

# **Sustainable supply chain management: achieving optimal performance and outcomes.**

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## **Abstract**

The research summarises theory in the fields of supply chain management (SCM) and its extension into sustainable supply chain management (SSCM). Recent literature reviews reflect a lack of theoretical development in SSCM. Where present these are imported from other disciplines. A key difference between SCM and SSCM is the latter's need to consider environmental and social externalities. A conceptual review finds that systems theory is a research paradigm shared by SCM, environmental science, social theory and service dominant logic. Meta-synthesis of these is then possible, to inform a conceptual framework for case study research into SSCM practice by proactive companies.

**Keywords:** sustainability, supply chain management, systems theory

## **Introduction**

Organisations are increasingly concerned about managing not only economic performance, but also their wider social and environmental impacts. Aligning these externalities within corporate strategy has been discussed in papers such as Porter and Kramer (2006), and evidenced by long-term studies such as (Golicic & Smith, 2013). However, for individual companies, achieving exemplary performance will not necessarily meet the macro goals of meeting ecological or social crises (Rockström et al., 2009). Whiteman, Walker, and Perego (2012) note that there is a significant knowledge gap between individual firm performance and aggregated social and environmental impacts. Organisations must work collectively with rivals or non-rivals at a sector level to transform practices towards positive impacts.

Within the field of SSCM, understanding of this issue has been growing. At the level of a single organisation, environmental or social performance can appear to be improved merely by outsourcing a polluting process, or selling and leasing back real estate, and thus getting the environmental footprint associated with those operations off the organisation's balance book. When viewed at the whole supply chain level an organisation's impacts are viewed in their totality. This is done at a product level with Life Cycle Impact Analysis (Adhitya, Halim, & Srinivasan, 2011; Lim & Park, 2009). Questions of responsibility over a supply chain is also a long-established topic, with for instance, (New, 2004) citing famous examples of upstream and downstream responsibility, such as Nike in the era of globalisation or IBM in the 1930s. New points

out, however, that business ethics is under theorised when it comes to responsibility over supply chains, and is also jurisprudentially complex. In practice, it is highly contingent on the specifics of any given case.

In a recent review of literature in SSCM, Carter and Easton (2011) conclude there is a paucity of theoretical grounding in most papers. Where theories are present in papers researching SSCM, they are imported from other disciplines. This is taken as a consequence of this being a young field of study, where case study research is popular precisely because work is needed to understand what the main factors at play actually are (Hassini, Surti, & Searcy, 2012). The wider, and only slightly older study of SCM suffers from a similar status, and different approaches to SCM reflect their mother disciplines. Giannakis and Croom (2004) and Chicksand, Watson, Walker, Radnor, and Johnston (2012) describe major paradigms and theories in SCM and how they provide different lenses for understanding the topic.

This paper therefore makes the following contributions to knowledge. First, it brings systems theory to SSCM, which has been applied to SCM (Pathak, Day, Nair, Sawaya, & Kristal, 2007) but has scarcely been adopted to view SSCM. Second, the suitability of systems theory is argued for as it has been applied to three disciplines that are relevant to SSCM: SCM, environmental science and service-science. As such, systems theory provides a coalescing perspective with which to view SSCM. Third, systems theory has practical relevance for SCM practitioners, as it helps them to think about notions of shared value and values in SSCM. This paper is structured as follows. Firstly, a review of theories used in SSCM research is described. Next, investigating SSCM from a systems theory perspective is considered, leading to the development of a conceptual framework involving case studies with a number of leading organisations seeking to deliver SSCM policies.

### **Theoretical lenses**

Giannakis, Croom, and Slack (2004) note five main disciplines that have influenced thinking in SCM; systems theory, transaction cost economics, game theory, inter-organizational relationships & industrial network theories, and e-business. Chicksand et al. (2012) identify eight important theories in SCM; integrated SCM, network theory, transaction cost economics, resource dependency theory, agency theory, industrial organisation, resource based view and dynamic capabilities. SSCM extends from SCM, and the systematic review by Carter and Easton (2011) concludes that there is a paucity of theoretical grounding in most research papers on SSCM. Conceptual frameworks, where present, are primarily imported from other disciplines. Carter and Rogers (2008) combines resource dependency theory, transaction cost economics, the resource-based view and population ecology to derive a combined conceptual framework for SSCM, Seuring and Müller (2008) address stakeholder theory, competitive advantage, performance management and risk management. Gold, Seuring, and Beske (2009) considers the 'relational view' of strategy and collaboration as a source of competitive advantage, Hassini et al. (2012) looks at performance metrics and decision science, and

Srivastava (2007) reviews mathematical models from operational research for 'green SCM'.

### **Conclusion of conceptual review**

Table 1 maps various theories used in SSCM research and is derived from the findings of an earlier systematic literature review produced using the methodology described in Tranfield, Denyer, and Smart (2003). Later work by Denyer, Tranfield, and Van Aken (2008) describes a process of meta-synthesis (as opposed to meta-analysis) where multiple theories covering the same topic can be considered alongside each other and potentially combined. Three different approaches for comparing theories in this way are: 1) 'refutational synthesis', where two mutually incompatible theories compete to describe the same thing. 2) 'reciprocal translation', where similar things are described in different ways. 3) 'lines of argument synthesis', where different theories explain different aspects of the same thing. These forms of meta-synthesis offer potential ways to improve how relationships between a focal organisation, its suppliers and other stakeholders are understood. As relationships are a central feature of supply chains, a potential meta-level of theory may be found.

Having looked at the literature on SCM and SSCM, there are some 18 different theories that have been used to conceptualise SSCM. Many appear to have only been used in one paper in the SSCM context, suggesting there is not yet a cumulative number of papers devoted to testing a particular theory. Conceptual research, where it exists, is eclectic. Carter and Rogers (2008), in combining a number of theories, have sought to forge a new collective conceptual framework. So have Seuring and Müller (2008) and Gold et al. (2009). Each of these individual theoretical perspectives, and the combined ones, are justifiable and reflect considerable progress in the field.

Understanding SSCM requires a wide and interdisciplinary view of theory. However, one unifying approach is systems theory (P. Checkland, 1994, 2000). This is a common theory across three distinct disciplines; environmental science (Whiteman et al., 2012), SCM (Giannakis et al., 2004; Pathak et al., 2007) and the relational paradigm of service-dominant logic, which also enables a consideration of both economic value and normative values needed for social and environmental sustainability (S. Vargo & Lusch, 2004; S. Vargo & Lusch, 2011). P. Checkland (1983) describes systems theory as epistemological rather than ontological. In other words it is a way of viewing things, rather than taking direct measurements. It involves considering the whole rather than analysing component parts, and he describes four key concepts as emergence, hierarchy, communication and control. A more recent definition in the context of SCM in Giannakis et al. (2004) is,

Name of Theory	Description	Original Authors	Units of analysis, terms, variables, constructs.	Some key themes	Authors that have adopted this for SSCM	Subject of origin
Absorptive capacity theory	How the internal capacity to learn and innovate aids strategy	Cohen and Levinthal (1990)	Knowledge stocks, knowledge flows, assimilation capacity	Capability for organisational learning	Kolk and Van Tulder (2010)	Strategic management
Agency theory	How information asymmetry can prompt unfair manipulation	Ross (1973)	Principal and agent, performance evaluation, reward	Asymmetric information, moral hazard, conflict of interest	Vachon and Klassen (2006), Kudla and Klaas-Wissing (2012)	Political science
Competitive Advantage theory	How the external forces of a market shape individual firm competitiveness and defensible value propositions	Porter (1979)	Competitive intensity, buyer power, supplier power.	Five forces, value chain and cost analysis, competitive scope, differentiation	Lowitt (2011)	Economics
Complexity theory	How systems display self-organisation, adaptability and resilience.	Prigogine and Stengers (1984)	Emergent order, stability, instability, the edge of chaos	Self-organisation in non-equilibrium systems	Matos and Hall (2007)	Mathematics
Contingency theory	How contextual factors are significant in firm performance Woodward (1970)	Woodward (1970)	Organisational form, open systems,	Leader-member relationship, task-structure, environmental uncertainty	Guide, Jayaraman, and Linton (2003); Walker and Jones (2012)	Organisational theory
Ecological modernisation theory	How environmental protection should be achieved through technological innovation	Gouldson and Murphy (1997)	innovation diffusion	Technological progress,	Zhu, Geng, Sarkis, and Lai (2011)	Innovation and policy
Information theory	How communication is affected by the complexity of information	Shannon and Weaver (1949)	Bits, entropy	Coding, signal to noise ratio, channel capacity, algorithmic complexity	Cabezas, Pawlowski, Mayer, and Hoagland (2005), Sarkis, Zhu, and Lai (2011), Delmas and Montiel (2009)	Mathematics
Institutional theory	How organisations benefit from following social norms	DiMaggio and Powell (1983)	Schemes, rules, norms	External pressures make organisations adapt	Carbone, Moatti, and Vinzi (2012)	Sociology
Institutional entrepreneurship theory	How organisations foster innovation to gain competitive advantage, and how individuals may or may not change organisations.	Battilana, Leca, and Boxenbaum (2009)	Institutions, actors, interests, agency	Paradox of embedded agency	Peters, Hofstetter, and Hoffmann (2011)	Economics
Resource based view	How core competencies of a firm are key to strategic success	Barney (1991)	Resources, capabilities,	Value, inimitability, substitutability, heterogeneity, tangible and intangible resources, competitive advantage	Carter and Rogers (2008), Gold et al. (2009),	Strategic management, organisational economics
Natural resource based view	How strategic advantage is restrained by dependence on the natural	Hart (1995)	Life cycle costs,	Pollution abatement,	Markley and Davis (2007), Shi, Koh, Baldwin, and	

	environment				Cucchiella (2012)	
Resource dependence theory	How inter-organisational power is influenced by access to resources	Pfeffer and Salancik (1977)	Transaction and structural relationship,	Dependency of the position of buyer or supplier shapes their power in relation to competitive advantage theory.	Carter and Rogers (2008)	Organisational theory
Service-dominant logic / service systems	How economic value can be understood as based on utility provided rather than physical properties	S. Vargo and Lusch (2004, 2007); S. Vargo and Lusch (2011)	Operant and operand resources, service and services, appliance	Service systems, co-creation of value, exchange of utility	Dobrzykowski, Hong, and Park (2012); Lusch (2011); Randall, Pohlen, and Hanna (2010)	Marketing
Social network theory	Mathematical modelling of discrete social entities and their interconnections.	Lin (1999)	Graph-structured data, nodes, links, hubs, closeness, clustering	Social network analysis, dissemination, contagion, increased value as number of nodes increases	Bernades (2010), Vurro, Russo, and Perrini (2009)	Computer science
Stakeholder theory	How strategy can benefit from acknowledging the needs and power of other parties	Freeman (1984)	Power and impact.	Stakeholder mapping, stakeholder engagement, stakeholder management	Gold (2011)	Organisational management
Structuration theory	How actors and their context are inter-dependent	Giddens (1984)	Structure & agent, agency, action, language	Social norms, capability constraints, conduct analysis	Pullman and Dillard (2010)	Sociology
Systems theory	Taking a holistic view, illustrating interconnections and interdependencies through process mapping, reveals functional activity	Von Bertalanffy (1956), P. Checkland (1983, 1994, 2000), Pathak et al. (2007)	Sets, boundaries, components, organization, behaviour, goals	Emergent phenomenon, dynamic equilibrium,	Fiksel (2003); Melville (2010)	Mathematics
Transaction cost economics	Explains how costs influence strategic decisions.	Williamson (1975)	Information costs, enforcement costs, bargaining costs	Make or buy decisions, vertical integration, bounded rationality	Carter and Easton (2011), Midttun, Dirdal, Gautesen, Omland, and Wenstøp (2007)	Institutional economics

Table 1. A conceptual review of SSCM literature

*"Systems theory views the world in terms of collections of resources and processes that exist to meet superordinate goals...A system may be constituted by material, people, information, and financial resources; configured into organizational or technical processes, intended to deliver goods and services that enable the system to achieve some desired level of performance."*

There is therefore also a teleological or normative element, based on what the desired performance of a given system is. This approach may then enable theory for SSCM that unites the measurement of complexity via Critical Systems Thinking (Jackson, 1991; Ulrich, 2003), while incorporating the normative goals of environment and society alongside economic goals. P. Checkland (1994) noted that the challenges of the 21st century (rising prosperity, resultant rising consumption and natural resource depletion) were not being adequately addressed by management theory, which remained rooted in a mid-20th century reductionist mindset where managers focus is on the firm, to the exclusion of the external impact the firm has. This point is hammered home by Whiteman et al. (2012) some 20 years later. Returning to Checkland's seminal work and combining it with subsequent work on service science, and social and environmental sustainability, offers the chance for developing a conceptual framework that can address the disconnect between the micro level of the firm and the macro level of social and environmental impacts.

### **Next steps: Applying systems theory to SSCM**

The ongoing research considers systems theory as a meta-level theory and explores the Soft Systems Methodology (P. Checkland, 2000; P Checkland & Winter, 2005). The synthesis of service-systems (Barile & Polese, 2010; S. Vargo & Lusch, 2010; S. L. Vargo, Maglio, & Akaka, 2008), SCM (Lusch, 2011) and sustainability (Edvardsson & Enquist, 2011; Sayem, 2012) offers a new way to understand business sustainability. A conceptual framework is being derived from this process and used for a series of case studies of organisations that currently have or plan to implement a sustainable supply chain strategy. Initial interviews have started, and more information can be provided at the conference. The case studies are being conducted using the methodology of Yin (2008), and qualitative research is deemed necessary to gain a rich level of insight given the novelty of this issue. Case studies will involve interviews along the supply chain.

Case no.	Sector	Size (staff)	Date of birth	SC relations	Transparency	Env impacts	Social impacts	Ownership
1	Clothing	00s	2010?	partnerships	v. high	V low	?	Private
2	Electronics	000s	1990s?	Spot market	Low	high	Med?	Shares
3	Telecoms	00,000s	1990s	?	?	?	?	Shares
4	Detergents	0,000s	1990s?	?	High?	V low	?	?
5	Chemicals	000,000s	1920?	?	?	High?	?	Shares
6	Nuclear	000,000	?	partnerships	High	?	?	?
7	Automotive	00,000?	?	?	Med/high	High?	?	?
8	Waste mgt	00,000?	?	?	?	?	?	Shares

Table 2: Case study organisations

The implications for further academic research as a result of this work will be to help establish theory that links inter-organisational relationships with economic performance and the wider social and environmental impact of operations. As P. Checkland (1994) said, to answer the social and environmental problems of the 21st century, theory that is anchored in new knowledge and not constrained by past modes of thinking is essential.

For management, this new approach can help understand the operational requirements needed to deliver both economic prosperity and contribute to meeting the challenges of society and the environment.

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