

The achievement of new Business Objectives Models for Supply Chain Sustainability

*Laura Macchion (laura.macchion@unipd.it)
Department of Engineering and Management, University of Padova,
Stradella San Nicola, 3 - 36100 Vicenza, Italy*

*Andrea Lion
Department of Engineering and Management, University of Padova,
Stradella San Nicola, 3 - 36100 Vicenza, Italy*

*Pamela Danese
Department of Engineering and Management, University of Padova,
Stradella San Nicola, 3 - 36100 Vicenza, Italy*

*Andrea Vinelli
Department of Engineering and Management, University of Padova,
Stradella San Nicola, 3 - 36100 Vicenza, Italy*

Abstract

Sustainability is today a central topic both in academia and in the industrial world, and many scientific issues are still open and for which new insights are required, in particular by adopting a supply chain perspective. To better identify the value of sustainability practices along the supply chain, this study analyzes four successful case studies of companies that have been able to create new Business Objective Models (BOMs) wisely integrating the concept of sustainability with their supply chain partners. Results show that these BOMs are supported by a strong alignment towards sustainability within the of the whole supply chain.

Keywords: Sustainability, Supply Chain, Business Model

Introduction

Sustainability is today an unavoidable theme for any company attentive to new needs of the markets, increasingly attentive to issues related to sustainability (Nielsen, 2015; (Reefke and Sundaram, 2017; Blome et al., 2014). Also environmental and social scandals, that have emerged throughout the world in recent years, have underlined the urgency of addressing the sustainability issue in a structured and in-depth way (Ageron et al., 2012). In this context, the theme of circular economy, defined as an economy designed to regenerate itself, is particularly relevant (Ellen MacArthur Foundation, 2018). To be really sustainable, however, each firm cannot neglect a Supply Chain (SC) vision

(Krause et al., 2009). Within the literature about sustainability, there is a clear call for considering the entire SC (Brandenburg et al., 2014) since a single company cannot overcome the challenge of sustainability alone (Seuring and Gold, 2013).

Starting in 2008, when the concept of SC sustainability from Seuring and Mueller was formalized, studies on this topic have taken several steps forward; today the maturity of the theme asks to raise the level of analysis detail by studying the cases of success with greater attention. In other words, it is now possible to move from a vision that opposes companies involved in sustainability to companies not interested to the sustainability change, towards a more evolved vision that seeks to identify the organizational realities that already take for granted the relevance of the theme. In this way, it is possible to bring out the peculiarities that differentiate highly evolved sustainability companies.

Today, more than ever, companies are rethinking their entire business model in order to adapt it to the new challenges of sustainability, and a greater focus on Business Object Models (BOMs), developed around the sustainability theme, is a promising line of research (Osterwalder e Pigneur, 2010; Bocken et al., 2014). The sustainability BOMs allow the reunification of the daily operative activities and the business strategy defined by the top managers with a long-term perspective. In this context, companies that implement sustainability practices can be classified base on different sustainability BOMs (Pedersen et al., 2016) thanks to a careful evaluation of the rationales that drive an organization to create, and capture a new sustainability value (Osterwalder and Pigneur, 2010).

The aim of the present research is to identify how the management of the Supply Chain changes, in particular the portion of the upstream supply chain, can be managed coherently in line with different BOMs by including and considering sustainability as a fundamental source of competitive advantage.

The paper then presents in the next paragraph an overview of the state of the art of scientific literature. The methodology used and the research protocol used are then presented. Therefore, after a presentation of the four case studies, the main results are illustrated. In conclusion, the main conclusions, the scientific contribution and the points of improvement are discussed.

Literature review and research goal

As already argued, sustainability is today a important topic both in the academic and industrial world. On the one hand, contributions from the scientific world are helping considerably the dissemination of sustainability concepts within universities, industries and society by increasing people's awareness of this topic. On the other hand, the scandals and incidents involving environmental and social issues that have emerged throughout the world in recent years have underlined the urgency of addressing the issue of sustainability in a structured and in-depth way (Ageron et al., 2012).

The academic literature concerning Sustainable Supply Chain Management is therefore wide, and deals with the management of materials and information among companies cooperating along the same the supply chain, by taking into account the objectives of all and three dimensions of a sustainable development (economic, environmental and social objectives) coming from the needs of customers and stakeholders (Seuring and Müller, 2008).

Companies have been working to improve the sustainability of their processes, mainly starting from internal processes and on products/services they provide, but just a few have started to look at and involve the supply network in this sustainability change. The extension of these virtuous sustainability behavior achieved by focal companies through the supply networks is not always easy to achieve. For example, in some cases focal companies have internally developed a specific know-how that will extended only later to their suppliers or, in other cases, focal companies have developed specific competences regarding sustainability, recycling and the circular economy in direct collaboration with their suppliers, through mutual exchange and collaboration. Moreover, also cases in which competing companies cooperate to develop new sustainability standards in order to increase the pressure on their relative supply chains exist (Zhu et al., 2010). Although there are many hypothetical strategies, the extension of sustainability practices to an entire supply chain represents one of the most complex business challenges of the moment, also due to the strong globalization that has led to a highly fragmented supply chain scenario (Sarkis, 2012) and some companies even have decided to abolish those suppliers that are not proactive in terms of sustainability, in favor of new suppliers with greater sustainability.

Undoubtedly, sustainability is not only a matter of production practices, but interests deeply corporate values through the redefinition of BOMs (Osterwalder and Pigneur, 2010). According to Bocken et al., 2014, the BOM can be characterized by three main elements: the value proposition (i.e. the offer of products and services to acquire economic, social and/or environmental value), the creation and the transmission of value (through key activities, resources, partners, technologies useful to create and deliver value) and the value acquisition (that interests how to earn revenues from the supply of goods/services). In this context, the inclusion of sustainability principles within the BOM is important since many customers explicitly consider and requests the environmental and social sustainability for their purchase decisions. Certainly, for some BOMs will be easier to cope with sustainability (Pedersen et al., 2016), in particular for companies that have since long faced and studied the topic of sustainability (Osterwalder and Pigneur, 2010); however in general BOMs including sustainability are not easy to implement. In fact considering sustainability within new BOMs is not a mere application of specific practices or initiatives; rather, it is a real process of transformation that must be supported by a real and substantial commitment to sustainability, that involves the organization in its entirety and not only (Pedersen et al., 2016).

In their review of the literature Bocken et al. (2014) identify eight different archetypes of sustainable business models (i.e. *i) maximize material productivity and energy efficiency, ii) create value from waste, iii) substitute with renewables and natural processes, iv) deliver functionality rather than ownership, v) adopt a stewardship role, vi) encourage sufficiency, vii) re-purpose the business for society/environment, viii) develop scale-up solutions*) each characterized by a different way of proposing, creating and exploiting the value proposed in a sustainable key.

However, to date there is still no clear understanding of how firms can cope and implement such sustainability BOMs (Bocken et al., 2014) and it is even less clear how these BOMs are collaborating with their SC to achieve true sustainability goals.

Considering these gaps, the objective of this paper is to focus on some successful cases of companies that have defined sustainable BOMs, by studying in detail the similarities and differences within the upstream supply chain. similarities and differences. The following research questions is formulated:

RQ: How companies adopting a sustainability BOM are collaborating with their SC?

Methodology

Consistently with Meredith et al. (1989) the choice of the methodology of analysis was based on on the main objective of the study. Considering the explorative nature of the research objective, we opted for the case study methodology that allows the understanding of phenomena in specific contexts through a broad perspective.

Following Voss et al. (2002) a descriptive and explanatory approach was implemented, considering multiple and retrospective case studies.

In order to have a solid scientific basis, we developed an ad-hoc structured interview protocol, focusing on:

1. Classification of the company within one of the BOMs formalized by Bocken et al., 2014 (Figure 1).
2. Identification of sustainability initiatives based on previous contributions available in literature (Da Giau et al., 2016)
3. Analysis of the collaboration available in the upstream SC for each BOM. Data collection was structured starting from the distinction of the practices theorized by Akamp and Mueller (2013) (Table 1).

Archetypes	Maximise material and energy efficiency	Create value from waste	Substitute with renewables and natural processes	Deliver functionality rather than ownership	Adopt a stewardship role	Encourage sufficiency	Repurpose for society/ environment	Develop scale up solutions
Examples	Low carbon manufacturing/ solutions	Circular economy, closed loop	Move from non-renewable to renewable energy sources	Product-oriented PSS - maintenance, extended warranty	Biodiversity protection	Consumer Education (models); communication and awareness	Not for profit	Collaborative approaches (sourcing, production, lobbying)
	Lean manufacturing	Cradle-2-Cradle	Solar and wind-power based energy innovations	Use oriented PSS- Rental, lease, shared	Consumer care - promote consumer health and well-being	Demand management (including cap & trade)	Hybrid businesses, Social enterprise (for profit)	Incubators and Entrepreneur support models
	Additive manufacturing	Industrial symbiosis	Zero emissions initiative	Result-oriented PSS- Pay per use	Ethical trade (fair trade)	Slow fashion	Alternative ownership: cooperative, mutual, (farmers) collectives	Licensing, Franchising
	De-materialisation (of products/ packaging)	Reuse, recycle, re-manufacture	Blue Economy	Private Finance Initiative (PFI)	Choice editing by retailers	Product longevity	Social and biodiversity regeneration initiatives ('net positive')	Open innovation (platforms)
	Increased functionality (to reduce total number of products required)	Take back management	Biomimicry	Design, Build, Finance, Operate (DBFO)	Radical transparency about environmental/ societal impacts	Premium branding/ limited availability	Base of pyramid solutions	Crowd sourcing/ funding
		Use excess capacity	The Natural Step	Chemical Management Services (CMS)	Resource stewardship	Frugal business	Localisation	"Patient / slow capital" collaborations
		Sharing assets (shared ownership and collaborative consumption)	Slow manufacturing			Responsible product distribution/ promotion	Home based, flexible working	
		Extended producer responsibility	Green chemistry					

Figure 1: BOMs formalized by Bocken et al. (2014)

Table 1: Practices of collaboration available in the upstream SC (Akamp and Mueller, 2013)

Supplier selection and evaluation	<ul style="list-style-type: none"> • Purchase of sustainable materials • Policy and documentation for suppliers / contractors • Selection of suppliers / subcontractors with sustainability criteria • Simplification of the supply chain • Consider standards and certifications
Supplier monitoring	<ul style="list-style-type: none"> • Analysis on incoming materials • Monitor the sustainability performance of suppliers/subcontractors • Traceability • Actions to have visibility on the 2nd and subsequent levels of supply
Supplier collaboration	<ul style="list-style-type: none"> • Improved logistics activities • Knowledge sharing • Packaging improvement • Recover production waste and manage waste • Recover the product at the end of its life cycle
Supplier integration	<ul style="list-style-type: none"> • Joint project • Strategic partnerships • Sharing goals • IT integration

Four Italian companies responding to the research objectives have decided to collaborate on the project. The four companies are characterised by different products (company A: advertising material such as pens; company B: leather products; company C: vine; company D: packaging), and are already committed to implementing sustainability practices. The analysis has been conducted in the year 2017. In each company at least three informants (i.e. SC, purchasing, and sustainability managers) were involved through direct interviews. We triangulated the information with the analysis of companies' code of conducts, sustainability, CSR reports and press releases (Harris, 2001). The data relating to the selected companies are available in table 2.

Table 2: Practices of collaboration available in the upstream SC (Akamp and Mueller, 2013)

Company	Description of the company	BOM
A	Company A is engaged in the production of advertising materials in the B2B market. The whole process of conception and creation of advertising products takes place in close collaboration with the customer and with supply chain partners since the raw material used comes from the productive waste of the customer. Within the production processes some activities are carried out through the scouting of new suppliers with particular skills in the manufacture of the final product produced. The 2016 turnover is in the 0-10 million Euro range	Create value from waste
B	Company B is a company realizes luxury leather goods for both the B2C and B2B market. The company is part of an international group and is strongly committed to the implementation of actions aiming at increasing the level of environmental and social sustainability of production and organizational processes. The commitment to sustainability is evident not only in the company's internal processes but throughout the supply chain, with the purpose of determining new evolved industry standards for sustainability. The 2016 turnover is in the range > 50 million.	Adopt a stewardship role
C	Company C is part of a larger consortium of wine producers of the B2B and B2C market. The main activity of the company is the bottling of the finished product and its treatment. The company invests heavily in initiatives aimed at maximizing production efficiency and effectiveness in order to minimize the consumption of energy and materials. The main	Maximise material productivity and energy efficiency

	focus is therefore on the process but not yet on the main asset (i.e. wine) due to the complexity of the supply chain. The 2016 turnover settles in the range 10-50 million euros.	
D	Company D is a company active in the world of packaging for B2B customers. The competitive element on which the company has focused has been the transformation of processes and materials towards more sustainable solutions in order to compete in a highly stable market (from a technological point of view) characterize by a high competition coming mainly from countries with low-cost labour. The 2016 turnover settles in the range 10-50 million euros.	Substitute with renewables and natural processes

Findings

Results led to the identification of 4 different sustainability BOMs. For the first BOM (Company A), "*Create value from waste*", the main distinguishing element lies in the fact that the whole design and production process takes place in close collaboration with customers and SC partners. In fact, each new product is made with raw materials coming from production wastes of the customer company, therefore new products are made *ad hoc* for each new order.

The second BOM (Company B), "*Adopt a stewardship role*", is strongly committed to the implementation of actions aimed at increasing the level of environmental and social sustainability of the production. The main distinguishing element is the push to transform business processes towards more sustainable production dynamics along the entire SC to determine new evolved SC standards.

The third BOM (Company C), "*Maximize material productivity and energy efficiency*", invests heavily in initiatives aimed at maximizing production efficiency to minimize the consumption of energy and materials. The main focus is on the sustainability of just final products due to the complexity of the SC.

Finally, for the fourth BOM (Company D), "*Substitute with renewables and natural processes*", the competitive element is the sustainable transformation of internal processes and raw materials towards more sustainable solutions, however without an alignment with the SC.

The BOM analysis also allowed the identification of the type of relationship with upstream SCs. The approach is substantially different between the two pairs of companies (A, B and C, D). In the selection and evaluation processes of SC partners, A and B verify the SC sustainability carefully with complex quantitative and qualitative parameters; C and D the selection and evaluation of partners is substantially regulated by the evaluation of classic parameters (for example certifications). Moreover, the relationship with SC partners is more oriented based on mutual trust A, B and on a high level of monitoring and control for companies C and D. In A and B, in fact, collaboration leads to a real integration of partners within the company mechanisms, with a strong alignment of objectives, programs and activities that often lead to a equalization of roles along the SC. For companies C and D, instead, the relationship stops at a relationship where they try to reconcile different objectives but where the intent of integration and harmonization of visions remains far away. From the qualitative analysis carried out therefore it is possible to identify a certain coherence in terms of efforts and peculiarities between the Company A and B and the company C and D, and it is possible to notice a greater complexity and maturity in the solutions proposed by A and B for sustainability challenges.

As regards the *selection of suppliers* and network partners, it is interesting to note that the approach is substantially different between the two pairs of companies. In the selection processes of supply chain partners, for A and B dedicate attention to quantitative and qualitative verifications and analyzes aimed at verifying the sustainability profile of the actors involved. However, a more intangible and less identifiable component can be clearly identified among the selection criteria of suppliers, such as the assessment of the coherence of their business trajectories and objectives in the field of sustainability, in line with the focal company. Or again, the affinity in terms of management style among suppliers (vision and values) is highly taken into account, and sometimes even the personal relationship between the subjects involved seems to be decisive in order to involve supplies in new sustainability projects.

For the C and D companies, however, the intangible dimension is completely missing and the selection and evaluation of the partners is substantially regulated by objective evaluation using more classical and more easily formalized parameters (certifications, performance indicators, audit results).

On the *monitoring* side, in Company A there is a total lack of monitoring of the supplier due essentially to the close contact carried out between the company and the partners in daily working activities. In B, monitoring is limited to the periodic check of the certifications evaluated during the selection phase. Instead, in C and D, consistently with the great attention placed in the evaluation phase, even the control during the whole period of collaboration remains structured and frequent.

For what concerns *collaboration*, it is certainly developed in all four cases. All the companies involved recognize the need to go beyond a simple careful selection and beyond a simple check of their supply chain and see in the active collaboration with the suppliers a fundamental and indispensable element to achieve the required sustainability objectives. In particular, in all cases it seems interesting to share the practices and skills acquired in order to allow the supply network to develop improved sustainability practices and projects.

The real distinction between the two groups of companies, however, is evident above all by evaluating the *integration* of partners. In A and B, in fact, collaboration leads to a real integration of partners within the company mechanisms, with a strong alignment of objectives, programs and activities with often a parification of roles (between the focal company and suppliers) along the supply chain. In this way, all organizations undertake a process of joint sustainability development, often starting from a situation of lack of knowledge and arriving at an improved result, whose benefit is distributed among all supply chain partners. For the company A this is expressed, for instance, in the development of new products starting from recycled material supplied by a customer for whom it is necessary to design and develop ad hoc and new production processes with third suppliers. For the company B this is realized in the development of new innovative production processes that lead to a substantial change in the leather production process with impacts along all levels of the supply chain (assemblers, tanneries, etc).

For companies C and D, however, this situation is almost absent. The relationship stops at a relationship of simple collaboration in which different objectives of different supply

chain partners coexists and the intent of visions' integration and harmonization remains far away.

Contributions

Addressing the issue of sustainability by integrating it within new BOMs is not a simple challenge. As highlighted in the previous paragraphs it is evident that there is no single valid approach in general. Starting from four different success stories, it was first of all valued how sustainability can be effectively added into company's BOMs with deeply different approaches.

After having defined the way in which the company intends to integrate sustainability into company practice, the great challenge of opening up to a broader sustainability vision that can also include the upstream supply chain remains. The four case studies of this research were studied by adopting this point of view, therefore by evaluating how their BOMs also considered sustainability aspects within their supply chain. Similarities and elements of difference emerged and highlighted the need for a coherence between how sustainability is understood and included in the focal company strategy, and how it is exploited with supply chain partners.

Simpler approaches of BOMs such as the maximization of the efficiency or the incentive the use greener processes (respectively adopted by Company C and Company D) seem to be consistent with more formalized relations with supply chain partners, based on monitoring activities and simple collaborations. Instead, more evolved approaches such as the implementation of circular economy strategies that implies the creation of value from waste or the definition of new sector targets by acting as a stewardship role in the market processes (respectively adopted by Company A and Company B) require to give up traditional methods of supply chain management, to move towards more advanced collaborations typologies that become a real integration with supply chain partners after an initial activity of suppliers' selection based also on sustainability criteria. Overall, it is interesting to note that for companies A and B the implemented practices are polarized at the extremes (selection and integration) of the four classes proposed by Akamp and Mueller (2013) while for companies C and D the focus is mainly on the two central classes (monitoring and collaboration) (Figure 2).

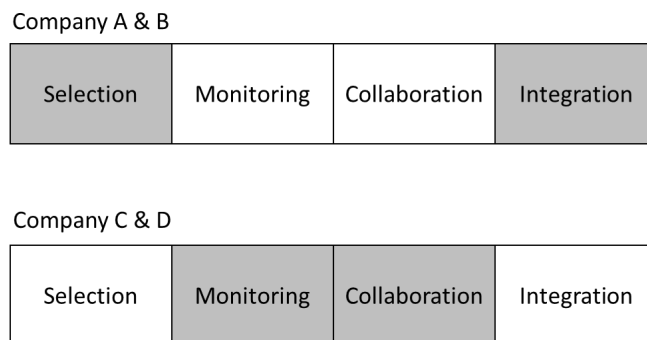


Figure 2: Type of collaboration with the upstream supply chain

In general, the present research stimulates a change of vision in the sustainability field, by focusing on successful case studies in order to better identify all the possible ways for an effective implementation of sustainability in a company and within supply chains. In this sense, the combination of BOMs concepts and sustainability requires further study by adopting a cross-sectional view.

There are certainly several aspects on which future researches are encouraged: first, an analysis of a larger sample would allow the collection of more evidences and, in particular, it could highlight the presence in the market of new BOMs. Overall, the world of sustainability and the circular economy are today more than ever current topics of interest to companies. There are many opportunities for in-depth analysis that can be seen in the future: however, studying the relationship between the BOM implemented by the focal company and the relationship with the related supply chain seems to be one of the most promising ways because it allows to develop a supply chain look from the beginning to face a theme, still not appropriately debated in previous literature. As a result, this paper contributes in this field by investigating different sustainability BOMs at the SC level, and filling in this way a literature gap as well as supporting managers in the implementation of new sustainability strategies. Moreover, the paper investigates the link between new sustainability BOMs and the relationship to be developed within suppliers, a combination also not deeply investigated in literature.

References

- Ageron, B., Gunasekaran, A., Spalanzani, A. (2012). "Sustainable supply management: an empirical study". *International Journal of Production Economics*, Vol. 140, pp. 168 – 182.
- Akamp, M., & Müller, M. (2013). Supplier management in developing countries. *Journal of Cleaner Production*, 56, 54-62.
- Blome, C., Hollos, D., & Paulraj, A. (2014). Green procurement and green supplier development: antecedents and effects on supplier performance. *International Journal of Production Research*, 52(1), 32-49.
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). "A literature and practice review to develop sustainable business model archetypes". *Journal of Cleaner Production*, 65, 42-56.
- Brandenburg M., Govindan K., Sarkis J. Seuring S. (2014), "Quantitative models for sustainable supply chain management: Developments and directions", *European Journal of Operational Research*, 233, 2, 299-312.
- Da Giau A., Lion A., Macchion L., Caridi M., Caniato F., Cappellari R., Danese P., Rinaldi R., and Vinelli A. (2016), "The Challenge of Sustainability within the Italian Fashion System", in Vecchi, A., Buckley, C., *Handbook of Research on Global Fashion Management and Merchandising*, IGI Global- in press.
- Ellen MacArthur Foundation (2018) <https://www.ellenmacarthurfoundation.org/>
- Harris, H. (2001). "Content Analysis of Secondary Data: A Study of Courage in Managerial Decision Making". *Journal of Business Ethics*, Vol. 34, pp. 191–208
- Krause DR, Vachon S, and Klassen R.D. (2009). "Special topic forum on sustainable supply chain management: introduction and reflections on the role of purchasing management". *Journal of supply chain management* Vol. 45, No. 4, pp. 18-25.
- Meredith, J. R., Raturi, A., Amoako-Gyampah, K., & Kaplan, B. (1989). Alternative research paradigms in operations. *Journal of operations management*, 8(4), 297-326.
- Nielsen (2015), <http://www.nielsen.com/us/en/insights/reports/2015/the-sustainability-imperative.html>
- Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, 16(1), 1.

- Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2016). Exploring the relationship between business model innovation, corporate sustainability, and organisational values within the fashion industry. *Journal of Business Ethics*, 1-18.
- Reefke, H., & Sundaram, D. (2017). Key themes and research opportunities in sustainable supply chain management—identification and evaluation. *Omega*, 66, 195-211.
- Sarkis, J. (2012). “A boundaries and flows perspective of green supply chain management”. *Supply Chain Management: An International Journal*, Vol. 17, No. 2, pp. 202 – 216.
- Seuring, S., & Gold, S. (2013). Sustainability management beyond corporate boundaries: from stakeholders to performance. *Journal of Cleaner Production*, 56, 1-6.
- Seuring, S., Müller, M. (2008), "From a literature review to a conceptual framework for sustainable supply chain management", *Journal of cleaner production*, 16, 15 1699-1710.
- Voss C, Tsiriktsis N, Frohlich M. (2002), “Case research in operations management” *International Journal of Operations & Production Management*, 22, 2, 195-219.
- Zhu, Q., Dou, Y., Sarkis, J. (2010). “A portfolio-based analysis for green supplier management using the analytical network process”. *Supply Chain Management: An International Journal*, Vol. 15, No. 4, pp. 306 – 319.