimizing the environmental impacts and maximizing the social well-being.

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