



Environmental management and operational performance in automotive companies in Brazil: the role of human resource management and lean manufacturing



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ABSTRACT

The main objective of this study is to verify the influence of Environmental Management (EM) on Operational Performance (OP) in Brazilian automotive companies, analyzing whether Lean Manufacturing (LM) and Human Resources (HR) interfere in the greening of these companies. Therefore, a conceptual framework listing these concepts was proposed, and three research hypotheses were presented. A questionnaire was elaborated based on this theoretical background and sent to respondents occupying the highest positions in the production/operations areas of Brazilian automotive companies. The data, collected from 75 companies, were analyzed using structural equation modeling. The main results are as follows: (a) the model tested revealed an adequate goodness of fit, showing that overall, the relations proposed between EM and OP and between HR, LM and EM tend to be statistically valid; (b) EM tends to influence OP in a positive and statistically weak manner; (c) LM has a greater influence on EM when compared to the influence HR has over EM; (d) HR has a positive relationship over EM, but the statistical significance of this relationship is less than that of the other evaluated relationships. The originality of this paper lies in its gathering the concepts of EM, LM, HR and OP in a single study, as they generally tend not to be treated jointly. This paper also provided valid empirical evidence for a little-studied context: the Brazilian automotive sector.

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1. Introduction

The intensification of environmental concerns has been leading companies to adopt environmental management practices at an increasing rate (Boiral, 2006; González-Benito, 2006). One of the arguments favoring the adoption of these environmental management practices is that they can benefit firms, giving rise to the so-called “green and competitive” (Porter and Van Der Linde, 1995; Hunt and Auster, 1990; Berry and Rondinelli, 1998; Molina-Azorin et al., 2009). Among those benefits that can be ascertained from environmental management is the improvement in firms’ operational performance, such as a reduction in production costs (Porter and Van Der Linde, 1995). However, specialized literature

affirms that environmental management can create synergy with management practices from other areas in a firm (Wagner, 2007).

Two management areas have gained prominence as targets of effective environmental management (Wilkinson et al., 2001). The first is operations/manufacturing management, which, because it processes resources, has significant environmental effects. The second area is human resources, which may influence the performance of new organizational objectives, such as those related to environmental performance.

The ability of the operations/manufacturing area to support environmental management tends to be greater when the company adopts Lean Manufacturing practices (González-Benito and González-Benito, 2008). This type of relationship has become known as the “Lean and Green” hypothesis and has been analyzed by several authors (Simpson and Power, 2005; Rothenberg et al., 2001; King and Lenox, 2001; Yang et al., 2011; Maxwell et al., 1998). These authors argue that, in general, waste reduction in

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manufacturing contributes to environmental management (Simpson and Power, 2005) through greater efficiency in the use of production resources (Rothenberg et al., 2001) and the adoption of cleaning practices and improved organization of the productive environment (King and Lenox, 2001), which can generate competitive advantages (Yang et al., 2011).

On the other hand, the support of human resource management practices is also considered fundamental for adopting environmental management practices (Jackson et al., 2011; Govindarajulu and Daily, 2004; Sarkis et al., 2010). These researchers affirm that human resource management must align its practices (such as recruiting, selection, performance evaluation, and training) with environmental management objectives. This process is called Green Human Resource Management (Renwick et al., 2008), which follows the hypothesis that a more intense alignment between human resources and environmental issues leads more firms to adopt environmental management practices (Bohdanowicz et al., 2011; Jabbour et al., 2010).

However, there are no studies which integrate Environmental Management (EM), Operational Performance (OP), Lean Manufacturing (LM) and Human Resources (HR). There are few studies that partially investigate these relationships. For example, Jabbour et al. (2012) analyze the relationship between environmental management and operational performance; May and Flannery (1995) investigate the relationship between environmental management and human resources; Rothenberg et al. (2001) analyze the relationships between lean manufacturing and environmental management. There is thus an opportunity for research that fully analyzes this relationship. Ideally, this relationship should first be verified in the automotive industrial sector, which is considered by some researchers (Womack et al., 2004) to be a pioneering industry for management practices and tendencies. Brazil was chosen as the country of analysis due to the growing interest of its researchers in environmental management as well as the high relevance of the automotive sector in the country's GDP.

Therefore, this study's main objective is to verify the influence of environmental management on the operational performance of Brazilian automotive companies, analyzing whether lean manufacturing and human resource management play a role in the greening of these companies. Based on this objective, this paper tests a conceptual framework based on structural equation modeling. In the face of the other statistical techniques available, structural equation modeling is advantageous because (a) it permits researchers to test more complex conceptual frameworks, guaranteeing a more robust and holistic statistical analysis (Ismail et al., 2012), and (b) it permits the simultaneous analysis of the relationships between a broad range of variables (Hair et al., 2011).

The following sections of this paper introduce the study's conceptual framework with its respective research hypotheses (Section 2). This study also details the methodological procedures used for collecting and analyzing data (Section 3), presents the results and discusses them in light of the literature (Section 4) and, in the conclusion, discusses the main implications of this study and describes a proposal for future studies (Section 5).

2. Research hypotheses and conceptual framework

According to Haden et al. (2009), environmental management concerns the complete incorporation of environmental objectives and strategies to the broader objectives and strategies pursued by the organization. Jabbour (2010) complements this definition, suggesting that environmental management be based on a systemic approach incorporating environmentally conscious strategy at every level of the organization.

Several factors can lead a company to adopt environmental management practices (Berry and Rondinelli, 1998). According to González-Benito (2006), stakeholder pressure is the main factor driving organizations toward more advanced environmental management. More advanced environmental management can also improve a company's financial performance (Molina-Azorin et al., 2009) and increase the company's manufacturing competitiveness, promoting cost reductions, quality improvements and the generation of new products and processes (Yang et al., 2010).

In addition, especially with the advances of the population's environmental awareness, companies that invest in environmental management may increase in worth through green marketing initiatives (Woolverton and Dimitri, 2010). Another means of increasing worth occurs when organizations announce their adoption of ISO 14001 environmental management systems, which tends to generate an increase in share value traded on stock exchanges (Jacobs et al., 2010).

There is thus an emerging consensus in the literature (Darnall et al., 2008; Iraldo et al., 2009; Crowe and Brennan, 2007; Vachon and Klassen, 2008; Yang et al., 2010; González-Benito, 2005; Sroufe, 2003) that there are positive results correlating the adoption of environmental management practices with the organizations' performance, gauged through various indicators, especially at environmentally proactive organizations.

It is believed that the adoption of these environmental management practices (Table 1) may generate advantages in several measures of operational performance in organizations

Table 1
Variables related to environmental management.

Environmental management (EM) variables/practices	Measures/definition	Source
Clear policy of valorizing environmental management (EM1)	Clear policy of valorization of environmental management through a precise declaration from business directors about the main environmental aspects and impacts generated.	Boiral (2006)
Environmental training for all employees (EM2)	Environmental training for all employees aimed at promoting environmental policy and permitting employee awareness of their activities' environmental impacts.	Daily and Huang (2001)
3Rs (Reduction, Reuse and Recycling applied to water, electric energy and paper) (EM3)	3Rs, comprising Reduction, Reuse and Recycling applied to water, electric energy, paper and other natural inputs, increasing business productivity.	Marcus and Fremeth (2009)
Development of products with smaller environmental impacts (EM4)	Development of products with smaller environmental impacts.	Sarkis (2001)
Development of production processes with smaller environmental impacts (EM5)	Development of production processes with smaller environmental impacts.	Sarkis (2001)
Supplier selection based on environmental criteria (EM6)	Vendor selection based on environmental criteria.	Jabbour and Jabbour (2009)
ISO 14001 or other Environmental Management System (EM7)	Environmental management systems (ISO 14001 and/or others).	ABNT NBR ISO 14001 (2004)
Voluntary promotion of information on environmental performance (EM8)	Voluntary promotion of information on environmental performance.	Boiral (2006)

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