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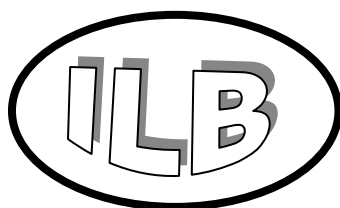
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Collaboration and Sustainable Relationships: their Contribution to the Life Cycle Analysis in Agri-Food Supply Chains¹

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Abstract

The life cycle approach is widely used in the analysis of sustainability. Its application to supply chains is necessary since the product flows, from processing of raw materials to the final customer, are considered. The role of the organizational aspects, expressed in terms of relationships between the supply chain agents, is little considered in the life cycle analysis approach. The aim of this paper is to extend the scope of the food chain life cycle analysis by adding the organizational dimension to the environmental, economic and social ones. Within this context, Collaboration and Sustainable Relationships concepts have been explored based on a literature survey. A theoretical framework, describing their role in assessing the organizational dimension in the life cycle analysis of the food supply chains, is defined. A hypothesis on their joint influence on the supply chains performances is formulated.

Keywords: *Supply Chain Collaboration, Sustainable Relationships, Sustainability, Resource Based-View, Transaction Cost Economics, Life Cycle Analysis.*

1 Introduction

The concept of sustainability was originally proposed by the World Commission on Environment and Development (WCED 1987) as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Sustainability aims to improve the management of systems through ongoing understanding and knowledge (Osorio L.A.R. et al., 2005; Bagheri A., Hjorth P., 2007). Sustainable supply chain management considers the entire life cycle of the product using the triple bottom line approach (Elkington J., 1999) as a measure of success (Linton J.D. et al., 2007; Pagell M. et. al., 2008). In particular, supply chain performance should be measured by environmental, economic and social impacts integrating the triple bottom line approach into the culture, strategy and operations of the different agents (McDonough W., Braungart M., 2000).

The growing interest on sustainability in the food supply chain increased the pressure from different stakeholders (consumer organizations, environmental advocacy groups, policy makers, etc.) on food industries and retailers to assess and improve the environmental and social performance within the product lifecycle (Maloni M., Brown M., 2006; Matos S., Hall J., 2007). Therefore, the creation of a sustainable food supply chain should represent an effective strategy for seeking competitive advantage and securing the stakeholders approval in the future.

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More dimensions than the economic, social and environmental are needed for an effective assessment of the sustainability in the supply chain; in particular supply chain collaboration and sustainable relationships should be added since these dimensions are the source of competitive advantage using a sustainable supply chain as a functional unit of the analysis (Markley M.J., Davis L., 2007). Our theoretical framework relates, in fact, to the business level and is mainly oriented to understand the dynamics of the supply chain agents' relationship on sustainability. Externalities and other aspects related to the meso and macro impact of the supply chain sustainability have not been included in our study.

The goal of this paper is the development of a theoretical framework integrating the supply chain collaboration and sustainable relationships dimensions into the sustainability assessment of a food supply chain. A review of the literature will be provided to this end.

2 Literature review

The paper examines supply chain collaboration and sustainable relationships within the business economic domain, from three different perspectives: (i) supply chain management, (ii) transaction cost economics, and (iii) resource based view theories. These approaches are widely recognized as the most significantly related to the businesses relationships analysis (Cao M., Zanhg Q., 2010; Bowen et. al, 2001). The different approaches are then integrated with a more specific literature contribution to the understanding of the role of supply chain collaboration, sustainable relationships and sustainability performances to sustainability assessment.

2.1 Sustainable Supply Chain Management

Supply chain management (SCM) is defined as “the integration of key business processes from end-user through original suppliers, that provides products, services, and information that add value for customers and other stakeholders” (Lambert D.M. et al., 2006), and was mostly concerned with the efficient and responsive system of production and delivery from raw material stage to final consumer.

Recently the integration of the triple bottom line approach in supply chain management practices is widely discussed in literature, due to the increasing pressure from various supply chain stakeholders (Seitz M.A, Wells P.E., 2006). Following the life cycle approach some authors have explicitly incorporated the social, environmental, and economic dimensions in the definition of the sustainability of an organization as including “equal weightings for economic stability, ecological compatibility and social equilibrium” (Góncz E. et al., 2007).

According to Carter and Rogers (2008) sustainable supply chain management expands the concept of sustainability from the single company to the supply chain level. The authors perform a large-scale literature review to introduce the concept of sustainability into the field of supply chain management defining it as the “strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chains”.

In order to address the impacts of production and consumption within the wider sets of performance objectives, sustainable supply chain management presents greater challenges for the integration of the actors along the supply chain (Teuscher P. et al., 2006; Linton J.D. et al., 2007; Seuring S., and Müller M., 2008). According to some authors, long-term and highly collaborative ways of working have to be created between all participants in the supply chain in order to reach a

sustainable competitive advantage (Cox A. et al., 2007; Geffen C., Rothenberg S., 2000) and reducing the risks associated to the supply chain management (Lee H.L., 2008).

2.2 *Resource based, extended resource based and relational view*

Supply chain management can be grounded in the resource-based theory (RBV) (Hunt S., Davis S., 2008). Moreover, RBV plays a central role in explaining supply chain collaboration. The key concepts of RBV are resources, capabilities and competences (Barney J. B., 1991).

Resources are the firm's strategic assets (Amit R., Schomaker P.J., 1993). They are unique (Rumelt R.P., 1984), heterogeneous and imperfectly transferable (Peteraf M., 1993). RBV claims that relational assets enable partnering firms to build competitive (Dyer J.H., Singh H., 1998; Teece D.J. et al., 1997) and market (Knudsen D., 2003) advantage because of their rare, valuable and difficult to imitate nature (Jap S.D., 2001).

Capabilities are a function of the tacit understanding, individual skills and resources that a firm accumulates over time towards changing environment (Teece D.J. et al., 1997; Mahoney J.T., 1995). If sustainability practices are part of a firm's capabilities they contribute to an increase in the performance also of the connected firms (Cao M., Zanhg Q., 2010). Bowen et. al (2001) defined a theoretical framework where supply chain capabilities assume a central role in developing the firm internal resources able to implement environmental practices.

Competences are evolved capabilities, which involve the governance process and collective learning across levels, business units and functions inside the organization (Prahalad C.K., 1993). They generate a strategic advantage for the firm if they are linked to the firm capability to innovate or to intensify intra-firm relationships, as a consequence of the interactions of different individuals and value systems within the organization (Hoopes D.G. et al., 2003).

Conventional RBV assumes that firms must totally control their resources to create value. On the other hand the extended resource-based view (ERBV) states that collaborative firms combine external and internal resources to achieve a *relational rent* (Lavie D., 2006), which is defined as a *profit* created in an exchange relationship that can only be created through the joint contributions of the collaborative partners (Dyer J.H., Singh H., 1998; Lavie D., 2006).

The relational view (RV) complements the RBV and concentrates on the generation of inter-organizational resources, capabilities and competences through interaction. RV suggests that key resources may span firm boundaries and the relational rents (Dyer J.H., Singh H., 1998) when collaborative partners combine and share assets, knowledge and capabilities through "relation-specific investments, complementary resource endowments and effective governance mechanisms" (Cao M., Zanhg Q., 2010). Therefore a relational rent can be extracted only from shared resources among partners (Lavie D., 2006).

According to Gold et al. (2010) following RBV and its further theoretical developments sustainable supply chain management generates inter-organizational resources which positively influence the inter-firm competitive advantage through collaboration; this concerns not only the economic but also the environmental and social sustainability performances.

2.3 *Transaction Cost Economics*

Transaction Costs Economics (TCE) provides an important analytical framework explaining the firms' organization and their relationships along the supply chains (Barringer B.R., Harrison J.S., 2000). This approach considers a firm as a governance body whose goal is to grant reliable and efficient contractual relationships. According to Williamson (1975) the necessity to compensate the costs that arise from bounded rationality and from uncertainties due to partners'

opportunism, leads to a firm orientation towards either vertical integration or less coordinated market relations (e.g. spot markets).

Between the extremes of vertical integration and spot market exchange, collaboration allows for an intermediate form of hybrid governance (Cao M., Zanhg Q., 2010). Collaboration puts more emphasis on governance through relational strategies in addition to governance through contract definition (Nyaga G. et al., 2010). Therefore, supply chain collaboration emerges as the alternative to avoid the problems arising from both hierarchies and markets (Koh J., Venkatraman N., 1991) by: a) reducing the costs of opportunism and monitoring related to market transactions through mutual trust; b) increasing the partner's interest in the partnership (Croom S., 2001).

2.4 *Supply chain collaboration*

Collaboration is about organizations working together and goes beyond normal B2B relationships. Collaboration between supply chain partners recently received increased attention in the supply chain literature (Anderson D.L., Lee H., 1999; McCarthy T.M., Golicic S.L., 2002) and refers to the enterprises which recognize the importance of working and operating together as essential to resolve common problems and to achieve the desired goals (Corbett C.J. et al., 1999; Barratt M., 2004; Wagner B.A. et al., 2002). The concept implies that the chain members are involved in coordinating activities that span the boundaries of their organizations (Bowersox D.J., 1990; Mentzer J.T. et al., 2000).

According to several authors, the supply chain agent's ability to compete is strongly related with their ability to collaborate with suppliers at various levels in the chain, as a way to construct a more efficient and responsive supply chains (Lamming R., 1993; Christopher M., 1998; Gunasekaran A. et al., 2001).

Cao and Zhang (2010) define supply chain collaboration as "a partnership process where two or more autonomous firms work closely to plan and execute supply chain operations towards common goals and mutual benefits". The authors, based on a large literature survey, develop a measurement instrument interconnecting seven dimensions: information sharing, goal congruence, decision synchronization, resource sharing, incentive alignment, collaborative communication and joint knowledge creation among independent supply chain partners.

Considering the changes occurred in the agri-food sector in the last decade, there are risks related to collaboration that needs to be considered in the supply chain management. According to (Matopoulos A., et. al. 2007) the central role of global retailers, the evolving consumer's attitudes as well as the existence of more strict regulations and laws regarding food production, have encouraged collaboration attitudes among supply chain agents in order to achieve performance improvements across many business levels (Kaufman P., 1999). Despite that, important barriers to collaborations also exist, mostly related to industry's complex and heterogeneous structure. Organization' differences in terms of economic size, structure, cultural approach (Mello J.E., Stank T.P., 2005) access on ICT applications could deteriorate collaboration intensity due to lack of trust, operational complexity or technical reasons.

2.5 *Sustainable relationships*

Supply chain collaboration includes intangible but equally important elements of relationships which refer to their sustainability. Recent contributions identified a set of variables defining the sustainable relationships (Fischer C. et al. 2010; Reynolds N., 2010) able to play an influential role in companies' decision to collaborate. Sustainability refers to the expectations and desires of the individuals involved in the relationship (Jarvelin A., Lehtinen U., 1996), and is defined by qualities such as trust, commitment and satisfaction (Lages et al., 2005). Moreover, sustainability defines

the efficiency and effectiveness of relations along a supply chain (Handy C., 1999; Christopher M., 1998) and it is a key source of chain competitive advantage (Schiemann M., 2007).

The relevance of sustainability and collaboration as indicators of successful and long-term relationships were previously stated by other authors (Handy C., 1999; Backstrand J., 2007; Christopher M., 1998). Recent contributions measure the sustainability of business relationships in food sector investigating its implication for supply chain competitiveness (Reynolds N. et al., 2009).

2.6 Sustainability performance

Traditionally, organizational performance refers to the economic dimension of sustainability, in particular to the achievement of market and financial goals (Yamin S. et al., 1999). In SCM there are short term and long-term goals. The former relate to increase the productivity and reduce the inventory and cycle time, while the latter relate to increase the market share, cost saving and profits for all members of the supply chain (Tan K.C. et al., 1998; De Giovanni P., Esposito Vinzi E., 2011). Economic performance is measured by criteria such as return on investment (ROI), market share, and profit margin on sales. The balanced scorecard approach (BSC) (Kaplan R.S, Norton D.P., 1993) goes beyond the above mentioned economic indicators measuring the firm performance considering four perspectives: the customer, internal process, innovation, and financial perspectives. Kleijnen and Smits (2003) proposed a framework which integrates multiple metrics considered in the SCM with the metrics included in the BSC performance evaluation.

Environmental performance is assessed by several measurement scales (Maxwell D., van der Vorst R., 2003; Huenting R., Reijnders L., 2004; Rao P., 2002). Despite the amount of literature on the topic, all contributions refer to the Life Cycle Assessment (LCA), which is a method to evaluate environmental impacts of the supply chain processes. The method is defined in the ISO standards 14040 and 14044.

Social performances refer to all management practices contributing both to individual-level human safety and welfare, and societal-level community development. Operative tool to assess and monitor the degree to which all supply chain actors manage social issues are needed (Awaysheh A., Klassen R.D., 2010). Despite that, standards (SA 8000, ISO 26000), reporting framework (GRI – Global Reporting Initiative), specific codes of conduct and guidelines are adopted to organize the understanding of social issues in the supply chain.

3 Research framework and hypotheses

Going beyond the triple bottom line approach, from a supply chain perspective sustainability refers to how supply chains must become more collaborative in order to create a win-win situation, to achieve business synergy and provide the competitive advantage in the marketplace.

Based on the discussed literature survey, collaboration emerged as the organizational pillar of sustainability. In sustainable supply chain management, collaboration is the key driver to face the challenges of integration among the actors in order to achieve economic, environmental and social goals. Where sustainability practices are part of supply chain capabilities (Bowen et al., 2001), the relational view of the resource-based theory defines collaboration as a *relational asset* enabling supply chain partnerships to build rare and non-substitutable competitive advantage. The central role of collaboration in influencing the relations sustainability along the supply chain is also supported by the transaction cost economics. Even if not explicitly related to environmental, economic and social sustainability, collaboration in TCE is considered as integrating the role of

governance, defined by contract definition, in influencing the relational strategy among supply chain actors.

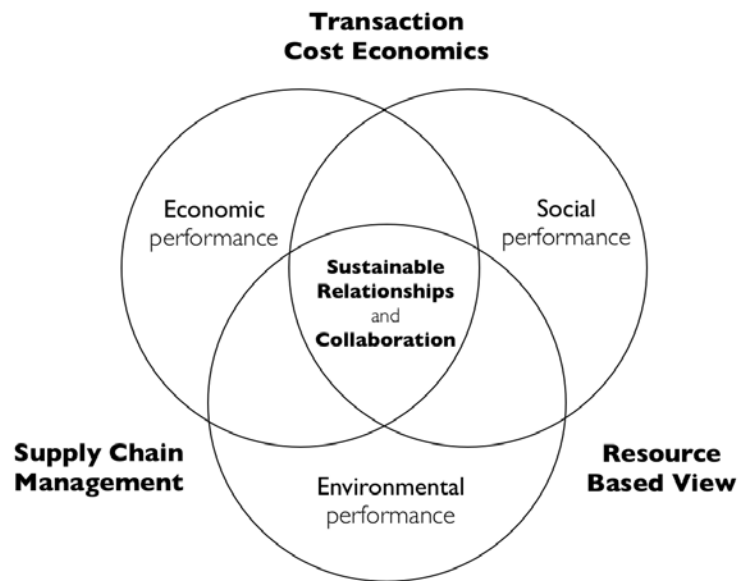


Figure 1. Theoretical Framework

Overall, supply chain collaboration influences the three dimensions of sustainability related performances. The direct impact of collaboration on the supply chain economic performances is widely discussed in literature (Cao M., Zanhg Q., 2010; Li S. et al., 2006; Kim S.W., 2009). Closer relations among supply chain partners can also contribute to the improvement of environmental performances through innovative processes and the related information exchanged (Yang, Liu, Chao 2010). Finally, collaboration plays a central role in adopting supply chain socially responsible practices (Awaysheh A., Klassen R.D., 2010).

In the long-term, collaboration between supply chain partners is based on intangible assets like trust, commitment and satisfaction. In supply chain management literature these assets define the variable *sustainable relationships* while, according to Resource Based view, they refer to the *relational capabilities*. Relational capabilities are part of firm's sustainable practices, derive only from shared resources among partners (Cao M., Zanhg Q., 2010) and contribute to increase organization's performances. Therefore, sustainable relationships directly influence the firm performances along the chain and also have an indirect role by mediating the influence of supply chain collaboration (Figure 1).

The following research hypotheses can be formulated in order to propose an organic conceptual framework integrating the supply chain collaboration and sustainable relationships dimensions in the sustainability assessment of a food supply chain (Figure 2):

- a) Supply Chain Collaboration is positively related both to the Organizational Performance and the Sustainable Relationships among the actors in the food-chain;
- b) Sustainable Relationship is positively related to the Organizational Performance of the actors in the food chain.

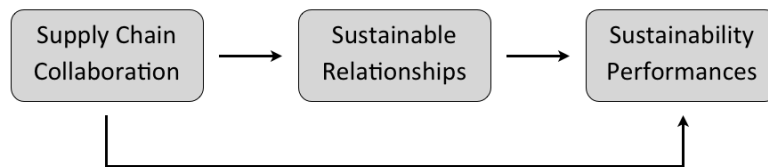


Figure 2. Research hypothesis

4 Conclusions

The paper presented a theoretical framework describing the role of supply chain collaboration and sustainable relationships as the organizational pillar of sustainability assessment of a food supply chain. Based on the economic literature review, the authors examine the importance of the collaboration and the relationships from three different perspectives: supply chain management, transaction cost economics and resource-based view theories. Research hypotheses have been formulated in order to assess the influence of supply chain collaboration and sustainable relationships on the three dimensions of sustainability performances.

Among researchers and practitioners there is a growing need to measure and assess the overall sustainability within organizations and along the supply chain. Despite that, a methodological framework able to jointly evaluate and measure supply chain sustainability's performances (both quantitative and qualitative) by incorporating stages of food production, food processing, food retailing and transportation is needed.

So far the life cycle approach considers this possibility by standardizing and weighing the different sustainability impact categories in order to provide a general sustainability index.

This method is useful to provide an aggregated answer to the sustainability measurement but not when a simulation is needed, for instance to evaluate an innovation impact on the supply chain sustainability. In this case a model able to fully integrate the relationships between the different sustainability dimensions can be helpful.

Structural Equation Modeling (SEM) have been used to investigate the relations between environmental management and firm's performance (De Giovanni P., Esposito Vinzi E., 2011), the impact of supply chain collaboration (Cao M., Zanhg Q., 2010) and supply chain practices (Li S. et al., 2006) on collaborative advantage and firm economic performance, as well as the influence of social and environmental performances on the economic performances (Pullman M.E. et al., 2009). This methodology could provide a useful analytical tool for empirically testing our hypothesis and defining and organic supply chain sustainability assessment model. Other recent modeling developments considering agent-based simulation models applied to Life Cycle Assessment could be useful too (Davis C.B., 2009). Both approaches are anyway quite demanding in term of construction and implementation. In particular agent-based models are at an early stage of development in the context of sustainability analysis of supply chains.

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