Measuring and managing sustainability performance of supply chains

Review and sustainability supply chain management framework

Stefan Schaltegger
Centre for Sustainability Management (CSM), Leuphana University Lüneburg, Lüneburg, Germany, and
Roger Burritt
Department of Accounting and Corporate Governance, Macquarie University, Sydney, NSW, Australia

Abstract
Purpose – The purpose of this paper is to discuss what a fully sustainable supply chain might look like and the consequences that can be drawn from this view. Also, it develops a practical approach towards sustainability supply chain performance measurement and management. The paper develops an analytical framework for the assessment of approaches for the measurement and management of sustainability performance of supply chains (SPSCs). Little research has been conducted on the issues, existing methods and possible approaches to measure and manage SPSCs.
Design/methodology/approach – Literature review and conceptual development of framework.
Findings – The paper develops an analytical framework for the assessment of approaches for the measurement and management of SPSCs. Existing approaches discussed in the vein of improving supply chains and increasing recycling are examined in the light of our framework, and areas to extend the research on sustainability performance measurement and management are identified.
Research limitations/implications – Opportunities for extension of research on sustainability performance measurement and management of supply chains are identified.
Practical implications – The framework offers help to managers in their choice of sustainability performance measurement and management approaches.
Originality/value – The paper provides a structured overview of sustainability performance measurement and management literature and approaches to supply chain management. The framework proposed provides a foundation for further research.

Keywords Performance measurement, Performance management, Sustainable supply chains

Paper type Conceptual paper

1. Introduction

To move closer to the fast-growing emerging markets and to reduce costs, many companies transfer large parts of their value-added processes to suppliers in countries with lower cost levels (Cheung *et al.*, 2009; Reuter *et al.*, 2010; Gold *et al.*, 2013), while headquarters and established "home" markets of many leading companies remain in developed countries. The essence of supply chains is usefully identified by Braziotis *et al.* (2013, p. 648) as being

> [. . .] a set of primarily collaborative activities and relationships that link companies in the value-creation process to provide the final customer with the appropriate value mix of products and/or services.

The key focus is on collaborating companies contributing to the conception, design, delivery and commercial exploitation of a product or service. In contrast, supply networks are seen as:

> [. . .] a set of active members within an organisation's supply chains, as well as inactive members to which an organisation relates, that can be called upon to actively contribute to a supply chain if a need arises (Braziotis *et al.*, 2013, p. 648).

Emphasis is on the identification of and interrelationships between supply chain members.

Supply chain management here deals with both supply chains and supply networks, as is ably demonstrated by Varsei *et al.* (2014) who consider a set of organizational theories, including social network theory, for development of a multidimensional foundation based on indicators for sustainability supply chain management (SSCM). A broader set of categories of difference and similarities are explored in the work by Beske and Seuring (2014) where orientation, continuity, collaboration, risk management and proactivity are argued to be key to the achievement of SSCM. Companies in supply chains have a wide geographical spread which often goes along with high reputational risks because of poor working or environmental conditions at the production sites of

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the suppliers (Reuter *et al.*, 2010). Media attention and consumer boycotts in various industries such as textiles, food or electronics illustrate the reputational risk (Locke, 2003). It is not a surprise that customers, media and regulators ask for confirmation that sustainability aspects are seriously considered at all stages of global supply chains (Beske *et al.*, 2008; Seuring and Müller, 2008b; Leire and Mont, 2010). Empirical evidence about global sourcing in supply chains is gathered and has been explored by Gualandris *et al.* (2014) to assess the impact on sustainability performance of supply chains (SPSCs). At the same time and related to the sustainability risks in supply chains, demand for environmentally friendly and socially responsible products and services has increased in many countries worldwide (Geffen and Rothenberg, 2000; Carter and Jennings, 2004; Guoyou *et al.*, 2013). Furthermore, sustainability-related risk and opportunities have spurred sustainability-oriented innovations in an increasing numbers of industries and markets and have become a major competitive driver between companies (Porter and van der Linde, 1995; Hansen *et al.*, 2009; Harms *et al.*, 2013; Schaltegger and Wagner, 2011).

Sustainability management and action involves consideration of environmental factors and social aspects of organisational activities, as well as their integration with conventional economic performance (Seuring and Müller, 2008a). Sustainability management is a process of steering the company towards its goals, and SSCM looks for changes in design and configuration of supply chains to achieve this (Varsei *et al.*, 2014, p. 5). SSCM looks to improve environmental and social performance of companies in the supply chains (Seuring and Müller, 2008a; Bai and Sarkis, 2010; Gold *et al.*, 2010; Wittstruck and Teuteberg, 2011; Harms *et al.*, 2013; Amann *et al.*, 2014). Hence, SSCM addresses the challenges of sustainability risks, opportunities and trade-offs from a business and value-chain perspective by bringing upstream (input) and downstream partners (output) into the boundary of investigation and management to improve SPSC (Brandenburg *et al.*, 2014). Pagell and Shevchenko (2013) argue that sustainability should be integral to management of supply chains. Likewise, sustainability performance management would be an integral part of performance management but has received little research attention. Beske and Seuring (2014) seek to highlight what exactly sustainability adds to supply chain management that theorizing can continue to extend. The challenge is to move from managing unsustainable supply chains in a (more) sustainable manner to managing sustainable supply chains with an emphasis on the removal of harm, tradeoffs between all aspects of sustainable performance, radical innovations in terms of practice which decouple the social and environmental from economic (Schaltegger, 2011) and improved measurement of social and environmental performance outcomes (Pagell and Shevchenko, 2013). Sustainability issues are often neglected or partially addressed, and the transdisciplinary teams of knowledgeable experts needed are absent or at best separate rather than integrated with mainstream information and management systems (Blattel-Mink and Kastenholz, 2005; Burritt and Tingey-Holyoak, 2012).

Risk-, opportunity-, trade-off- and innovation-related developments are a particular challenge to focal companies to establish approaches for effective and efficient management and measurement of the SPSC. The purpose of sustainability performance management has, first, served to identify social and environmental deficiencies and risks in the supply chain and is thus a basis for improved risk management. Second, differentiation of products and services through contributions to reducing unsustainability or to increasing sustainability of the economy and society requires product development, product service system innovations and value chain redesigns which are led by sustainability criteria (Seuring and Müller, 2008a; Pagell and Wu, 2009). The effects of these "sustainable" product offers need to be identified and verified with measurements relating to sustainability criteria and associated trade-offs. This is an organizational challenge which encompasses further measurement dimensions, such as providing "proof for superiority". It explains the underlying understanding of sustainability, providing robust information of the contribution towards a more sustainable world.

For both risk- and opportunity-oriented management dimensions, SSCM is not only challenging because of complex international paths and interrelationships of goods and services and long geographical distances between a large number of suppliers (Reuter *et al.*, 2010) but also faces cultural and political differences in supplier countries with often unstable political and socio-economic conditions (Beske *et al.*, 2008). In addition, risks and opportunities arise because of frequent changes in the supply chain constellations, i.e. who is part of a specific supply chain (Harms *et al.*, 2013).

Although SSCM literature has been published (for literature overview, see Seuring and Müller 2008a; Brandenburg *et al.*, 2014), few publications have specifically dealt with sustainability performance measurement for improving supply chain management. Hence, the reason why this paper addresses sustainability performance measurement with regard to supply chain challenges and the risk- and opportunity-oriented supply chain management strategies.

In the next section, measurement and management supply chain strategies and SPSC goals are examined.

2. Strategies of SSCM and sustainability performance goals

Measurement and management of organisational sustainability performance involves consideration of the main facets of SSCM which add value and the relevant scales of measurement.

2.1 Risk- and opportunity-oriented SSCM strategies

Seuring and Müller (2008a, p. 1703ff.) distinguish "supplier management for risks and performance" as a strategy from "supply chain management for "sustainable" products". Although both strategies include similar elements, they emphasize distinct aspects of *risk-oriented* and *opportunity-oriented strategies* (Harms *et al.*, 2013).

Measurement and management of SPSCs is uncoupled in (Grosvold *et al.*, 2014) where an institutional theory-based framework is used to examine the relationships between these three variables. Managing SPSCs addresses all (i.e. ecologically, socially and economically) sustainability risks as

well as innovations and business opportunities. Measurement identifies and uses different scales depending on the required degree of precision for making the company's progress against environmental, social and economic goals transparent (Grosvold *et al.*, 2014).

There are two distinct supply chain management strategies: (1) risk and (2) opportunities, which are influenced by different intentions (assess and reduce risks vs increase and realize opportunities). They have an emphasis on different issues (eliminate existing and potential problems at production sites and suppliers vs realize sustainability-driven product designs) and aim to achieve different results (e.g., reduce negative effects vs create positive effects). Management of sustainability risks and opportunities often follows a different logic with regard to design, production, products and supply chains, and thus leads to different foci for the SPSC.

For SPSC measurement and management, these distinctly different perspectives are further complicated when considering the diversity of measurement scales which can all be applied to both perspectives. Different scales of measurement provide different levels of precision – nominal, ordinal, interval and ratio (Chambers, 1966, p. 85). These measurements can be in absolute (nominal) and relative terms (order, interval and ratio) and are related to the purpose of performance being considered (Chambers, 1966). They can provide data to answer questions such as:

- Does a property exist (e.g. a carbon emission)?
- Is more or less of the property evident (e.g., increase or decrease in volume of carbon emissions to provide a ranking to help with choice)?
- Are common intervals available to measure the property (e.g., 10-19 kilograms, 20-29 kilograms, etc.)?
- Can constant ratios be calculated to relate the interval properties being measured to a base zero (e.g., tonnes of carbon emissions/$ revenues).

Ratios provide the most precise measurement. Each of the measurement scales can be applied to risks and opportunities facing organisations in SSCM and are considered in Sections 2.2 and 2.3.

2.2 Measuring sustainability risks for SCM

Sustainability risks in SSCM are often related to specific production sites or working conditions among suppliers which then can influence the reputation of the focal company or the acceptance of its products. The focus tends to be on manufacturing rather than service industries, non-profit or government supply chains. Managing sustainability supply chain (SSC) risks has its basis on *criteria or rules about what must not be done*. Confirmation of such rules is achieved either through audits, assurance, training, communication, incentives or other management approaches at supplier sites (Carter and Jennings, 2004; Koplin *et al.*, 2007; Reuter *et al.*, 2010; Harms *et al.*, 2013). Risks originate from the suppliers (upstream) and have effects on the focal company (downstream). Elimination and reduction of risks of the whole SSC and the focal company is then a consequence of effective application of sustainability management at a multitude of suppliers. Risk-oriented SSCM often refers to evaluation and selection of suppliers, as the risks of various sustainability aspects have in practice "either-or" *nominal* measurement characteristics such as child labour or slavery. Although the number of *ordinal* instances (increasing or decreasing) may play a role, the risk is usually about whether child labour *nominally* exists somewhere in the supply chain. Other SSC risks entail more gradual comparative measurement characteristics such as the amount of emissions or waste. Pollution is mainly seen as a risk if it exceeds certain absolute or relative levels (e.g., regulatory levels, levels defined by the World Health Organization for occupational health, etc.) or if they are higher than for comparable products or the industry average (potential *ratio* scales), etc. Risk-oriented SSC measurement is thus oriented towards eliminating, reducing and confirming compliance with standards about what is considered safe. Acquaye *et al.*, (2014) examine benchmarking standards for carbon emissions performance at macro-, meso- and micro- levels through regional input–output analysis and industry-based benchmarks and mapping for inter-firm comparisons (Acquaye *et al.*, 2014). The benchmarking process using carbon maps of the whole product supply chain, for which a representative exemplar of carbon emissions in the steel industry is provided, is advised by key supply chain considerations of complexity, need for integration, diverse data qualities, geographical considerations and diverse standards. Although the aim is to encourage better planning by companies based on better environmental decisions, the added complexity needed to extend the process to full sustainability, make its practical application (Pannell *et al.*, 2013) hard to envisage, but something which mapping might help overcome. The main lessons for SSC risk measurement and management are:

- that all measurement scales and levels of precision have a role to play in the process;
- measurement focus is that no (relevant) sustainability problems exist in a supply chain or network either because this problem does not exist (e.g. child labour) (*nominal*) or because negative impacts are below what is considered to be a problem by international authorities, scientists or societal groups (e.g. occupational toxicity levels) (*ordinal, interval and ratio* measures);
- it remains elusive, but a method for decision-making about sustainability performance of companies is needed and preferred by managers.

2.3 Measuring sustainability opportunities for SSCM

Sustainability-related opportunities refer to what may be solutions to existing sustainability problems and to what the most sustainable products, services or product–service combinations look like (Hansen *et al.*, 2009). Managing sustainability-oriented opportunities is thus based on the search for innovations relating to *what could be improved and should be done*.

Opportunities mostly originate from management decisions of the focal company. From this perspective, managing SPSCs is connected to product design and the business model as defined by the focal company. This requires both knowledge about sustainability problems, ranking of possible solutions and the assessment of consumer expectations and market strategies to make sure that the most sustainable product offering becomes a market and business success.

The definition of and criteria for SSC solutions and practices are deduced from product- and service-quality characteristics and expectations which contribute the most to sustainable development. This approach, first of all, can question the conventional product as such and requires:

- a fundamental redesign of the focal company offering;
- the supplier network; and
- the business model.

Individual mobility in urban areas, for example, can be substantially more sustainable with car sharing than with a high number of individual cars, even if they are most fuel efficient (Katzev, 2003). For instance, car manufacturers such as BMW and Daimler with their Smart car products have started car sharing business units including electric vehicles as part of the car sharing offer (Kramer *et al.*, 2014). SSCM consequences of such business transformations are not limited to improvements of the existing supply chain of fuel-based cars, but require *replacement with new SSCs* including electric motor and electricity providers for the electric cars or software providers for apps to quickly find the next available car to calculate the use and fees or to optimise parking placement (Prettenthaler and Steiniger, 1999; Mont, 2004; Firnkorn and Müller, 2011). In a next, more operational step, opportunity-oriented SSCM includes *product eco design*, the understanding of lists of allowed ingredients and materials and the right use of defined production methods.

Opportunity-oriented SSCM requires specific education and training for innovation in the focal company as well as supplier development and training (Carter and Jennings, 2004; Koplin *et al.*, 2007; Reuter *et al.*, 2010; Harms *et al.*, 2013). A focus on SSCs rather than reducing unsustainable supply chains also requires audit and inspection as with risk reduction through new or differentiated products based on radical innovation (Pagell and Shevchenko, 2013). This can be achieved with product development (number of developments *ordinal* scale, proportion of new developments *ratio*), product service system innovations and value chain redesigns (complex multi-objective measurement patterns) which are driven by sustainability criteria. An understanding of what "sustainability" means for the target market and product use has to be explained. Also, the effects of these "sustainable" product offers need to be identified and verified with appropriate measures relating to these sustainability criteria providing robust information of the contribution to sustainable development to confirm or certify sustainability advantages.

2.4 SPSC impact level, improvements and side effects

The management of supply chain risks and opportunities can spur sustainability-oriented innovations for products and services as well as production, coordination and organization through the whole supply chain in an integrated way (Hansen *et al.*, 2009; Pagell and Shevchenko, 2013). Related to this, management approaches and management method innovations are needed to measure the following:

- existing levels of negative social and environmental impacts and how they relate to economic performance;
- improvements (i.e. reductions of negative social and environmental impacts) and what effect these activities have on economic performance; and
- the social, ecological and economic effects of actions taken targeting improvement.

SPSCs is thus connected with impact levels, improvements and side effects and requires a full spectrum of measurement scales which as yet are under-researched. Furthermore, the introduction of multiple and offsetting or conflicting goals leads to complexities in measurement methods requiring simplification for the practice of sustainability management and would find integration to single metrics unproductive (Burritt and Schaltegger, 2010).

Different SPSC measurement and management approaches exist and depend on the focus of analysis and the performance goal(s).

Table I illustrates the variety of different performance measurement and management tools which are described in a large and growing body of literature (in supply chain literature, seeBrewer and Speh, 2000; Hervani *et al.*, 2005). The question of which sustainability performance measurement and management tools are most useful in specific company and supply chain management cases depends on the sustainability performance goal and basic sustainability strategy and the supply chain design approach taken.

2.5 Basic strategies and SSCM

Performance measurement and management requires the definition of goals against which performance can be measured. The main priority of a corporate sustainability-oriented performance system is to measure, communicate and reduce the absolute amount of negative environmental and social impacts substantially and to contribute to a sustainability transformation of markets and society. This includes consideration of sustainability risks and opportunities of the existing supply chains. Three general sustainability strategies have been discussed in the sustainability literature and can be applied to improving supply chains – efficiency, consistency and sufficiency.

First, the *efficiency* approach is in the sustainability context guided by the principle of creating economic value with lower negative social and environmental impacts (von Weizsäcker 2009; Schaltegger, 1998; Schaltegger and Burritt, 2005). Related supply chain management goals are thus to cause less waste and less resource consumption in each step of the supply chain and throughout the entire supply chain. Specific supply chain-related approaches of eco-efficiency are efficiency improvements at the production at suppliers, recycling, down-cycling, closed loop supply chains and reverse logistics (Fleischmann *et al.*, 1997; Pokharel and Mutha, 2009; Sahamie *et al.*, 2013; Stindt and Sahamie, 2014).

Examples of the relative performance measures of eco-efficiency and socio-efficiency of a complete supply chain are the ratios provided by the carbon footprint of a product (CO_2/product unit), material intensity of a product (tonnes of materials/product unit) or the energy intensity of a product (energy input/product unit). Similar performance measures can be applied at each step of the supply chain.

Second, the *consistency* approach's goal is to substitute unsustainable materials with materials consistent with nature, i.e. materials found in natural ecosystems (Braungart *et al.*, 2007). In contrast with the efficiency approach, consistency

Table I SSC performance management and measurement approaches

Tools scopes and foci	Tools for risk oriented SSC management	Tools for opportunity oriented SSC management
Scopes		
Internal supply chain and production (Scope 1)	Material flow cost accounting, production information system	Positive criteria list
First tier	Procurement checklist	Certification for green energy
Scope 2	Specific data form electricity provider/ data basis on electricity production	Material flow and flow cost optimization
Total supply chain	LCA, LCC	LCA optimization
Scope 3	Supplier audits and selection	Product design criteria
	. . .	Product stewardship
		Supplier development, education and training
		. . .
Foci		
CO2	Carbon footprinting	Carbon neutrality calculation
Chemicals	Toxic release inventory, REACH datasheets, etc.	Fair trade product (criteria met)
Social	Social audits	Organic agricultural production (criteria met)
Water	Water footprinting	Product design criteria
Biodiversity	Biodiversity risk monitor	Product-service-system design (e.g. effective reduction of number of cars)
. . .	. . .	. . .

Notes: LCA = life cycle assessment; LCC = life cycle costing

does not strive for reducing material flows, but aims to scrutinize and replace all unsustainable material and energy flows of the whole supply chain with natural, harmless materials (e.g. which are biodegradable). Reverse logistics and human-designed recycling systems are not needed, as the materials are harmless and consistent with those in the natural ecosystem cycles. Consistency informed SSCM approaches include product design, substitution of materials, water and energy carriers.

Examples of performance measures of consistency of a complete supply chain are the number and amount of non-natural materials (e.g. tonnes of artificial materials/unit of product), biodegradability of products (e.g. degree and time of biodegradability) or the use of renewable energy (e.g. percentage of renewable energies involved in a whole supply chain).

Third, the *sufficiency* approach is based on the fact that every product which does not have to be produced will not cause harm and will not require a supply chain with harmful impacts. Less consumption and the substitution of products with services are guiding principles of sufficiency (Halldórsson *et al.*, 2009). Supply chain management guided by principles of sufficiency focuses elimination (e.g. on reducing the number of products, reducing the number and size of parts in a product and reducing the number of steps in the supply chain).

Examples of sufficiency performance measures of a complete supply chain include the reduction of the number of products (product/person), reduced product parts (grams of reduced parts/product unit) or services replacing products.

These three general strategic sustainability approaches can be combined. For example, replacing a heavy car, with car sharing using an electric car fed with renewable energy is characterized by sufficiency (less cars, no ownership of a car), consistency (renewable energy instead of petroleum) and efficiency (efficient electric car instead of heavy petrol car). The combination of these approaches makes the definition of adequate performance measures more difficult, but the underlying principles of these strategies can guide the design of business models (Schaltegger *et al.*, 2012) and supply chains for the strategic management of sustainability improvements.

Most sustainability performance measurement and management tools identified in Table I cannot be allocated clearly to one strategy, but usually support two or all three SSC strategies. For example, material flow cost accounting has a focus on efficiency improvements (reducing costs through the reduction of material flows), but also supports improving consistency, as it provides information on what materials are involved in production processes and the product. Similarly, LCAs create information for efficiency and consistency improvements alike, and the discussion of LCA optimizations can support a sufficiency approach.

The sustainability transformation of the company's products based on such sustainability strategies has substantial consequences for the (re)design of the supply chain, ranging from elimination to incremental efficiency improvements.

2.6 Supply chain design and SPSC measurement and management

Applying the principles of elimination, substitution, redesign and efficiency improvement to the design of supply chains offers the various (more and less) radical approaches:

- Elimination of a supply chain: what would be a radical sustainability improvement of a supply chain? It would be

eliminated. The elimination of a supply chain or of parts of the supply chain may appear unrealistically radical at first sight, but various sustainability innovations which introduce services replacing products have or may have such an effect (e.g. electronic cameras replaced plastic films and eliminated chemical photo development with its supply chain of chemicals and apparatuses).

- Substitution with new supply chain: electric cars and motors have different supply chains than supply chain for the production of diesel cars and petrol motors.
- Shorter supply chains: less steps in the supply chain and less geographical spread (i.e. the supply chain steps are geographically nearer to each other) will often lead to a reduction of sustainability problems.
- "Slimmer" supply chains: dematerializing a supply chain requires less material and energy flows passing through the supply chain. With regard to process efficiency, more sustainable suppliers have mostly more modern facilities with higher production efficiency.
- More efficiently organised supply chains: if the supply chain cannot be eliminated, substituted with a superior one or made slimmer, then reverse logistic systems, recycling and down-cycling as well as production facilities with cascade production systems applying industrial ecology principles may help reducing the overall sustainability burden.

As with the basic strategies, these SSC design approaches also can be combined and are mostly complementary rather than exclusive. The transformation from a company offering products to customers to offering product-service systems (Devisscher and Mont, 2008; Hansen *et al.*, 2010) may result in the elimination of some SSCs, the substitution and slimming of others. For example, car sharing instead of selling a car may eliminate the supply chain for petrol, substitute the supply chain for petrol motors with a supply chain for electric motors and slim down the supply chain for car wheels.

Whereas the more substantial approaches of eliminating or replacing a supply chain cannot be easily captured with a performance measure less fundamental approaches to design such as reverse logistics or recycling systems can be managed more closely with defined, mostly ratio-based efficiency-oriented performance measures. Sustainability innovations combining the different design principles challenge management to develop and agree on a set of different SPSC measures which can be used.

3. Conclusions and outlook

This article is founded on the argument that measurement and management of SPSCs is of critical importance, as trade relations are built with developing countries which are subject to the need for familiarisation with risks and opportunities involved. So far, SPSC has often focused on measures of improvement and efficiency of single production processes or products in the supply chain; however, to support decision-making and strategies for SSCM, there is a need for measurement of specific information about opportunities and risks. Exceeding the view from current sustainability risks and opportunities in the supply chain, requires analysing the existing product offers and business model of the focal company. Efficiency, consistency and sufficiency strategies can help innovation for more sustainable solutions, to redesign the business model and to create product-service-system innovations. This can have very fundamental consequences for the elimination, exchange and redesign of supply chains connected to the offers of the focal company. This paper thus proposes that sustainability performance measurement should be adapted to the sustainability performance management approach applied to supply chain design. Rich measurement scales for efficiency, consistency and sufficiency strategies are available to managers. The strategies are discussed, their interactions are explained and the related measurements are illustrated.

Design of an SSC in the light of measurement and strategic management issues was reviewed. A conventional product-focused view can lead to suboptimal and incremental changes in the supply chain, as more substantial redesign of the supply chain may create larger improvements and would not be drawn to attention. The paper outlined five SPSC designs which, used individually or in combination, can lead towards a more radical change in management thinking to secure competitive advantage. The implication for practice is that SPSC measurement should therefore start with managing the supply chain through redesign. Depending on the approach to the design adopted, fundamentally different measures and key performance indicators are needed to add support.

In the current absence of systematic empirical evidence about the necessary measurement systems to support different designs, a simulation of such indicators is provided by Bai and Sarkis (2014), with an approach for discovering how the complexity of measures of sustainability performance of networks of suppliers may be reduced in the face of different strategies and actions. Thus, is the management challenge for improved SPSC outlined above. A caveat is that eliminating or replacing existing products and supply chains often requires the introduction of more services and reduced numbers of products or different products. Such fundamental changes may not be captured with simple SPSC measures and require a set of indicators addressing different impacts and aspects. The paper suggests that such measures, with relevant nominal, ordinal, interval and ratio scales, are in need of systematic development. Only then will the move towards successful integrated SPSC become business as usual.

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Corresponding author

Stefan Schaltegger can be contacted at: schaltegger@uni.leuphana.de