

Sustainable Supply Chain: A Framework for Evaluations

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Abstract

The objectives of sustainability are to satisfy the triple bottom line – the environment, the economy and society. Initiatives are developed, potential improvements are estimated and outcomes are documented after implementation. This paper offers a framework for alternative tools and evaluation methods to assist with the analysis of sustainable initiatives.

Keywords: supply chain, sustainability, evaluation

Introduction

The interest in sustainability is shared among a variety of national and international organizations, special interest groups and corporations around the world. The expectations regarding sustainable business practices and more specifically for this paper - sustainable supply chain practices – are becoming a worldwide standard to be followed. Many of the sustainability requirements have been stated explicitly by a number of different organizations. A widely cited definition of sustainability is attributed to the United Nations Brundtland Commission and reads as follows:

“meeting the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987)(Christopher, 2011).

Another example conveys the broader context of sustainability as seen in the ten principles of the UN Global Compact which was enacted in 1999. The ten principles set forth a set of core values for organizations to follow and to influence their partner organizations to subscribe to the principles as well. The ten principles address a set of universal issues in human rights, labor, environment and anti-corruption.

The broader scope of Corporate Social Responsibility (CSR) is spelled out in the UN Global Compact principles as listed below:

Human Rights

- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
- Principle 2: make sure that they are not complicit in human rights abuses.

Labour

- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
- Principle 4: the elimination of all forms of forced and compulsory labour;
- Principle 5: the effective abolition of child labour; and
- Principle 6: the elimination of discrimination in respect of employment and occupation.

Environment

- Principle 7: Businesses should support a precautionary approach to environmental challenges;
- Principle 8: undertake initiatives to promote greater environmental responsibility; and
- Principle 9: encourage the development and diffusion of environmentally friendly technologies.

Anti-Corruption

- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

Source: The Ten Principles <http://www.unglobalcompact.org/aboutthegc/thetenprinciples/index.html>

Another widely referenced set of guidelines for CSR has been published by the International Institute for Sustainable Development (IISD, 2007). Clearly the CSR Principles extend beyond the scope of sustainability. The primary area of agreement between the two sets of principles deals with the environment.

Evaluation Techniques in Use

Life Cycle Assessment (LCA) is a commonly used approach when evaluating an organization's sustainability initiatives. Two international standards, ISO 14040:2006(E) and ISO 14044:2006, provide guidelines for conducting LCA. Section 4.1.2 of ISO 14040:2006(E) describes the life cycle perspective as follows: "LCA considers the entire life cycle of a product, from raw material extraction and acquisition, through energy and material production and manufacturing, to use and end of life treatment and final disposal. Through such a systematic overview and perspective, the shifting of a potential environmental burden between life cycle stages or individual processes can be identified and possibly avoided." (ISO, 2006). Section 4.1.3 of the standard indicates the "Environmental Focus" of the standard and that ..."Economic and social aspects and impacts are, typically, outside the scope of the LCA" (ISO, 2006).

Environmental Impact Assessment (EIA) is often performed in conjunction with the LCA approach. EIA may also be used as a separate evaluation technique in some instances. EIA as the name suggests is also focused exclusively on environmental impacts and does not evaluate economic and social aspects.

NOVO Group is an excellent example of a corporation that has made extensive use of both LCA and EIA. The company is also a very good example where the sustainability

philosophy is a core attribute of the organization. Everyone in the organization knows the company's beliefs and the emphasis that is placed on sustainability. NOVO Group is also a unique example in the fact that the company embraces sustainability practices within their own operations and the commitment to sustainability extends to their product line as well. More specifically, NOVO practices sustainability principles as they produce products which in turn are used to make the products produced by other manufacturers more sustainable – and at the consumer level the user of those products also gains benefits which are consistent with sustainability. Nielsen (2005) is one example of an extensive list of publications by Novo Group scientists describing the LCA for their various products – in this case enzymes for use in cold water detergent.

LCA is primarily concerned with the actual product, how it will be used, how it will be serviced and how it will be disposed of throughout the different stages of the product's life. The EIA approach when used with LCA, is primarily concerned with the impact of producing the product and any by-products that may result from the various processes.

LCA and EIA are very useful and effective for what they are intended to evaluate – the product and by-products and the environmental impacts. There are many other elements in the supply chain which LCA and EIA do not explicitly evaluate. Additional prompting is needed to fully consider many of the elements that are not directly involved in the production of products or the production and handling of by-products.

The SCOR® Model (Bolstorff and Rosenbaum, 2007) from the Supply Chain Council provides a comprehensive view of the major elements of a supply chain (see Figure 1). By depicting the different elements of the supply chain in this fashion, the identification and evaluation of all possible sustainability issues becomes somewhat easier. The model states the elements which then prompts the necessary thought and questioning to identify sustainability issues that might otherwise be overlooked (if using LCA or EIA).

The International Institute for Sustainable Development proposes a “six-stage ‘plan, do, check and improve’ implementation framework for a CSR approach” (IISD, 2007). This framework is commonly associated with the quality field and is traditionally used for process improvement.

This paper proposes the use of the SCOR® Model from the Supply Chain Council as a framework for sustainability evaluations. The five terms used in the SCOR® Model are Plan, Source, Make, Deliver and Return. The sequence follows the logical order of events that occur in the supply chain. The following discussion and outline demonstrates how the SCOR® Model can be deployed for sustainability initiative evaluations.

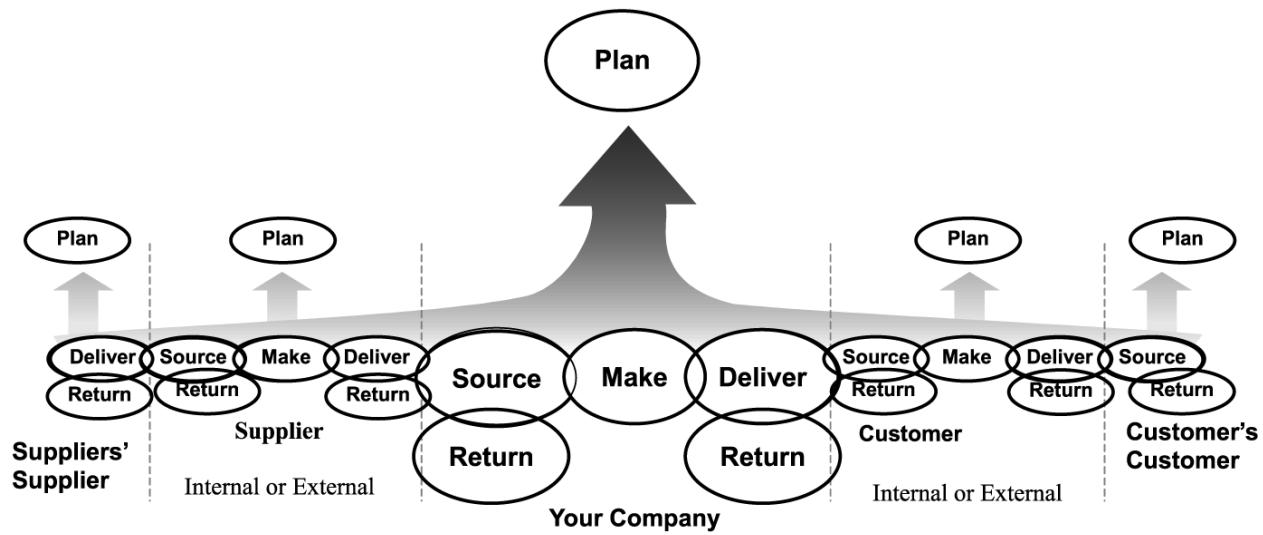


Figure 1 The SCOR® Model

SOURCE: adapted from Bolstorff and Rosenbaum, 2007; Yilmaz and Bititci, 2006

Plan

Are the principles of sustainability used as a set of guiding principles in the Planning stage for the company's supply chain? By Plan we refer to many different activities including: new product development, selection of materials for products, new process development, planning capacity, selecting transportation modes, deciding to outsource logistics to a third party as well as many others. The full range of environment, economic and social issues are included in the Planning issues to be considered.

Source

Are the principles of sustainability guiding the company's choices when making sourcing decisions? These decisions include selection of suppliers, insourcing vs. outsourcing, developing a supplier as a strategic partner, choosing local vs. distance suppliers, and many other supplier related decisions. Two other questions help to describe the intent here: Is the company selecting suppliers who are also committed to follow the sustainability principles? And - Is there a better option in any given sourcing decision where the "new" option meets the company's sustainability requirements better than the original option. The entire triple bottom line is considered explicitly in making these decisions.

Make

All of the sustainability statements regarding manufacturing apply here. Reduce, reuse and recycle the materials used in the manufacturing process are the primary approaches for using these resources in a responsible manner consistent with sustainability. Again the focus has to include environment, economic and social considerations and explicit company positions must be developed.

Deliver

Throughout the entire global supply chain there are multiple transportation elements and multiple handoffs (Russell and Saldanha, 2003). Transportation is a major concern with regard to

emissions and the related environmental impact. The multiple listings of Plan, Source, Make, Deliver, Return across the SCOR® diagram reinforce the idea that the material/product will be transported a number of times.

An example in this segment is intermodal transportation which translates to benefits in each of the areas for the triple bottom line. Tyssen et al. (2011) describe two case studies where decisions involving intermodal terminals result in benefits that are seen in each category – economic, environmental and social.

Transportation choices have a major effect on the carbon footprint for companies. The decision to utilize intermodal rail for a significant portion of the transportation of products will have a very favorable impact on the company's environmental compliance, carbon footprint or other environmental metric. Intermodal also provides an economic benefit when compared to greater utilization of truck deliveries.

Return

This stage of the supply chain may refer to the product, used component parts, packaging, or even reusable or recyclable shipping materials. The economic benefits here will manifest as cost savings and in some cases new revenue streams. While the environmental and economic benefits are at the forefront, additional probing should be used to identify social benefits as well.

Summary

Table 1 provides a brief summary of evaluation techniques discussed in this paper. The main lesson to take from this discussion is that there is not a single technique currently in use that provides a comprehensive evaluation of supply chain sustainability. In this paper, the SCOR® Model has been proposed as a framework that has the potential to be a more comprehensive evaluation framework for supply chain sustainability.

LCA and EIA are focused exclusively on the environment. IISD focuses on CSR which may or may not cover supply chain sustainability adequately. The SCOR® Model affords the opportunity to look at the triple bottom line in a more thorough and a very systematic way.

Table 1 Comparison of Supply Chain Sustainability Evaluation Frameworks

Evaluation Technique	Used for this Purpose
Life Cycle Assessment	Product through all stages of product's life
Environmental Impact Assessment	Specific environmental concerns for producing the product and any by-products that occur
IISD Framework	Plan, do, check and Improve cycle for CSR; covers all aspects of CSR and incorporates the perspective from major stakeholders
SCOR® Model	Comprehensive evaluation of all supply chain elements including Plan, Source, Make, Deliver and Return as guiding terms. Covers strategic decisions, supplier selections, manufacturing, transportation, recycling, reuse and disposal.

The model of ‘plan, source, make, deliver, and return’ is repeated at each stage of the supply chain and is used to guide the evaluation. This includes multiple tiers of suppliers, the many transportation links from suppliers to the central manufacturing/marketing company, the manufacturing operations, and then the multiple levels of the distribution system. By doing this, every conceivable element in a global supply chain is covered by the model and will be evaluated when supply chain sustainability initiatives are proposed.

The SCOR® Model has been used for the last two decades to provide a common language to discuss supply chain elements. More recently, the model has been suggested as a tool for sustaining supply chain improvement (SCC, 2013). In this paper, the model is proposed as a framework for evaluating sustainability initiatives which are intended to address the triple bottom line. This is a new extension for the use of the SCOR® Model. By explicitly addressing the environment, economic and social objectives of sustainability and doing that for the five major phases of the SCOR® Model a much more thorough evaluation can result.

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