



Research article

“There is no carnival without samba”: Revealing barriers hampering biodiversity-based R&D and eco-design in Brazil



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ABSTRACT

Considering the unique relevance of Brazilian biodiversity, this research aims to investigate the main barriers to biodiversity-based R&D and eco-design development in a leading national company which has been commended for its innovation and sustainability. The methodology for this research was based on on-location visits, in-depth interviews, and consensus building among R&D, sustainability, and quality managers. A multi-criteria decision-making (MCDM) approach was adopted through interpretive structural modelling (ISM), a method that assists decision makers to transform complex models with unclear data into structural models. Some of the most influential barriers to biodiversity-based eco-design initiatives are “lack of legal incentive”, “not enough demand from the market”, and “not enough available knowledge/scientific data.” The most relevant barrier was “no legal incentive” from government. Consequently, managers should concentrate their efforts in tackling those barriers that may affect other barriers known as ‘key barriers’. Government should work decisively toward promoting a framework of legal incentives for bio-based eco-design; otherwise, metaphorically, “there is not carnival without the samba singer who pushes the rhythm”. The results given here reveal the barriers for bio-based eco-design in a Brazilian leading company, and this is the first work combining ISM to barriers to biodiversity R&D and eco-design.

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1. Introduction

Eco-design, also known as environmental product design, environmentally-friendly design, or green design, has emerged as an important subject in the development of a more sustainable society. Eco-design is a subject within the emerging field of sustainable entrepreneurship (Shepherd and Patzelt, 2011) and innovation for sustainability (Seebode et al., 2012). Eco-design integrates environmental issues during the process of product development (Luiz et al., 2016; Park and Tahara, 2008) in order to

provide low-impact products (Karlsson and Luttrupp, 2006). The adoption of eco-design principles is a proactive approach to corporate environmental management and, as a consequence, a myriad of authors and managers have encouraged companies to integrate eco-design into their efforts when working towards sustainability (Wijethilake, 2017). Some authors name eco-design as the most relevant approach to bolster corporate greening (Brones and Carvalho, 2015).

The literature has highlighted a range of benefits that can come from the adoption of eco-design, such as improving sales and profit (Plouffe et al., 2011; Fujimoto et al., 2009), improving corporate reputation (Sanyé-Mengual et al., 2014; Vercalsteren, 2001), improving innovative capacity (Hellström, 2007), and improving organizational performance in terms of operational and environmental performance (Jabbour et al., 2015). However, eco-design is not a simple method of corporate greening and its implementation

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will face similar challenges to those that any other environmental management initiative might face (Poulikidou et al., 2014). These challenges, labeled as “barriers for environmental management”, have been studied by scholars and practitioners for some time (Chan, 2011; Kehbila et al., 2009; Studer et al., 2006; Hillary, 2004).

However, after analyzing the current literature on eco-design, it is apparent that most available works have not discussed the effects of the barriers on its implementation. Addressing barriers for implementing eco-design remains as a critical research gap (Paramanathan et al., 2004; Dekoninck et al., 2016). Additionally, the majority of works that discuss barriers to green initiatives have neglected eco-design as a focus of their study (Murillo-Luna et al., 2011; Chan, 2008; Shi et al., 2008; Hillary, 2004; Post and Altma, 1994), and most of them are conceptual (Brones and Carvalho, 2015; Hillary, 2004; Post and Altma, 1994). Moreover, there are research avenues for developing studies about emerging economies (Murillo-Luna et al., 2011) and only a few articles have discussed the reality of eco-design in the context of an emerging economy (Jabbour et al., 2015). Scrutinizing the impact of the barriers on eco-design initiatives is particularly relevant in emerging economies (Mittal and Sangwan, 2014). Emerging markets demonstrate an impressive growth rate of nearly 7%, and this rapid forward development exceeds what is typically found in developed nations. Still, emerging markets face significant challenges as they try to implement modern sustainable strategies, because in some cases even basic definitions remain unclear (Tseng et al., 2016).

To accompany discussions of environmental issues and eco-design, ideally, academia should discuss another important subject: biodiversity. As affirmed by Boiral and Heras-Saizarbitoria (2017), the mainstream of the literature on corporate greening has neglected issues on biodiversity; however, the conservation of natural ecosystems and indigenous biodiversity are core principles of eco-design (Yang et al., 2004). Under the conceptual and practical umbrella of eco-design, barriers for eco-design, biodiversity-based eco-design and the context of emerging economies, searches for articles on ISI Web of Knowledge and Scopus were conducted and it was noted that there is no work integrating all of these issues while providing useful and practical evidence. Thus, we aimed to discover the relationships between the barriers to biodiversity-based eco-design in a leading Brazilian company which has economic activities in the field of bio and natural products.

The efforts undertaken in emerging economies such as Brazil to expand their industry seeking more intense economic growth have side effects, including resource rarefaction and environmental problems (Lopes and Azevedo, 2014). Furthermore, as observed by Pedrollo and Kinupp (2015), although Brazil has some advantages in developing natural products, the country also faces a variety of challenges, such as bureaucratic obstacles and legislative delays by the public administration bodies (Pedrollo and Kinupp, 2015). In Brazil, we can understand the complexity of bio-based eco-design as “organising the carnival party” and this expression is frequently used to refer to very complex processes of everyday life, and is based on full-collaboration of a variety of stakeholders. However, these processes can be worthy. Therefore, a better understanding of the potential barriers to corporate environmental management, in particular in the context of emerging economies, as mentioned before, can be useful during decision making processes and can help decision-makers prioritize the issues that deserve the most attention to work towards a more sustainable society.

This work is organized as follows. After this Introduction (Section 1), a theoretical background defining the main concepts of the research is provided (Section 2). Section 3 presents the research methodology and the procedures adopted to collect and analyze data. Section 4 presents research findings and its discussion. Finally, Section 5 registers final remarks.

2. Literature review

2.1. Eco-design

Due to the fact that there are currently high levels of concern among governments and consumers regarding the development of environmentally sustainable products (Dalhammar, 2016; Jabbour et al., 2015; Sanye-Mengual et al., 2014), there is a growing amount of research that highlights the need for companies to incorporate environmental sustainability in their product project (Dekoninck et al., 2016; Pigosso et al., 2013). Within this scope, recent works (e.g., Brones and Carvalho, 2015; Brones et al., 2014) have advocated for the application of eco-design as a practical way to integrate environmental concerns into product design decisions.

In product designs that are based on eco-design, quality assurance and customer satisfaction should be considered and integrated with the necessary environmental requirements. These factors should be acknowledged in order to implement greener solutions throughout the product’s life cycle (Hur et al., 2005) in terms of extraction of raw materials, manufacturing, packaging, usage, spare parts, maintenance, disposal, reuse, and end of life (Park and Tahara, 2008; Zhu et al., 2010).

Luchs et al. (2012) emphasize that the application of eco-design can help to overcome the traditional trade-off that many companies face between the development of environmentally sustainable products and production costs. In terms of practicality, Byggeth and Hochschorner (2006), Luttrupp and Lagerstedt (2006), Pigosso et al. (2010), Finksel (2012), and Bovea and Pérez-Beliz (2012) propose to apply different eco-design methods, such as environmental-quality function deployment (EQFD), environmental failure mode effects analysis (E-FMEA), and a checklist of eco-design, among others, in order to facilitate the choice of production processes, materials to be used, and other environmentally sound features that would subsequently support firms in their eco-design approaches.

Many positive effects result from the application of eco-design principles, including an increase in sales volume and profitability (Fujimoto et al., 2009; Plouffe et al., 2011), an improvement in image within the market, an improvement of the quality and technological capacities of products and processes, and a greater alignment to various legal requirements (Sanye-Mengual et al., 2014; Vercauteren, 2001). Poulikidou et al. (2014) noted that real and practical implementations of eco-design are still not very widespread among companies. The lack of current research emphasizes the importance of expanding research considerations within the area of eco-design in order to identify problems and alternatives for researchers and practitioners involved. Identifying barriers to eco-design is an essential part of this process.

2.2. Barriers to eco-design

As any other initiative of environmental improvement in companies, eco-design tends to face several barriers to its implementation. Barriers to environmental management within companies have been studied by several authors over the years (Chan, 2011; van Hemel and Cramer, 2002; Kehbila et al., 2009; Studer et al., 2006). Studying barriers to environmental management is particularly important in the context of emerging economies (Mittal and Sangwan, 2014), because the majority of knowledge on this subject often represents the reality of more developed countries. A better understanding of the potential barriers to corporate environmental management can be useful during decision making processes and decisions regarding the prioritization of issues that deserve attention from managers and policy makers towards a more sustainable society. In this work, we use the barriers to corporate environmental management as a foundation

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