

RBV and Capabilities Creation on the Supply Chain
The Case of Environmental Management System Diffusion

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Abstract

The objectives of this study are: (1) to understand the creation of capabilities necessary to the upstream diffusion of the Environmental Management System (EMS) along the supply chain during the processes of supplier relations; and (2) to formulate hypotheses for future research. A case study research was conducted with data from interviews with the purchasing officers of a large Brazilian manufacturing company, using the Resource-Based View (RBV) of the firm as the analytic framework. The supplier relations were analyzed and described, leaving theory proposition to a future work.

1 Introduction

Many studies have attempted to connect environmental management to organizational strategy, to internationalization, to operations strategy and management, to quality management, to supply chain management, to logistics, to purchasing, and to innovation. Those studies, however, do not provide a comprehensive theoretical model, empirically validated, to explain the policies of capabilities development deployed by industrial customers on their supply chain. There are evidences of those policies in the academic literature and in the companies' environmental or social responsibility reports, in addition to a large number of anecdotal evidences in the management literature. Ford Motors Company, for example, has demanded from its 5000 suppliers ISO 14001 certification until 2003, providing them training on Environmental Management Systems (Rao, 2002), even collaborating with General Motors and DaimlerChrysler to communicate in a consistent way with its first tier suppliers³. General Motors demanded ISO 14001 certification from its 600 largest suppliers by the end of 2002, and launched a program to develop environmental capabilities in small- and medium-size suppliers⁴. In 2003, the quality department of Petroflex, a Brazilian plastics supplier to Sony Corporation, was working hard to participate to the *Green Supplier* program of this customer⁵. There are evidences that the large corporations, at least in the automotive and electronics industries, are imposing Environmental Management Systems (EMS), ISO 14001-based or not, on their supplier base. It is necessary, therefore, to understand how this upstream "imposition" of the EMS, or the creation of environmental capabilities on the supply network, is done.

The objectives of this study are (1) to understand the creation of capabilities necessary to the upstream diffusion of the Environmental Management System (EMS) along the supply chain, during the processes of supplier relations, using the Resource-Based View (RBV) as the analytic framework, and (2) formulate hypotheses for future research.

³ **Ford Motors Company Corporate Citizenship Report 2003-2004.** Available on <<http://www.ford.com/en/company/about/corporateCitizenship/report/toolsPrint.htm>>.

⁴ **General Motors Sustainability Report 2000-2001 – Achieving a sustainable balance through innovation, technology and partnership.** Available on <<http://www.gmsustainability.com>>.

⁵ Verbal information provided by a Petroflex employee.

To accomplish these objectives, in dept interviews were performed on three large Brazilian manufacturing companies with global presence. For clarity purposes, only the most eliciting case will be presented here. The company, a large agricultural equipment manufacturer, has the most comprehensive supplier relations system found in the companies contacted, and will be used to elicit the practices being studied.

The paper proceeds as follows. Section 2 introduces the related literature. Section 3 presents the methodology. Section 4 describes the data obtained from the interviews and discusses the main results. Finally, Section 5 presents the conclusions and questions for future research.

2 Literature Review

2.1 *The Resource-Based View of the Firm*

For several years, it was believed that the industrial organization should determine the competitive alternative that would position the firm to achieve superior performance. Porter (1980; 1985) indicated that the competitive advantage is the source of superior performance in competitive markets. He stated that strategic choices are determined by the industry's attractiveness and the firm's competitive position within the industry. Moreover, the competitive advantage derives from the value that a company can generate to its customers. Industrial attractiveness, however, is not sufficient *per se* to explain a firm's performance. In fact, Grant (1991) showed that there is greater performance variance among the companies within industries than across industries. Consequently, the source of competitive advantage lies in the firm's resources rather than in the industry's attractiveness. This attractiveness is explained by the firm's resources which should be coordinated to raise barriers to entry, improve bargaining power with customers and suppliers, prevent the introduction of substitutes, and manage the competitive process.

Resources are internal elements that make up the firm (Barney, 1991). Wernerfelt (1984) uses the SWOT framework introduced by Andrews (1971) when he states that resources are the strengths and the weaknesses of the firm, indicating that the resources are the tangible and intangible assets of the firm. Grant (1991) proposed that the main objective of formulating a resource utilization strategy is to maximize the revenues generated by these resources. Resources themselves do not generate revenue until they are utilized. However, different application of these resources may generate different returns with different levels of risk. The earnings that an organization can generate from its resources is a consequence of the portfolio of utilization of these resources, coordinated by a complex pattern of organizational routines, applied to the operational capabilities of the organization (Grant, 1991; Nelson and Winter, 1982). Capabilities are dynamically created (Teece et al., 1997), or learned, even on interorganizational settings (Grant, 1996; Knight and Pye, 2005).

The strategic capabilities of a firm are the outcome of the coordinated utilization of resources. The goods and services offered by a firm exist because of its sets of capabilities. They are the visible results of resource utilization. Hence, if the firm's products become obsolete, so are its capabilities. Therefore, the strategic capabilities are the source of competitive advantage of the firm (Barney, 1991; Grant, 1991; Prahalad and Hamel, 1990).

Grant (1991) proposed four determinants of sustainable competitive advantage: durability, transparency, transferability, and replicability. The longevity of a competitive advantage depends of the rate of obsolescence of the capabilities and the resources associated with the advantage. In general, capabilities last longer than the associated resources, because the former might be substituted. Transparency reflects the imperfect information that competitors receive about a competitive advantage. A competitive advantage based on a single characteristic is easier to identify and reproduce than an advantage based on multiple characteristics. Moreover, a capability that requires complex coordination of several resources is harder to comprehend than a capability based on a single resource. Transferability refers to the simplicity with which competitors may acquire the capabilities associated with a competitive advantage. The transferability of resources and capabilities is inversely proportional to the sustainability of the competitive advantage that they support. Replicability refers to how easy it is for competitors to develop a competitive advantage internally. Replicability and transferability often require that the competitive advantage be transparent.

According to Barney, the antecedents of a competitive advantage comes from four characteristics of the capabilities: value, rareness, imperfect imitability, and substitutability (Barney, 1991). According to Collis and Montgomery, however, the value of a capability is given by three economic variables that describe it: scarcity, demand and ownership. If a given capability – or the resources that support it – is abundant, this capability is valued less than if it were scarce. Likewise, if there is no demand for a given capability, its value is small. These two forces are connected to the neoclassic supply and demand relationship, applied to the capabilities rather than to the products that they generate. Ownership, on the other hand, relates to the appropriation of the value generated by the capability. The agent in the value chain that appropriates the value of the capability owns that capability. A firm that owns a capability has difficulties appropriating its value if these capabilities depend on resources that are not under complete control of that firm, and whose access depends on complex organizational routines. In fact, if these resources are not tightly sewn to the firm's organization, the revenues of these capabilities will be difficult to appropriate, and will dissipate in the value chain (Collis and Montgomery, 1995).

In order to remain competitive, firms must focus on their core competences (Prahalad and Hamel, 1990). On pursuing this focus, firms outsource many processes to partner firms. This leads to a necessity of developing new capabilities not only on the internal Operations Value Chain (OVC: De Toni et al., 1992), but along the whole supply chain, a phenomenon called interorganizational learning (Knight and Pye, 2005). There is a paradox on the theory at this point: when capabilities creation is necessary over the OVC, there are at the same time threats and opportunities. While it poses a serious threat to the sustainability of competitive advantages, because some competencies must be made explicit, then easier to copy, on the other way, creates a new competitive advantage, which is the ownership of capabilities over a network and as a network of firms, a very difficult advantage to imitate or acquire.

The literature on Operations Strategy has tried to approach RBV within its body of knowledge (for a review see, for example, Coates and McDermott, 2002). RBV was also used to explain the Environmental Management System (EMS) as a capability (Delmas, 2001; Hart, 1995; Sroufe, 2003).

2.2 Strategies of Environmental Operations

Many studies have attempted to connect environmental management to organizational strategy (Bansal, 2003; Carmona-Moreno et al., 2004; Delmas, 2001; Hart, 1995; Hart, 1997; Henriques and Sadorsky, 1999; McGee, 1998; Melnyk et al., 2003a; Porter and van der Linde, 1995; Reinhardt, 1998; Rugman and Verbeke, 1998; Sharma and Vredenburg, 1998; Shrivastava, 1995; Tinsley, 2002), to internationalization (Carpentier et al., 2005; Corbett and Kirsch, 2001; Cunningham, 2004; Epstein and Roy, 1998; Kennelly and Lewis, 2002; Ruud, 2002; Sharfman et al., 2004; Spalding, 2001; Vogel, 1995; Wheeler, 2001), to operations strategy and management (Angell and Klassen, 1999; Azzone and Noci, 1998; Chinander, 2001; Gavronski et al., 2003; Kassinis and Soteriou, 2003; King and Lenox, 2001; Klassen, 2000; Klassen, 2001; Klassen and Whybark, 1999a; Klassen and Whybark, 1999b; Melnyk et al., 2003b; Rao, 2004; Rothenberg et al., 2001; Sarkis, 1995; Sarkis, 2001; Sarkis and Rasheed, 1995; Sroufe, 2003), to quality management (Angell, 2001; Kitazawa and Sarkis, 2000; Pil and Rothenberg, 2003), to supply chain management (Beamon, 1999; Handfield et al., 2005; Handfield et al., 1997; Hugo and Pistikopoulos, 2005; Klassen and Vachon, 2003; Lakhali and H'Mida, 2003; Lippman, 2001; Rao, 2002; Rao and Holt, 2005; Sarkis, 2003; Zhu and Sarkis, 2004; Zhu et al., 2005), to logistics (Abukhader and Jönson, 2004a; Abukhader and Jönson, 2004b; Guide and Van Wassenhove, 2001), to purchasing (Bowen et al., 2001; Carter and Carter, 1998; Carter and Dresner, 2001; Carter et al., 2000; Gillett, 1993; Green et al., 1998; Zsidisin and Siferd, 2001), and to innovation (Brunnermeier and Cohen, 2003; Lambert and Boons, 2002; Lanjouw and Mody, 1996; Popp, 2006).

Klassen and Whybark (1999a; 1999b) proposed a typology of operations technologies to address environmental impacts: pollution prevention, environmental management system and pollution control. In this context, the mission of operations is to translate the respective operational approach into eco-efficient competitive weapons. Klassen and Whybark (1999a; 1999b) called these weapons the environmental operations technology. Other authors suggested alternative typologies of environmental impact of operations (Hart, 1995; Shrivastava, 1995).

Pollution prevention requires structural investments that involve changing the operations, improving the environmental performance not only at the final product, but throughout the productive process, generating significant economic benefits to the company. For this reason, Hart (1995) indicated that pollution prevention programs are similar to total quality management programs. Both programs try to eliminate losses and wastes in the whole process, given that pollution and the excessive use of materials and energy can be considered process losses. Hence, the resources and capabilities that a firm develops for the introduction of TQM might be useful in a pollution prevention program.

Environmental management systems are infra-structural procedures that affect how the operations are managed. They might include the formalization of operating processes, cross-functional coordination, involvement of stakeholders, monitoring, internal and external disclosure of results, training, certification, and other activities related to the environmental impact of the company (Klassen and Whybark, 1999b).

Pollution controls are the structural investments that deal with final process emissions after they have been generated. They not always reduce the total amount of pollutants that are released or discarded, but they reduce the risk associated with them (Klassen and Whybark, 1999b).

Angell and Klassen (1999) suggest that there are two environmental strategy perspectives: *external constraint* and *component*. Firms that treat the environment as an external constraint will make environmental decisions independently of the operational decisions. Since these decisions made separately are locally optimized, it is unlikely that they are also globally optimal. Firms that treat the environment as an operational component recognize them as legitimate operational factors that must be integrated in all operational decisions. Our research indicates that this last approach generated better results in the Brazilian companies.

Azzone and Noci (1998) proposed a typology of environmental policies that include five orientations: missionary, pro-active, predictive, reactive and not reactive. Klassen and Whybark (1999a) identify a taxonomy of three managerial orientations with regard to their environmental policies: obedience, opportunism and leadership. These taxonomies are neither mutually exclusive nor redundant. Since one typology classifies these policies focusing on the technologies adopted and the other classifies them based on the motivation of the firms, both can be analyzed empirically.

EMSs have been connected to TQM – positive relationships between ISO 14001 and ISO 9001 certification, for example (Corbett and Kirsch, 2001; King and Lenox, 2001; Pil and Rothenberg, 2003), to plant characteristics and personal values of managers (Klassen, 2001), and to lean manufacturing (King and Lenox, 2001; Klassen, 2000; Rothenberg et al., 2001).

Angell and Klassen (1999) propose that there are several research opportunities to expand our understanding of the sustainable operations management. These opportunities can be structured similarly to the manufacturing decision categories of Wheelwright (1984) and Wheelwright and Hayes (1985). They show how the operational decision making model is sufficiently robust to incorporate the new sustainability concerns into the operations strategy framework. Likewise, when Angell and Klassen propose these questions in all decision categories, they show how that the environmental concerns affect all areas of operations and integrate with it, which confirms the coherence of the operational component perspective.

Several authors have conjectured that it is possible to combine environmental and economic sustainability, being competitive while protecting the natural resources (Hart, 1997; Porter and van der Linde, 1995). This dual objective has proven to be an elusive target to most managers (Klassen and Whybark, 1999b), and needs to be studied further. If, as proposes Sarkis and Rasheed (Sarkis, 1995; Sarkis and Rasheed, 1995), environmental management is more than compliance with regulations and is part of the competitive strategy of the firm, and if, as proposes Grant (1991) and Barney (1991), in order to achieve competitive advantage the firm has to develop strategic capabilities, it is, then, fundamental to understand what environmental capabilities firms develop over their OVCs, and why they are developed.

2.3 Supply Management

For the purposes of this study, the following supply management processes will be considered: supplier procurement, supplier selection (Sarkis and Talluri, 2002; Talluri et al.), supplier development (reverse marketing) (Handfield et al., 2000; Krause et al., 1998; Leenders et al., 2001), supplier evaluation and rewarding (Carr and Pearson, 1999).

2.4 *Environmental Supply Chain Management*

Some empirical studies address the systemic effects of environmental management on the supply chain. Klassen and Vachon, for example, found that the customer-initiated collaborative activities (what is called ‘supplier development’ in this paper) tend to generate more environmental investments than supplier evaluation activities (Klassen and Vachon, 2003). There is empirical evidence that environmental commitment on purchasing (mainly in supplier selection and development processes) is correlated to superior firm performance. Even in developing countries (Rao, 2002; Rao, 2004; Zhu and Sarkis, 2004; Zhu et al., 2005) firms are trying to improve their environmental performance, especially those engaged in a process of internationalization (Corbett and Kirsch, 2001), in order to participate (enter), maintain or even upgrade in global commodity chains (Gereffi, 2001; Gereffi and Korzeniewicz, 1994), or global sourcing initiatives.

3 Methodology

The research problem and the state of knowledge on the field suggests the use of the case study research method (Meredith, 1998; Yin, 1994). Up to this date, very few studies on environmental supply management have been done (Handfield et al., 2005). In order to fulfill the objectives of this study, in depth interviews with the purchasing officers of three large Brazilian manufacturing companies were conducted and the supplier relations were described and analyzed, leaving to a future work theory proposition (Handfield and Melnyk, 1998). Using the approach proposed by Eisenhardt (1989) and Yin (1994), the case was conducted based on a protocol, derived from the framework formerly proposed. The case study method was chosen because the nature of understanding, mapping and discovering of emergent themes in Operations Management (Stuart et al., 2002).

The case study protocol was conceived to capture the following supplier relationship activities: procurement, selection, development and evaluation/rewarding. The interviewees spoken freely about the purchasing procedures, and eventually the interviewer stimulated the participants to talk about the environmental criteria on the supplier relationships. To avoid repetition, only the most comprehensive case will be described.

4 Results

Tractors1 (a fictitious name) is a global corporation that manufactures and distributes agricultural equipment. It has acquired a Brazilian plant in 1994, which was ISO 9001 certified in the same year, and is ISO 14001 certified since 1999. As a corporation, Tractors1 has presence on more than 140 countries.

The purchasing process on Tractors1 Brazilian plant is documented in its quality manual, and one of the purchasing analysts of the company brought this document to the interview, to serve as his guide during the interviewing process.

The **procurement/selection** process identifies new suppliers, and the prospective supplier is submitted to four analyses, in two well defined phases. On the first phase, there is the commercial analysis, conducted by the purchasing department. On this analysis, the prospective

supplier is evaluated on the following criteria: price, capacity (maximum production volume), company history and main customers. If the prospective supplier is considered “strategic”, and doesn’t adhere to the requirements of Tractors1, an action plan is conducted to solve jointly the problems found before the next phase. On the second phase, the remaining three analyses are triggered in parallel. Quality analysis identifies if the prospective supplier is ISO 9001 certified, minimum quality requirement, and analyzes the process to identify the amount of waste. Quality engineering department, responsible for this analysis, visits the prospective supplier’s facilities. Quality assessment is based on the MAF (supplier assessment manual). A second analysis is financial, where are identified the main financial indicators of the prospective supplier, which indicates a long term relationship intention from Tractors1, because if the supplier has any financial problems after its approval, there could be production halts and shipment delays due to shortage on materials. Still on the second phase, the environmental and occupational safety and health department requires the operational licenses (LO) from the state environmental regulations bureau, eventually the ISO 14001 certification and, as a warranty of the social responsibility of the supplier, it signs a social commitment letter, where it agrees to not hire children, keep acceptable quality of work life standards and others. If the prospect supplier is approved on both phases, it is implemented in the Tractors1 information system (ERP) and joins the supplier base.

The **evaluation/awarding** process is applied to the supplier base, and evaluate three aspects: price evolution over time (30%), quality, measured as parts per million rejected (40%), and delivery, measured as the capability of delivering on time, delivery flexibility, etc. (30%). The score, a weighted mean of the former indicators, goes to the “supplier performance report card” (BDF). The BDF is then used to rank the suppliers by the purchasing department. The suppliers receive the BDF, as a feedback. The quality engineering department does periodic on-site audits to the suppliers’ facilities, to assess the quality of the manufacturing process. On these audits, the quality analyst and, sometimes, the purchaser, assesses the adherence of the supplier to the MAF. The financial department also assesses periodically the supplier base. Only the most “important” suppliers are evaluated, and this importance level is based on two criteria: expenditure and “strategic” items, normally single suppliers for that item. The financial assessment product is a report that is sent to the purchasing department.

On a monthly basis there is a meeting of the “supplier committee”, with representatives of purchasing, supply and materials, and quality engineering. If there are suppliers with “low grades” on their BDF, is started an action plan to correct the problems. The BDF is the central instrument for evaluation and rewarding. Every year, there is a national event for the “manufacturing” suppliers, providers of items used directly on manufacturing processes, excluding MRO (maintenance, repair and operations) and services. Tractors1 sends to this event the Latin America and Caribe director, the Material and Purchasing, and Manufacturing and Quality vice-presidents. On this event, it shown to the suppliers the company performance (sales, etc.), relationship trends, and the best suppliers are awarded, on three categories: large, medium and small suppliers.

The environmental criteria are not used for supplier evaluation and rewarding. The environmental and occupational safety and health department had once proposed to phase out suppliers without ISO 14001 certification, but purchasing department couldn’t replace the suppliers, making the idea not viable on current conditions.

Finally, the supplier **development** process is under construction at Tractors1. There is no formal program or structure to improve suppliers’ operations or quality, except the formerly

described action plans. At the time of the interview, there was an intention to work with 6-Sigma's tool DMAIC (define, measure, analyze, improve and control) inside the supplier. The interviewee foresees a trend of dealing with suppliers as if they were an extension of Tractors1, once a large amount of the share of the final cost is bought from them. The lean manufacturing philosophy will be extended to the suppliers; some suppliers start to exchange *kanbans* with Tractors1. The company had already made an agreement with one university to improve the quality on critical suppliers, but the program ended and there is no internal structure working to transfer knowledge to suppliers. There are no training and development of suppliers regarding environmental management.

5 Discussion, Conclusions and Future Research

The limitations of this research do not allow us to be more conclusive: up to this moment, only three companies have been contacted, and the data could not reach the point of empirical saturation, where no more relevant information would be gathered. This poses an opportunity for future research: finding companies implementing more advanced ESCM practices and understanding what capabilities are developed on the supplier base and how.

For the moment, three findings emerge. First, supplier relations require action from more than one department, on a process basis. Second, if effective ESCM is happening somewhere in the automotive industry, it is not getting to the second tier suppliers, because the large first tier studied (not described in the results) does not have advanced ESCM practices, as expected. Third, perhaps not surprisingly, advanced ESCM practices are not common, not even on companies with high standards of environmental management or supplier relationship practices.

Can the theoretical framework of the RBV help to explain that gap? Could ESCM bring a sustained competitive advantage? Advanced ESCM practices would have durability, once they are based upon capabilities, not physical resources; their transparency would be relatively high, because much of those capabilities would be created in the interface between the company and its supplier base; their transferability and replicability, then, would be relatively low. Then, according to the framework proposed by Grant, advanced ESCM practices would be sustained if they provided any competitive advantages. But would it be a competitive advantage? It is scarce, but it has demand? And the ownership of the capability: it is owned by the company, the supplier base, or both? Answers to these questions are not in the scope of this work, and require further research.

At the moment, the objective of describing the environmental supplier relations found only that those companies, participants of the research, develop environmental capabilities on their supplier bases more by demanding ISO 14001 certification and regulatory compliance than involving their suppliers on any kind of collaborative activities.

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