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► **To cite this version:**

Liliyana Makarova Jørsfeldt, Peter Meulengracht Jensen, Brian Vejrum Wæhrens. Implementation of Sustainability in Ongoing Supply Chain Operations. 19th Advances in Production Management Systems (APMS), Sep 2012, Rhodes, Greece. pp.192-199, 10.1007/978-3-642-40352-1\_25. hal-01472241

**HAL Id: hal-01472241**

**<https://inria.hal.science/hal-01472241v1>**

Submitted on 20 Feb 2017

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# Implementation of Sustainability in Ongoing Supply Chain Operations

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**Abstract.** The need to take the sustainability agenda beyond its technological outset and include supply chain practices is well-established, but still little has happened and the supply chain has remained largely unaffected. This paper asks why this may be the case and investigates what happens in the translation from ambitious strategic goals to operational practices.

To do this an exploratory case study is presented detailing the efforts of a large Danish manufacturing company to introduce an ambitious sustainability agenda in its ongoing supply chain operations. The study aims to develop a deeper understanding of the inter-functional coordination and operational practices when the sustainability agenda is introduced into supply chain. The study points to a lack of tangible environmental performance measurements and to incoherent functional logics as the main factors preventing effective implementation. We find support for a lack of formalized sustainability integration into operations and clear systemic approach to cross-functional coordination.

**Keywords:** Sustainable Supply Chain Management, Cross-functional Implementation.

## 1 Introduction

The phenomenon of sustainability has in recent years received a great deal of attention by practitioners and academics alike. Simultaneously, in private business sustainability has slowly been accepted as a strategic agenda [1]. The rise of sustainability as a key strategic priority has been due to a number of changes in the manufacturing environment, namely: global competition for resources and escalating deterioration of the environment [2]; rising supply chain cost – regulation in response to environmental protection has changed the cost structure; growing awareness of sustainability issues creates new markets for sustainable products and increases customer pressure for sustainable supply chains [1].

At the same time due to the phenomenon of globalization in the manufacturing environment, a new approach to competitiveness has emerged: the new idea is that it is not single functional area or even firm that competes, but competitive advantages rests in the firms capability to orchestrate the supply chain as a whole [4, 2, 11]. This in turn brings forward issues related to cross-functional and inter-organizational coordination and integration of which we know very little when it comes to driving key

strategic agendas through. With the intensification of the globalization phenomenon, the supply chain of many companies is increasingly complex and dispersed, which also makes the pursuit of emerging strategic agendas inherently difficult. Furthermore, many companies need to respond to a non-coherent strategic demand, i.e. there is no single strategic demand or performance objective, which means that the company needs to balance diverse demands, which translates into several competing or even diverging performance objectives. There are numerous empirical studies that reveal the existence of managerial problems when sustainability is applied in the supply chain context [1].

The literature on sustainable development in operations documents that tools and techniques for implementation sustainability in the supply chain has been developed over the past 25 years [5, 10]. Among some of the most dominant and applied techniques lifecycle assessment (LCA), reverse logistics, closed loop supply chains, design for disassembly can be mentioned. All confirm the link between sustainability practices in supply chains and competitive advantage in manufacturing companies [6].

## **2 Research gap**

Despite consensus that sustainability is a key competitive parameter and the availability of effective tools, the operational practices in the most companies remain largely unaffected. This is documented in several studies, however, only a few studies empirically investigate this problem on an operational level [12, 13, 14]. Furthermore, these available empirical studies primarily investigate the drivers of environmental behavior and describe the existing practice in order to identify supply chain environmental operational activities, and do not include factors related to the organizational context when implementing sustainability in ongoing supply chain operations and calls have been forwarded to bridge this gap in the literature [2, 7, 13].

Hence the purpose of this study is to go beyond the strategic and corporate realm and, on an operational level, investigate what barriers are preventing companies from adapting sustainability into their supply chains. This purpose leads to the following research question: What are the current organizational barriers preventing companies from implementing and anchoring sustainability in their supply chain practices?

To answer the research question, this study will seek to examine the current organizational set-up and traditional key performance indicators; discuss how sustainable initiatives were approached and motivated in different parts of the supply chain operations; identify challenges of embedding sustainable development in an ongoing supply chain operations; establish the patterns of organizational changes in response to the need of more sustainable manufacturing practice and suggest the solution.

## **3 Research Design**

### **3.1 Conceptual Framework for Study**

As several different approaches to supply chain management exist, for the purposes of our study we define supply chain management as “the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as whole” [8].

The study will take a supply chain governance perspective and the framework underlying the study is presented in Figure 1. The framework rests on system view of supply chain management process where the materials and information flows are coordinated from the market to the suppliers through the company, and then detailed organizational elements were drawn additionally in order to understand how new corporate agenda of sustainability affecting cross functional integration and coordination of the ongoing supply chain. The engagement of all partners is considered in the framework. It is done in order to get deep understanding of how partners from support functions and core supply processes are interacting when striving to carry out the strategic agenda.

Strategic agendas that are set by a corporate management strategy are often quite diverse and may draw attention in many different directions. For example cost, quality, responsiveness, and sustainability are each make diverging, but also to some degree mutually reinforcing demands on the organization. Every time a new strategic agenda is set by top management, the need to readdress the supply chain governance form appears: partners from core supply chain processes and support functions have to engage in different ways to carry out tasks set by different strategic agendas and to balance the different strategic agendas.

The discussion will be based on the given framework applying Kahn’s division of integration in cross- functional work, which distinguishes between interaction- based integration and collaboration-based interaction [16]. Finally, the paper will conclude with a discussion of how roles and coordination are affected by the emerging agenda.

### **3.2 Case Selection**

As a sample for our study we choose an organization that is well-ahead in its industry in terms of social and environmental performance, while still maintaining economic viability. The company has a global presence with regards to all value chain functions and employs more than 10,000 people in more than 45 countries. It has been working with the sustainability agenda for more than fifteen years. In the past five years sustainability has been established as a key competitive requirement for the future and a very ambitious goal has been publicly announced. In the Danish context the case company represents an extreme case [9] with regards to its focused efforts and ambitious goals to establish sustainable operations, but also with regards to the complexity

of implementing the new agenda in the supply chain. The extreme case enables us to study the phenomenon at its edge and is likely to reveal more information [9].

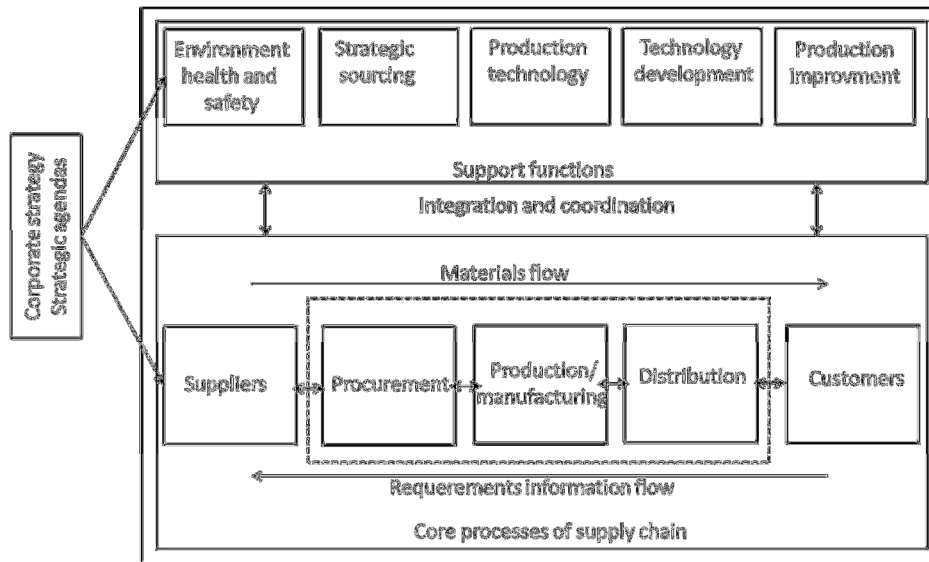


Fig. 1. Organizational Context of Sustainability

### 3.3 Data Collection

We used a semi-structured interview protocol to interview actors, who were representing different functions and parts of the supply chain which were engaged in the process of sustainability implementation. In this way we had the necessary flexibility to focus on what was unique at each specific process. It was important to understand how sustainability issues were addressed in the supply chain process and what challenges were experienced during the process of implementation. The case consists of seven subcases – mirroring the different stages of supply chain management and key support functions thereof: the sub-cases differ both in terms of the approach applied to sustainability and in terms of interaction with other parties in the supply chain.

**Environmental Department.** The environmental department was developed with a purpose to ensure and support group strategy towards sustainable development. Being a support function, the department does not pose any power of environmental resources at the company sites. However, the department has a mandate to negotiate the yearly environmental targets for the relevant sites in the organization. The department initiates environmental projects in cooperation with local sites and other departments across the global supply chain, but for the present such projects are only allowed to take place when it does not affect the material flow. The main challenges to imple-

mentation identified, were the lack of authority to allocate resources and the need for cross-functional integration around the agenda.

**Purchasing Department.** The primary business objective for the purchasing department is to ensure appropriate suppliers to organization. To live up to the company's value of sustainability suppliers are estimated and monitored in regard to their CSR practice. While the choice of supplier is mainly driven by cost, informally, CSR assessment is used as indicator for quality. The yearly audit for suppliers is based on performance requirements, which are regularly revised in collaboration with production companies, environmental department, and other functions and in accordance to corporate strategy.

The following challenges were identified: how to measure the value of CSR in a way it can "make a sense" on the operational level of purchase process; how to integrate CSR mindset in support processes.

**Production Technology Department.** The idea to include the requirement from environmental department as well from other stakeholders in the beginning of the process of implementation of new equipment initially was targeting reducing time of implementation. When setting the sustainability agenda into the process of machinery implementation, the production technology department is following the demands from the corporate level. Supportive functions as environmental department and working conditions are mainly the sources of information and do not have real power to change processes of material flow.

The following challenges were identified: lack of technical competencies (knowledge of equipment) from supportive functions; the need to restructure the process to align requirements from all stakeholders in time.

**Production Facilities.** The primary business objectives for production are to manufacture product meeting the delivery time, efficiency and cost. Planning, production technology and quality are the departments that are engaged in decision making regarding processes in production. At present there is no or little formal integration of sustainability in the production process. The governance of sustainability initiatives is perceived as the responsibility of the environmental department and can take place only if it does not interfere with the production process. Because of high priority of cost and other traditional KPIs for the production, the capacity for development remains limited. Few resources can be allocated to sustainability related work and specialized competences have not been developed, and as a consequence the translation from strategic intentions to implementable solutions remains weak.

**Technology Development Department.** In spite of strong strategic intentions towards development of sustainable technology, sustainability is not well integrated in the process. The main reason for this as it was expressed by the environmental engineer is that customers of the technology center (production sites, business development) focus on cost, quality, performance, and environmental criteria are not a key priority. To change the situation, the department has intentions to involve customers

and other stakeholders in the early stages of machinery development process. To do so it is planned to formalize procedure of assessment of sustainability on operational level to make it more tangible; to then set-up sustainability targets for new projects while or before specifications are being made and involve customers in this early stage of development; finally when a project is closed to reassess environmental targets for new projects. The main challenges for imbedding sustainability are: how to make sustainability tangible on an operational level, and how to raise awareness of sustainability in the department.

**Logistics Department.** In 2009 the 5<sup>th</sup> Climate Change conference took place in Denmark. It gave a momentum to the initiative of mapping CO<sub>2</sub> emissions from transportation on case-company supply chain. A measurement found that one third of overall CO<sub>2</sub> emissions of the company were due to transportation. The challenge the department faces is expressed by a transportation manager: Where we go now? How do we operationalize the sustainability strategy and find solutions towards CO<sub>2</sub> reduction without compromising traditional performance criteria?

While the existing relationships linkages to transport providers as well as to the production sites, distribution centers, and warehouse may produce trustworthy information about transportation related CO<sub>2</sub> footprint; the logistics function has no influence on flow of components in the operations network. The lack of power to influence the physical flow and the production planning in the operations network remains a key barrier for reaching the ambitious environmental targets stated by corporate strategy. It demands that the logistics department changes its role from simply providing logistics services on demand to them penetrating and influencing the planning system that they respond to.

**The Production Improvement Function.** The primary business objective of the function is to support and align operations strategy with operations practice in the production sites. With the sustainability agenda as one of the top priorities of corporate strategy, the operations strategy has aimed to incorporate sustainability within its ongoing lean activities. Production improvement is a support function and while it is engaging with group strategy, production sites, environmental department and sales companies to create the focus for production improvements it has limited effect on how the initiatives take effect in the operations flow. Within challenges mentioned is a change in behavior on the shop floor towards practicing a culture and mindset of continuous improvement.

## 4 Discussion and Conclusions

The case company has as one of the Danish frontrunners on sustainability come a long way with its product and process redesign, but it also recognizes that to take the next steps the supply chain needs to be a key contributor of reductions. As can be seen from the case description above the sustainability agenda is met with many challenges once it starts to interfere with the physical flow and its well-established logics and

measures of good practice. In the following the framework developed in the section 3.1 will be used as a canvas for discussions as a means of highlighting inter-functional interdependencies related to task performance as well as inter-functional logics and measures of performance.

*Information flow:* sustainability in the case company is driven by two key motives: corporate values regarding responsible behavior and expected growing sustainability demands from customers. Yet, at the present customers do not have direct and concrete demands to sustainability. This means that there is no direct information flow from customers to core operations in the supply chain, but instead this information flow reaches corporate management. As to the information flow between core functions and support functions, it was noted that the sustainability agenda increases the amount of data flowing from operations to the support functions; and to define sustainability targets for different departments' knowledge of specific processes becomes a key priority.

*Material flow:* it is clear from case study that the flow of materials is not as of yet affected by any of sustainability initiatives, due to overriding agendas. Improvements have been made, but mainly with new installations or with technology driven refurbishments where sustainability is a key agenda.

*Cross-functional involvement:* the sustainability agenda brings at least one more new stakeholder in every core supply chain process (the environmental department), but these new stakeholders have only scarcely been involved in these processes. Moreover the nature of involvement of different functions is changing: new technologies are today only certified by the environment department after they have been specified, the environment department does not have the capabilities to be involved in the specification process, and the technology department only has limited knowledge of the environmental impact of new technologies. The analysis of data shows that the sustainability agenda leads to an increase in the number of functional interests involved in the coordination of supply chain processes.

*Interaction vs. collaborative cross-functional integration:* to meet sustainability demands functions are changing the way they work with each other from a sequential interaction based approach to increasing the focus on ongoing collaboration and reciprocal interdependencies. For example, when addressing cost issue, departments communicate with each other using well established and tangible measures. For sustainability few tangible measures exist and the communication is much more directed towards achieving a mutual understanding and forming the basis for collaborating.

Although the case company has come a long way towards implementing sustainability initiatives successfully, this had not had a direct influence on the flow of materials or the planning thereof. To meet the highly ambitious goals of rapid global growth and a related neutral CO<sub>2</sub> footprint thereof, the current sustainability initiatives need to be implemented together with material flow oriented initiatives. To cope with the complexity of multifunctional cooperation a systematic approach to sustainability goals should be developed at the operations level: the guidance, the measurement of sustainability that will be tangible for day-to-day work on operational level. One of the solutions can be programme management [17]. The essential purpose of programme management is to direct the numerous and widely dispersed projects so



that they not only support the global strategy, but also support a systematic competence and capability build-up in the organization. This is done through balancing between global support and guidelines (e.g. tool-box development, knowledge-sharing platforms, control mechanisms and resource allocation) and local emergent initiatives, incitement and ownership.

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