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Sustainability in purchasing and supply: defining the territory

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Abstract

The purpose of this paper is to provide a review of definitions for sustainability in the area of purchasing and supply. In order to do this a literature review is used to define the term sustainability at different levels of supply including the: 1) purchasing, procurement and sourcing 2) supply chain and 3) network levels. Furthermore, measures used in recent studies are also presented in order to demonstrate the typical scope of studies.

Introduction

This differentiation in levels of analysis is important, for example Seuring and Muller (2008 pg 460) show "*supplier management (particularly addressing issues at the supplier–buyer interface*)" and "*Supply chain management (issues across all companies involved in the supply chain)"*. Moving further from traditional conceptualizations we also include the network level of analysis. There are a number of reasons why networks are relevant here. As Roome (2001 p.) aptly states "*we increasingly see ourselves part of a network society living in a network age*", "*concerns about complex environmental and social consequences of industrial activity have provoked the need for more frequent and meaningful engagement between companies and stakeholders*" and "*networks have an identified role in innovation for environmental management and sustainable development*", as well as "*knowledge suggests that ecosystems are based on organisms connected through complex networks of energy and material flows*". Alongside these definitions of sustainability we also provide a review of the principal measures used to gauge the degree of sustainability at these different levels of analysis. These measures include those used in empirical and conceptual frameworks as well as those typically used in practitioner models. In summary we ask: what are the definitions and measures used to describe sustainability at different levels of analysis in the area of purchasing and supply?

Method

This paper is a literature review. One of the difficulties in defining sustainability at different levels in a supply chain is that authors often describe their research as addressing supply chains when in fact the level of analysis is rather more restricted for example to a buyer or supplier perspective. Hence we are not limiting this review to empirical works (as these are rather limited across all levels), but to include other conceptual, theoretical papers as well. At the same time the review does not consider analytical modeling approaches, though there are significant research studies in this area we are more concerned with what firms are actually doing. The research asks what are the definitions and measures of sustainability at different levels in the supply chain. Papers are analyzed regarding the conceptual and empirical levels of analysis. At the same time

we search for explicit and implicit measures used to detect differences in elements of sustainability at these different levels of SCM.

For the initial search of relevant papers the authors used the well established databases Emerald and Ebsco. For this first part of the study, journal article titles were searched. Using the following search terms. We used a number of criteria for the selection of articles: relevance, contains definitions and measures, recent (we decided an arbitrary cut off point at year 2000). As this is a continuing study, many of the limitations stem from the methodology. Hence, from this initial review we intend to extend the review further to provide an exhaustive list (attempting to achieve saturation in the results).

Table 1: Search terms used and results

Term	Term	Emerald	Ebsco	Number Selected
Green	supply	14	43	20
Green	purchasing	8	10	7
Sustainable	supply	15	55	27
Sustainable	purchasing	1	2	2
Sustainability	supply	4	20	13
Sustainability	purchasing	0	2	1
Sustainable	Procurement	6	10	10
Sustainability	Procurement	0	2	2
Green	Procurement	0	13	5
Sustainable	Network	-	45	10
	Totals	48	157	**97**

Table 2: Journals used in the review

Journals used in the review	
Academy of Management Proceedings	International Journal of Operations & Production Management
Asian Business & Management	International Journal of Physical Distribution & Logistics Management
Benchmarking: An International Journal	International Journal of Production Economics
Business Ethics: A European Review	Journal of Business Ethics
Business Strategy & the Environment	Journal of Cleaner Production
Corporate Environmental Strategy	Journal of Operations Management
Corporate Social Responsibility & Environmental Management	Journal of Purchasing & Supply Management
European Journal of Innovation Management	Journal of Supply Chain Management
Greener Management International	Omega
International Journal of Environmental Technology & Management	Supply Chain Management
International Journal of Logistics: Research & Applications	Sustainable Development
International Journal of Management Reviews	Transportation Research: Part E

Definitions of sustainability: different analytical levels

Sustainable purchasing, procurement and sourcing

There have been a number of studies that have taken the purchasing level of analysis (Bowen, Cousins, Lamming & Faruk, 2001; Grankvist & Biel, 2007; Green, Morton & New, 1996, 1998; Min & Galle, 1997; Min & Galle, 2001). While Walker et al (2008) describe green supply chain practices, the evidence is collected from a purchasing perspective, whereby "*In this context green supply chain management practices are understood as supply management activities that attempt to improve the environmental performance of purchased inputs, or of the suppliers that provide them*" (pg 75). Sustainable sourcing is also a term often used by practitioners but has not become a mainstream academic construct. Variants on this include ethical sourcing (Blowfield 2000), and research in this area tends to focus on guidelines and codes of practice for managing relationships (trading) with suppliers along social and environmental dimensions, in particular using quality control (audit) type systems (Hamprecht et al 2005). Other implications include organizational integration issues to support new sourcing priorities (Koplin et al 2006). The following table provides examples of definitions of sustainability at the purchasing, procurement or sourcing level, typically involving the purchasing department or the dyad (buyer-supplier).

Table 3: Definitions of sustainability at the purchasing, procurement or sourcing level

Definition	**Year**	**Authors**
Socially responsible organizational buying is that which attempts to take into account the public consequences of organizational buying or bring about positive social change through organizational buying behavior	1994	Drumwright (exception included)
Green supply refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment	1996	Green et al.
"supply management activities that attempt to improve the environmental performance of purchased inputs, or of the suppliers that provide them" (pg 75)	2008	Walker et al
social sustainability: A product or system that meets the performance requirements and expectations of customer stakeholders without causing harm to the wellbeing of society and its members across different time periods.	2008	Lindgren et al
managing the optimal flow of high-quality, value-for-money materials, components or services from a suitable set of innovative suppliers in a fair, consistent, and reasonable manner that meets or exceeds societal norms, even though not legally required.	2009	Eltantawy et al
Sustainable procurement (SP) is procurement that is consistent with the principles of sustainable development, such as ensuring a strong, healthy and just society, living within environmental limits, and promoting good governance.'	2009	Walker and Brammer
an environmentally conscious purchasing initiative that tries to ensure that purchased products or materials meet environmental objectives set by the purchasing firm, such as reducing the sources of wastages, promoting recycling, reuse, resource reduction, and substitution of materials (Carter et al., 1998; Min and Galle, 2001; Zsidisin and Siferd, 2001).	2010	El Tayeb et al

Sustainable supply chain management

Few studies have attempted to address sustainability across the whole supply chain (Seuring & Mueller, 2008). Work that claims to address the supply chain level is fairly diverse in scope (Beamon, 1999; Gavaghan, Calahan Klein, Olson & Pritchett, 1998; Handfield, Walton, Seegers & Melnyk, 1997; Lambert, 2001; Murphy, Poist & Braunschweig, 1996; Preuss, 2005; Rao & Holt, 2005; Van Hoek, 1999; Walker, Di Sisto & McBain, 2008; Walton, Handfield & Melnyk,

1998; Zhu, Sarkis & Geng, 2005; Zhu, Sarkis & Lai, 2008). Furthermore, some researchers claim to address the supply chain, while the analytical level is actually limited to the firm (Matos & Hall, 2007). Other terms used includes 'green' as a focus for sustainability (Darnall, Jolley & Handfield, 2008). As an example, defining green supply chain management Walker et al (2008 pg 69) view associated practices as "*reducing packaging and waste, assessing vendors on their environmental performance, developing more eco-friendly products and reducing carbon emissions associated with transport of goods*". The supply chain level implies a greater scope of management spanning boundaries up and downstream of operations including issues of external integration (Andersen & Skjoett-Larson 2009).

Table 4: Definitions of sustainability at the supply chain level

Definition	Year	Authors
Green Supply Chain Management (GSCM)= Green Purchasing + Green Manufacturing & Materials Management + Green Distribution + Marketing + Reverse Logistics	2005	Aref et al
Environmental supply chain dynamics (ESCD) are a phenomenon where environmental innovations diffuse from a customer firm to a supplier firm, with environmental innovation defined as being either a product, process, technology or technique developed to reduce environmental impacts	2000	Hall
Green SCM practices include internal environmental management, external green SCM, investment recovery, and eco-design or design for environment practices.	2004	Zhu and Sarkis
Defines GSCM as 'integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumer as well as end-of-life management of the product after its useful life'.	2007	Srivastali
sustainability supply management concept consists of 4 levels: 1) normative requirements 2) early detection 3) supply process 4) monitoring and supplier development	2007	Koplin et al
Interorganizational knowledge sharing in green supply chains involves activities of transferring or disseminating green knowledge from green manufacturing firms to their partners with a view to developing new capabilities for effective actions.	2008	Cheng et al
Sustainable supply chain management as the management of material and information 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, and stakeholder requirements into account	2008	Seuring et al.
SSCM as the strategic, transparent integration and achievement of an organization's social, systemic coordination of key interorganizational business processes for improving the environmental, and economic goals in the long-term economic performance of the individual company and its supply chains.	2008	Carter & Rogers
GSCM is designed to incorporate environmental considerations into decision making at each stage of an organization's materials management and logistics functions through post-consumer disposal	2008	Zhu et al
GSC encompasses a broad range of practices from green purchasing to integrated supply chains flowing from suppliers, to manufacturers, to customers, and to the reverse supply chain, which is "closing the loop"	2008	Lee
one that performs well on both traditional measures of profit and loss as well as on an expanded conceptualization of performance that includes social and natural dimensions	2009	Pagell and Wu
The sustainable supply chain discourse thus differs from mainstream supply chain management, as it involves the recognition of stakeholders within and beyond the	2010	Hall and Matos

supply chain.		

Sustainability at the network level

At this level we cast the net wider from the companies involved in the supply chain to also include the broader network of organizations. Typically this is a lens used in stakeholder studies, often drawing on network theory (Cumming, 2001; Delmas, 2001; Fineman & Clarke, 1996; Matos & Hall, 2007; Peter, Beat & Niels, 2006). The advantage of adopting this level of analysis is that the stakeholders in sustainable development are many and varied, including consumers, businesses and government, NGOs, shareholders, activists, competitors, suppliers and individual managers. Achieving sustainability therefore involves multiple inter-connected actors, who are likely to have different ambitions and objectives, and the friction amongst these network actors may be critical (Araujo & Harrison, 2002). It is clear from the literature review that studies looking at sustainability at the network level are far more rare. We find very few studies really take this wider view, but instead often use network and supply chain synonymously. An example of the wider network view includes industrial symbiosis involving the use of one firm's residual resources and byproducts as inputs (supplies) for another (Bansal & McKnight, 2009). Many articles attempt to take this view in their explanation but clear definitions are largely absent (Frota Neto, Bloemhof-Ruwaard, van Nunen & van Heck, 2008; Mehalik, 2000; Roome, 2001; Vachon & Mao, 2008; von Malmborg, 2007; Wheeler, McKague, Thomson, Davies, Medalye & Prada, 2005; Young & Kielkiewicz-Young, 2001).

Measures of sustainability

In this part of the paper we present measures that have been used to gauge the level of sustainability in the areas of purchasing and supply. As in the previous section we divide this into the three level of analysis in order to understand how sustainability has been measured

Sustainable purchasing, procurement / sourcing measures

Looking at corporate social responsibility from a purchasing perspective, Carter (2005) used four dimensions of CSR related to diversity, environment, human right philanthropy and safety. Measures for the environmental dimension included using LCA, design for disassembly, design for recycling and reuse, waste reduction commitment, reducing packaging and so forth.

Table 5: Measures of sustainability at the purchasing, procurement or sourcing level

Examples of Measures used	**Study**
SM ethical responsibility (based on the definitions of Carroll, 1991, and Carter and Jennings, 2004) • 1- I am very knowledgeable of my firm's ethical policies. • 2 - I am in compliance with my firm's ethical policies.	Eltantawy et al
• Uses a life-cycle analysis to evaluate the environmental friendliness of products and packaging • Has a formal MWBE (minority/women-owned enterprise) supplier purchase programme • Participates in the design of products for recycling or reuse • Ensures the safe incoming movement of product to our facilities • Purchases from MWBE suppliers • Volunteers at local charities	(Walker & Brammer, 2009) See also Carter and Jennings, 2004

• Asks suppliers to commit to waste reduction goals • Purchases from small suppliers • Visits suppliers' plants to ensure that they are not using sweatshop labour • Participates in the design of products for disassembly • Asks suppliers to pay a "living wage" greater than a country's or region's minimum wage • Donates to philanthropic organisations • Ensures that suppliers' locations are operated in a safe manner • Ensures that suppliers comply with child labour laws • Purchases from local suppliers • Reduces packaging material	
Green purchasing (9 item measures; • GP1 Provides design specifications to suppliers that include environmental requirements for purchased items • GP2 Requires its suppliers to develop and maintain an EMS • GP3 Requires its suppliers to have a certified EMS such as ISO 14001 • GP4 Uses a questionnaire to collect information about its suppliers' environmental aspects, activities and/or management systems • GP5 Makes sure that its purchased products must contain green attributes such as recycled or reusable items • GP6 Makes sure that its purchased products must not contain environmentally undesirable items such as lead or other hazardous or toxic materials • GP7 Evaluates its suppliers based on specific environmental criteria • GP8 Evaluates the environmental aspects of its second-tier suppliers • GP9 Makes sure that its suppliers meet its environmental objectives Plus Regulations 7 item measures, Customer pressures 9 item measures ; Social responsibility 9 item measures Expected business benefits 9 item measures	ElTayeb et al 2010
• Environmental performance measures: 42 measures of GSCM across all possible dimensions	Aref et al 2005
• Product based • Process based • Support and Indirect measures	Preuss 2009
• Buyer GSC practices: • Buyer1 Incorporate environmental considerations in selecting their supplies and suppliers. • Buyer2 Request us to have an environmental management system (e.g. ISO 14001). • Buyer3 Have interest in greening the supply chain. • Buyer4 Provide us with environmental training, education, or technical assistance.	Lee 2008
• 1 Holding environmental awareness seminars for Suppliers • 2. Guiding/helping suppliers to establish their own environmental programs . • 3 Bringing suppliers together • 4 Informing suppliers about the benefits of environment friendly technologies • 5. Urging suppliers to take environmental actions • 6. Choice of suppliers by environmental criteria • 7. Arranging funds to help suppliers for their environment programs • 8. Sending company auditors to appraise environmental compliance of suppliers	Rao 2009

Sustainable supply chain measures

In measuring green supply chain management Darnell et al (2008) used OECD established metrics covering assessment of the environmental performance of suppliers, requiring suppliers to establish environmental practices and tracking the cost of waste throughout the supply chain, as well as, if facilities informed buyers of ways to reduce their environmental impacts. For these measures it can be seen that sustainability in a supply chain context is taken up primarily through

collaboration or cooperation with suppliers to achieve various outcomes and monitoring of suppliers. It is the monitoring part that seems well developed, such as checking compliance to regulations and rules and voluntary standards such as ISO14001.

Table 6: Measures of sustainability at the supply chain level

Examples of Measures used	**Study**
• Environmental collaboration with suppliers (5items) - Achieving environmental goals collectively. - Developing a mutual understanding of responsibilities regarding environmental performance. - Working together to reduce environmental impact of our activities. - Conducting joint planning to anticipate and resolve environmental-related problems. - Making joint decisions about ways to reduce overall environmental impact of our products • Environmental collaboration with customers: (5 items) • Environmental monitoring of suppliers: (4 items) - Providing suppliers with written environmental requirements. - Sending environmental questionnaires to suppliers in order to monitor their compliance. - Requiring that suppliers have an implemented environmental management system (e.g. ISO 14000). - Asking suppliers to commit to waste reduction goals. • Environmental monitoring by customers: (5 items) • Environmental technologies: (5 items)	(Vachon & Klassen, 2006; Vachon & Mao, 2008)
Environmental performance measures: 42 measures of GSCM across all possible dimensions	(Aref, Marilyn & Joseph, 2005)
• SGO1 Environmentally sound product (importance over the last three years) • SGO2 Environmentally sound product (current importance) • SGO3 Improving your environmental performance (for the next three years	(Hong, Kwon & Roh, 2009)
External GSCM practices • Providing design specification to suppliers that include environmental requirements for purchased item • Cooperation with suppliers for environmental objectives • Environmental audit for suppliers' internal management • Suppliers' ISO14000 certification • Second-tier supplier environmentally friendly practice evaluation • Cooperation with customer for eco-design • Cooperation with customers for cleaner production • Cooperation with customers for green packaging	(Zhu & Sarkis, 2004)

Sustainable network measures

These measures are rather more scarce but can relate to industry level measures of environmental practices (Delmas and Toffel 2004) as well as managerial attitudes to broader stakeholders e.g. reactive, defensive, accommodative and proactive (Henriques and Sadorsky 1999). However, our review failed to find measures at a network level that show the degree of engagement within sustainable network (including the supply chain but also extending beyond typical supply chain companies, and out to other stakeholders). As this area is rather new, we might expect that methods used to study this phenomenon may be more restricted to case studies where measures

could be embedded within narrative analysis. Thus further exploration of articles may reveal measures of how companies engage in sustainability at the network level.

Conclusions

The review reveals there is a great deal of confusion in the definitions and measures used, often cutting across levels of analysis. Hence our contribution is to show how definitions vary across different levels of analysis. As a general observation we can see that definitions at the purchasing (function or buying company) level tend to share many of the same elements as at the supply chain level, but the majority of the purchasing level definitions focus on the impact on purchased inputs. Definitions at the supply chain level tend to increase scope and focuses on the practices that cut across the supply chain. However it is the area of measures that provides the most usefulness, as this operationalises the definitions that have been given and shows how sustainability is actually detected. As such supply chain sustainability appears to be manifest through collaboration with and monitoring of suppliers (up to a 2nd tier in the case of monitoring). We also develop a research agenda that addresses sustainable supply chain management at each different level and suggests measures for each of these levels of research.

Limitations

This working paper reports on on-going research into the definition and measurement of Sustainable purchasing and supply. As such this paper reports on current progress in the project and not final outcomes. The main area to be further developed is the method, whereby an extension of search terms may reveal further definitions and measures of sustainability at various levels of analysis.

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