



Manufacturing and environmental practices in the Spanish context

Andrés Muñoz-Villamizar^{a, b, *}, Javier Santos^a, Elisabeth Viles^a, Marta Ormazábal^a

^a TECNUN Escuela de Ingenieros, Universidad de Navarra, San Sebastián, Spain

^b School of Economics and Management Sciences, Universidad de La Sabana, Chia, Colombia

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ABSTRACT

Manufacturers have become progressively more aware of their operations' impacts on the triple bottom line (social, environmental and financial), and they are under increased pressure to account for their resource consumption and environmental footprint. These challenges are forcing companies to implement and combine different management approaches, such as “green” and “lean”, to meet the needs of the ever-changing market demand. Using semi-structured interviews in 58 different companies, this paper shows how manufacturing companies carry out manufacturing and environmental practices. This study contributes to the current debate in the literature on environmentally friendly manufacturing by arguing that companies with advanced manufacturing practices do not engage in proactive participation in environmental management with tactical and strategic practices inside their organizations. Following that, some considerations for correctly measuring the environmental efficiency in companies are presented. The findings and recommendations of this study can be used to fully utilize the potential of environmental practices to simultaneously improve manufacturing productivity and environmental performance and to identify trends in organizational development.

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1. Introduction

The activities of the manufacturing industry have contributed significantly towards strengthening the economy of many nations, including developing countries, and they play a vital role in the global economy by supplying goods and services. However, it is crucial for manufacturers to prevent the overuse of resources. According to the International Energy Agency (IEA, 2009), the manufacturing industry contributes 38% of CO₂ emissions worldwide. Given the detrimental impact on the environment (e.g. global warming, changes in weather patterns, formation of acid rain and air pollution) and the potential for affecting human health and disrupting the natural balance of the ecosystem, it is essential that industry reduce CO₂ emissions. Otherwise, in the absence of positive environmental initiatives, manufacturing activities will lead to the creation of enormous amounts of waste, the exploitation of natural resources and the overconsumption of energy (Abdul-Rashid et al., 2017).

The advancement of the concept “sustainability”, first introduced in 1987 (Brundtland, 1987), can be witnessed in the

subsequent emergence and adoption of environmental practices and standards, either in relation to production (life cycle analysis, green building standards, etc.) or to management procedures (environmental management system) in industry. Many studies have highlighted the drivers, drawbacks, and benefits of implementing these new practices, with some drawing attention to the strategic implications of adopting such practices (Chen et al., 2016). The term “sustainability” can be defined as expanding the corporate perspective to one that considers environmental, social and economic aspects (i.e., triple bottom line) (Abdul-Rashid et al., 2017). However, this study will focus on environmental and economic aspects of sustainability.

After the international community received a wakeup call from the Brundtland Report (1987), issues such as global warming and environmental impacts have become key concerns for many companies around the globe. Governments and business communities have devoted their resources and efforts to improving ecological performance over the last four decades (Kang and Lee, 2016), and manufacturing managers have adopted various strategies to limit the impact of their operations and products on the natural environment (Vachon and Klassen, 2008). Given this context, companies' environmental performance and disclosure become increasingly important factors in their competitive success (Lu and Taylor, 2016). However, the return on investment for the

* Corresponding author. TECNUN Escuela de Ingenieros, Universidad de Navarra, San Sebastián, Spain.

E-mail address: afmvillamizar@tecnun.es (A. Muñoz-Villamizar).

implementation of environmental technical solutions has become one of the biggest challenges for manufacturing companies.

As some industrial performance metrics requirements are shifting from measures of economic-centric performance to measures of environmental performance (Abdul-Rashid et al., 2017), the relationship between environmental practices and financial performance has been the object of numerous debates and discussion in the literature due to the heterogeneous results found (Miras-Rodríguez et al., 2015). The most popular issue in environmental sustainability development studies is the causality between environmental strategy and company performance, and whether the relationship has a positive or negative influence (Kang and Lee, 2016).

Due to different perceptions, it is crucial to gain an understanding of how environmental practices influence manufacturing performance (Abdul-Rashid et al., 2017). In addition, Alayón et al. (2017) point out that a better understanding of the empirical reality surrounding the adoption of environmental principles in organizations is required. Furthermore, Kang and Lee (2016) showed that the majority of studies on this topic have been conducted using data from the USA (e.g., Vachon and Klassen, 2008), are focused on a single country, have utilized a resource-based view, and have analyzed mixed industries. Thus, as research has provided considerable insights into our understanding of the benefits of the interaction between the environment and operations, very little attention has been devoted to the underlying contextual factors that may affect such an interaction and characterize it (Galeazzo et al., 2014b). As qualitative studies are often only applicable to a single company, a single sector, a single country or a single function, more empirical studies are required to test transferability and to explain the distinctions between environmental management practices among countries.

Based on the scenario of challenges and opportunities described above, this article intends to analyze the implementation of environmental practices in the Basque Country and quantify the relationships between advanced manufacturing practices and environmental practices in manufacturing companies. In addition, this research contemplates non-conventional manufacturing sectors unusually explored in the sustainability literature (Despeisse et al., 2012). Because the integration of environmental management into operations is context-dependent (Galeazzo et al., 2014b), the specific aim of this paper is to identify and analyze production and environmental practices within manufacturing companies. This study provides empirical data that supports using the potential of environmental practices in simultaneously improving manufacturing productivity and environmental performance. This is done by analyzing data acquired from 58 different manufacturing companies in the Basque Country, a region located in the north of Spain.

This paper is organized as follows. Section 2 presents a review of relevant literature. Section 3 is devoted to describing the proposed research method and results are presented in Section 4. A discussion about correctly measuring environmental efficiency in companies is in Section 5. Section 6 closes out the paper by presenting some concluding remarks and highlighting some opportunities for further research.

2. Literature review

2.1. Environmental management

Traditionally, environmental management has attracted little support from conventional management, which puts emphasis on cost leadership, profitability and resource efficiency without considering the natural environment (Christmann, 2000).

However, a notable transition has been observed over the last decade as many modern consumers tend to be concerned about green products and ways to identify them. At the same time, people seem to expect higher quality from these kinds of products (Prieto-Sandoval et al., 2016). This trend is supported by personal values and the wealth of positive feelings that people have when they choose products with an environmental label (Kang and Lee, 2016).

According to Martínez León and Calvo-Amodio (2017), external environmental pressure on companies stems from laws and regulations, stakeholders, customers and suppliers, the scarcity of fossil fuels, and competition and global reputation. Internal pressure, in contrast, stems from reducing operational costs despite the rising costs of materials, energy use and waste disposal, and the risk of not being held liable or found negligent for accidents or environmental damage, etc. As environmental issues affect all levels of the organization, including the business, functional, and operational levels (Rothenberg et al., 2001), company commitment to environmental protection is emerging as an important strategic issue in the business world (Aguilera-Caracuel et al., 2011).

Consequently, green management has emerged as a philosophy and management approach that reduces the negative ecological impact of an organization's products and services and improves the environmental efficiency of their operations, while still achieving their financial objectives (Duarte and Cruz-Machado, 2013, 2017; Galeazzo et al., 2014a; Garza-Reyes, 2015). This management approach demands the commitment of all members of the corporation, from senior management down to the shop floor (Taylor, 1992).

2.2. Environmental practices

Green management is operationalized through green initiatives or practices (Digalwar et al., 2013) that include: environmental collaboration with suppliers, environmentally friendly purchasing practices, working with designers and suppliers to reduce and eliminate product environmental impact, minimizing waste, sourcing material from environmentally and ethically friendly sources, ISO 14001 certification, reverse logistics, environmental collaboration with customers, eco-design, environmentally friendly packaging, etc. (Raghu-Kumar et al., 2016; Duarte and Cruz-Machado, 2017). Previous studies have indicated that recycling, waste reduction, remanufacturing, environmental design, and market surveillance for environmental issues are the environmental practices that most strongly affect company performance (Montabon et al., 2007).

These environmental practices can be classified into two groups: active (proactive or prevention) and passive (reactive or control) (Rothenberg et al., 2001; Xie et al., 2016). Active practices include all the practices that change the structure of the process and adopt more environmentally friendly resources (Galeazzo et al., 2014a) in order to reduce environmental impact. These practices are often “value added” for the firm since they reduce costs through material use reduction or through the avoidance of waste management costs (Rothenberg et al., 2001). In this active approach, companies introduce environmental objectives into their tactics and strategy (Ormazábal, 2013). In contrast, passive practices entail the entire end-of-pipeline approach that recognizes, captures, and disposes of the emissions caused by the production process, without any structural intervention (Galeazzo et al., 2014a). As there is no structural intervention, those practices could be categorized as operational-level activities. Furthermore, passive practices are often required by external requirements from the market, the government, and repeated media exposure, among others (Rothenberg et al., 2001; Xie et al., 2016).

Recognizing that environmental management practices have

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