

# AN EMPIRICAL INVESTIGATION OF SUPPLY CHAIN SUSTAINABILITY AND RISK MANAGEMENT

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## ABSTRACT

*It seems, in today's business environment, practitioners and academicians are increasingly becoming conscious of the importance of two trends in supply chain management – namely risk management and supply chain sustainability. However, while the supply chain risk management (SCRM) categories, such as disruptions, delays, systems risk and the others, and their drivers and mitigation techniques have been identified theoretically for some time, there is minimal empirical evidence of the real life application of SCRM methods by supply chain managers. The same is true about the theory versus the real life application of supply chain sustainability methods. In other words, many supply chain managers identify sustainability as a strategic business driver, but use it as a mere public relation tool.*

*Therefore, while these two concepts are receiving growing attention by supply chain managers, and are related to each other, the extent to which the techniques of SCRM and sustainability are used by the practitioners remains to be determined.*

*The purpose of this paper is to investigate the level of understanding of the Supply Chain sustainability on the part of supply chain managers, and to determine to what extent practitioners address this strategic issue in their chains.*

*The methodology involves the use of a primary questioner to identify what supply chain executives deem as important concerns for sustainability in their chains, and how these factors relate to the ones reported in academic literature. Based on our findings in the first part, a second survey will determine whether supply chain managers are addressing their sustainability issues effectively by using the methods that are recommended by academicians.*

## INTRODUCTION

Today, many firms are addressing and discussing sustainability as a strategic concern of paramount importance. It relates to meeting the present needs without imposing or compromising the ability to meet the needs of the future generations. More specifically, supply chain sustainability is associated with organizations social responsibilities towards present and future community needs. This means bringing supply chain partners into a collaborative arrangement to work together to achieve sustainability throughout the entire supply chain. That is, the traditional collaboration to move information, material, and funds would have to be reevaluated. For that, organizations should realize that supply chain sustainability involves many aspects of supply chain network including

environmental resources, employees, community, customers and their reputations and perceptions.

According to Mollenkopf and Tate (2011), supply chain sustainability is achieved by working with upstream suppliers and downstream chain partners to analyze operations and processes in order to identify opportunities to find alternative, environmentally friendly ways of producing products and delivering services. Krajewski et al. (2013), however, offers a broader definition involving three basic elements: (1) financial responsibility to all monetary stakeholders, (2) environmental responsibility to current and future generations, and (3) social and ethical responsibility to the whole society. Supply chains use sustainability as a strategic element for at least three reasons (Mollenkopf and Tate, 2011); risk management, government regulations, and supply chain influence. Haklik, 2012, identifies the impact of ISO certification on sustainability through the ISO 14001 guidelines that require awareness of a company's impact on the environment, acceptance of responsibility for those impacts, the expectation that harmful impacts will be reduced or eliminated, and assignment of responsibility for environmental impacts.

According to Mollenkopf and Tate, sustainability programs pose some challenges that chain members have to address. These may include corporate structure and culture, communication issues in the chain, and products and processes specifics that require tremendous upfront investments for sustainability (Mollenkopf and Tate, 2011). A 2010 audit of more than 230 enterprise sustainability programs found the best-in-class performers were three times more likely to appoint a chief sustainability officer. Moreover, those the best-in-class that were seriously implementing sustainability initiatives, reported an average of almost 80% increase in equipment effectiveness, almost 20% reduction in energy consumption, and almost 30% reduction in emissions versus the previous year (Slaybaugh, 2010).

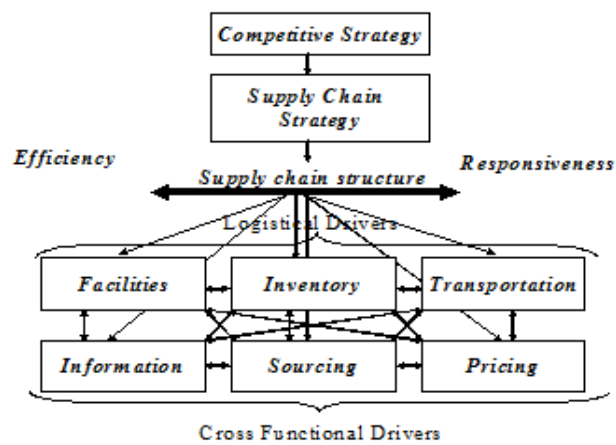
A 2011 survey of supply chain greening programs found that more than 80% of the supply chain professionals favored suppliers with green business practices. However, only 25% had any type of "carbon footprint evaluation process" to measure their suppliers' performance. The Institute of Supply Management (ISM) suggests the use of several guidelines and measurement tools to benchmark and achieve the sustainability objectives in practice. They include: ASPI Eurozone (Advanced Sustainable Performance Indices) to identify those who are committed to sustainable development and corporate social responsibility (CSR), and Dow Jones Sustainability Indexes (DJSI) to measure the financial performance of global companies that lead in sustainability. Brown and Ulgiati (1999) suggest "Emergy Sustainability Index" (ESI) to measure supply chain sustainability. It is defined as the ratio of emergy yield ratio (EYR) over the environmental loading ratio (ELR). While the academic ground is laid and the research demonstrates the enthusiasm of the supply chain executives, it is of vital importance to investigate and understand the reasons for apparent gap between the theory and practice of sustainability issues, measurements, and challenges.

The purpose of this paper is to investigate the level of understanding of the Supply Chain sustainability on the part of supply chain managers, and to determine to what extent practitioners address this strategic issue in their chains, and how these factors relate to the ones reported in academic literature.

**SUSTAINABILITY: A STRATEGIC DRIVER**

Chopra et al., 2013 describes six major drivers within supply chain spectrum (Figure 1). Although all are strategically related to sustainability within supply chain, but the holistic approach to sustainability remains to be determined and implemented. The review of the literature in the earlier section associates sustainability with corporate social responsibility within the supply chain framework. Figure 2 shows a framework, which defines a broader spectrum within suppliers, producers and customers in the cradle to grave cycle of a product. The three dimensions (suppliers, Producers, and customers), displayed in Figure 2, bring much more insights into how an organization defines its supply chain drivers for profitability and sustainability, by showing their interaction to create value for the customer. Figure 3 illustrates a modification of Figure 1 in which the six supply-chains logistical and cross-functional drivers are redesigned to assure supply chain long-term profitability, as well as sustainability.

**Figure 1**



**Figure 2**

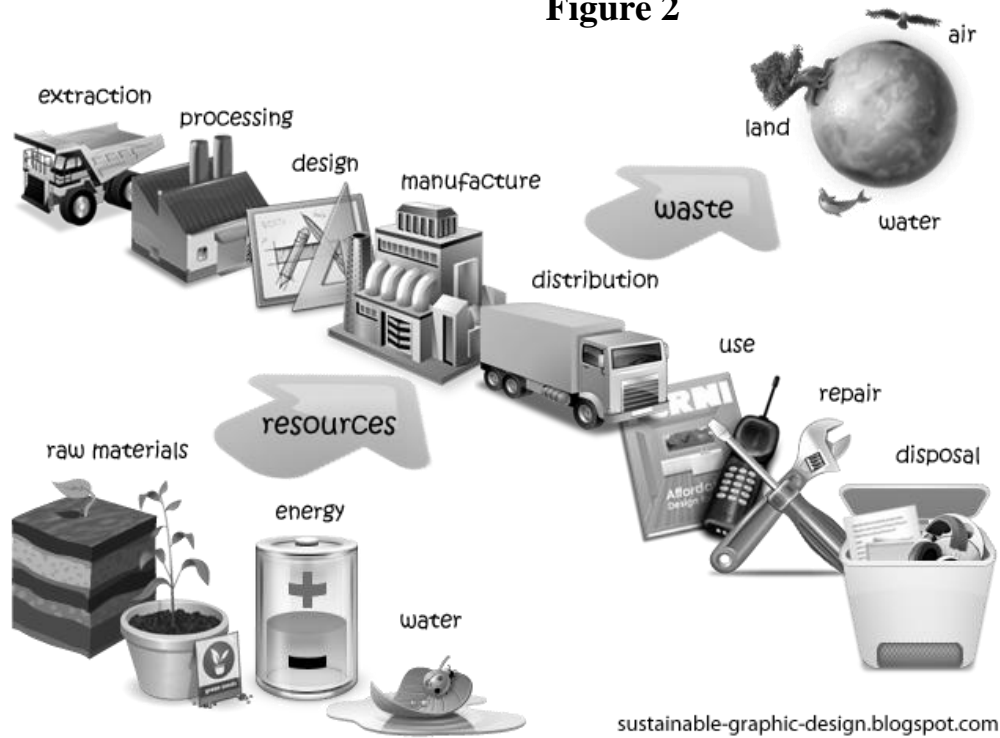
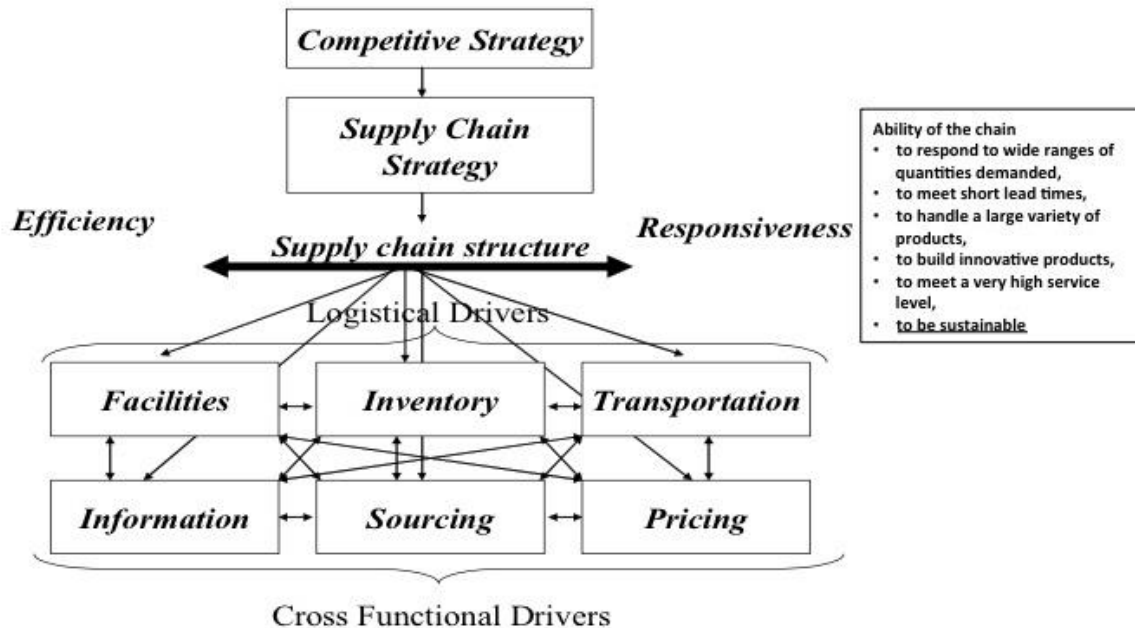


Figure 2 and the supply chain structural drivers in Figure 1 signify that products should be evaluated from concept development through disposal in their life cycle for supply chain sustainability, and this process should include people, resources, employees, community and the resulted company’s perception and reputation. It is a strategic survival approach that all organizations should consider and implement. Organizations should be aware and concerned about how their suppliers, on their supply side of Figure 2, and their distributors, warehouses, retailers, etc., on their customer side of Figure 2, maintain the sustainability issues within their chains. Some major organizations such as GE and Walmart have supplier audits, and BMW has developed recycling and reuse of their parts to reduce waste and environmental pollution. Sustainability requires a host of diverse issues within the specified sections in Figure 2. These issues are related to product life cycle assessment, product design, processes and their stabilities, logistics and reverse logistics and their components, rules and regulations (domestic and international), and industry standards.

**Figure 3**



While the academicians have laid the ground and the research demonstrates the enthusiasm of the supply chain executives, it is of vital importance to investigate and understand the reasons for apparent gap between the theory and practice of supply chain sustainability (SCS). The questionnaire used in this study aims at identifying what supply chain executives deem as important concerns for sustainability in their chains, and how these factors relate to the ones reported in academic literature. Moreover, the questionnaire studies the sustainability concerns and practices among small, medium, and large size organizations.

**METHODOLOGY AND FINDINGS**

This study has directed surveys to three classes of organizations based on their number of employees: small, medium, and large sizes. 28 small, 31 medium, and 16 large organizations are surveyed by phone and in actual meetings on the issues which have been discussed in sustainability literatures as are listed in Table 2. The results of the survey on “organizational awareness” and “supply chain audits” are presented in Table 1.

**Table 1**

Organizations	Organizational Awareness	Supply Chain Audits
Small (less than 100 employees)	8%	2%
Medium (100-500 employees)	45%	8%
Large (500 or more employees)	73%	11%

**Table 2**

Organizational Awareness	Supply Chain Audits
Does your company consider sustainability as a business objective, Or does it have a sustainability code of conduct?	Does your company have a visible sustainability program to manage its chain partners?
Do all your employees, shareholders, and other stakeholders have Knowledge or training in principles of sustainability?	Does your company audit the upstream Or downstream chain partners for sustainability issues?
Does your company have a chief sustainability executive (CSE), or an executive in charge of sustainability?	Will your chain partners face positive or negative consequences as a result of their sustainability efforts or lack of?
Is your company planning to allocate more resources to sustainability training and projects in the future?	Is your chain planning more collaboration to achieve sustainability in the future?

The results in Table 1 are alarming and show how organizations overlook sustainability as a core strategic element to achieve efficiency and responsiveness in long term. The survey also showed that over 70% of all organizations had difficulty in relating the listed issues to supply chain sustainability. 43% of the respondents believed that achieving what the supply chain audits require, as are explained in sustainability domains, would be impractical and not possible. In particular, some practitioners argued that in today’s competition and global business activities, auditing may not be as effective and fiscally economical. The results also, highlighted the fact that the smaller is the organization the less that organization is aware of supply chain sustainability and the needs for pursuing it. Interestingly, according to the results, the smaller size organizations that are aware of supply chain sustainability have planned and pursued supply chain audits more. That is, 25% of small size organizations that are aware of supply chain sustainability also have supply chain audits in contrast to 18% and 15% of medium and large size organizations, respectively. That may be due to their shorter supply chain domain compared to the medium and large organizations. Nevertheless, the results in this survey show that the large size organizations have more awareness about the importance of such strategic issue in their quest for achieving efficiency and responsiveness, but they have put less effort to plan and achieve that.

## CONCLUSION AND REMARKS

Chopra et.al, 2013, suggests that in order to achieve the supply chain strategic objectives, a chain must position itself somewhere in the “efficiency to responsiveness spectrum,” and then manipulate six supply chain drivers of facilities, inventory, transportation, information, sourcing, and pricing, to reach and maintain this position. In this context, responsiveness is defined as the ability of the chain to respond to wide ranges of quantities demanded, to meet short lead times, to handle a large variety of products, to build innovative products, and to meet a very high service level.

As indicated before, in today’s business environment, sustainability is becoming increasingly important. Therefore, it should be considered a major part of the organizations’ supply chain strategy. This means that we need to consider responsiveness in a broader context, which includes sustainability. Namely, responsiveness should be defined as the abilities previously mentioned, plus the ability to achieve sustainability. While the strategic importance of sustainability has been discussed by the academicians and substantiated by business professionals, its place in the overall objectives of business organizations has not been established yet. The result, as shown in this paper, is a lack of comprehensive sustainability program that is championed by effective supply chain managers and fully supported by top management. This research, however, is addressing the lively issue of sustainability in a dynamic and ever changing supply chain environment, which could easily force its members to change their practices in short order. That is why we suggest further research, perhaps in a year or two, is needed to see how the importance and practice of sustainability in business organizations is changing.

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