Journal of Engineering and Technology Management xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Engineering and Technology Management

journal homepage: www.elsevier.com/locate/jengtecman

Eco-innovation determinants in manufacturing SMEs from emerging markets: Systematic literature review and challenges

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ARTICLE INFO

Keywords:
Innovation
Eco-innovation
Sustainable innovation
Small and medium enterprise
SME
Determinants
Emerging markets
Literature review

ABSTRACT

The debate on eco-innovation is a recent and emergent topic between practitioners and in the academy. Especially in developing economies, such as in Brazil, this topic is very incipient mainly in Small and Medium-Sized Enterprises (SMEs) context. Hence, the purpose of this study is to identify what are the determinant factors for the successful adoption of eco-innovation in Brazilian SMEs. The findings reveal several similarities/differences and intersections/overlaps resulting in a list of sixteen primary determinants. Results also demonstrated that eco-innovations in SMEs may be enabled by breaking away from the immediatist culture, by the participation of SMEs in cooperation networks, by considering the regulations affecting the sector where the SME operates and the applicable legislation, by investing in R&D of innovative technologies in conjunction with external agents, by qualified professionals planning for and implementing eco-innovation and by reinforcing the financial condition of the SMEs. The practical contribution of this study is a consolidated comprehensive framework of eco-innovation to Brazilian SMEs providing important insights and challenges to academics, policy makers, and practitioners, improving the diffusion of eco-innovative practices. Furthermore, others emerging economies will benefit from the findings of our research.

1. Introduction

Currently, sustainable development and technological innovation are recurring themes in society, academic and business environments. The first studies of innovation date back to the propositions to categorize the concept of innovation made by Schumpeter (1911) in his book "The Theory of Economic Development" published in Austria. Blackburn (2007, 2008) claims that a definition of environmental sustainability is not yet fully clear in business circles. Additionally, Blackburn (2007) and Carrilo-Hermosilla et al. (2009) discuss some aspects related to the history of sustainability, and refer to the 1972 United Nations Conference on Human Development in Stockholm as the time when the term sustainability first surfaced, a fact that Mendonça et al. (2012) corroborate. Regarding the discussion about integrating innovation and sustainability domains, the first studies published in the literature

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https://doi.org/10.1016/j.jengtecman.2018.04.002
Received 17 April 2017; Received in revised form 26 February 2018; Accepted 4 April 2018

according to Maçaneiro and Cunha (2012), were carried out by Fussler and James (1996), James (1997) and Rennings (2000). Fussler and James (1996) are credited with having coined the term "eco-innovation" in a book titled "Driving Eco-Innovation: A Breakthrough Discipline for Innovation and Sustainability".

If on the one hand, the theme of innovation has been strictly connected with economic concerns, such as competitiveness, demand and investment, on the other hand, the environmental area has been hard put to incorporate the technological innovation processes. Compared with publications on classical innovation, there are currently only a few studies about the management of technological eco-innovation and its processes (Ozaki et al., 2013; Klewitz and Hansen, 2014). The management of technological eco-innovation and its processes have been widely discussed in the context of large companies, and mainly in industrial and technological sectors. However, the discussion about the impacts in Small and Medium-Sized Enterprises (SMEs) is still very incipient and inconclusive.

Moreover, in the field of environmental sustainability, there are limited researches about the integration and comprehension of these two themes specific to SMEs context (Klewitz and Hansen, 2014; Sabadie, 2014; Borghesi et al., 2015). Nevertheless, the debate of innovation in SMEs is generally focused on other topics, such as open innovation (Brunswicker and Vanhaverbeke, 2015; Wynarczyk et al., 2013), product innovation (Massis et al., 2015; Maes and Sels, 2014), SMEs networks (Gronum et al., 2012), innovation process (Love and Roper, 2015), internationalization (Raymond and St-Pierre, 2013) and others.

Therefore, considering integration of innovation and sustainability a relatively recent topic in the body of knowledge available in the literature, it is possible to conclude that even more immature is the discussion about eco-innovation, particularly in the SMEs context (Klewitz and Hansen, 2014; Rashid et al., 2015; Del Río et al., 2016) and mainly in emerging markets or low-income economies such as Brazil. Recent studies also corroborated this assumption (Govindan et al., 2016).

Hence, more research that aims to advance the diffusion of eco-innovations in SMEs is necessary (Klewitz and Hansen, 2014). To achieve this goal, a systematic review of the literature on eco-innovation of SMEs is required and relevant for several reasons (Klewitz and Hansen, 2014). First, SMEs are considered a type of enterprise recognized internationally to the economy of nations. According to OECD (2010, p. 3): "SMEs account for approximately 99% of all enterprises and two thirds of employment across the OECD area, their transition to sustainable practices, in both manufacturing and services, is key to the large scale uptake of a green growth model". Second, SMEs as a group contribute to a significant share of overall pollution (UNEP, 2003). Third, SMEs are not simply smaller versions of their larger counterparts (UNEP, 2003). Fourth, SMEs' peculiarities imply that they will innovate differently for sustainability (UNEP, 2003). Fifth, the literature highlighting SMEs' disadvantages (e.g. resources constraints, lack of formalized planning), which may prevent them from engaging proactively in the innovation process, shows reactive behavior toward environmental and social issues (Borghesi et al., 2015; Klewitz and Hansen, 2014).

Based on the body of knowledge available of literature, while debate and research on eco-innovation are more frequent in the international context, in Brazil this topic is still very incipient. Consequently, just a few scarce studies have been developed in recent years. In fact, concerning Brazilian SMEs, the discussion on the adoption of eco-innovation practices still remains in a more immature stage. Findings from the Global Forum on Environment on Eco-Innovation of OECD (2009a,b) reveal that apart from recent initiatives on climate change issues, eco-innovation itself is not a goal in official innovation and technology policies in the Brazilian context. Regarding environmental issues, the Brazilian National Policy on Industry, Technology and Trade explicitly emphasizes biotechnology research in the Amazon region, norms for certified forestry, development of biodiesel and innovation in environmentally sound technologies.

Results also indicate that R&D consequences on environmental performance have decreased, in past years, in the Brazilian context (Motta, 2009). A recent study analyzing the Brazilian context reveals it is necessary to seek new management designs that focus on eco-innovation, to adopt eco-efficient processes and to develop eco-efficient products, as well as to encourage sustainable consumption (Brasil et al., 2016). Consequently, the relevance of our study relies on widening the comprehension of eco-innovation determinants in Brazilian SMEs, seeking to provide a more comprehensive understanding specifically for the small companies' reality. Therefore, factors involving the adoption of eco-innovation need to be better understood in the background of Brazilian economy, aiming to increase the national and international competitivity of Brazilian small industries.

A suitable strategy to better understand this phenomenon and landscape is to analyse which are the determinants for eco-innovation in Brazilian SMEs and whether or not they are similar to empirical results available from the literature. In this sense, this study adopts the following definition for eco-innovation: "the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and to provide a better quality of life for everyone with a life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances" (Reid and Miedzinski, 2008 p.2).

In short, based on the gaps in the literature previously discussed, the research question that drives this study is: what are the determining factors to implementing eco-innovation practices in Brazilian SMEs? The methodological procedure adopted started with a systematic literature review on eco-innovation in the main scientific databases to identify and analyse these determinants. Next, a semi-structured questionnaire was applied to Brazilian experts with the goal of identifying the determinants to eco-innovation in Brazilian SMEs. Lastly, the results of the literature review were compared against the answers of Brazilian experts aiming to identify similarities/differences and intersections/overlaps. The main scientific value of this study is to contribute to future research on the implementation of eco-innovation practices in SMEs located in emerging economies such as Brazil as well as in other nations. The originality of our study may also contribute to providing a common identity for the scientific and industrial community interested in the eco-innovation field. In our opinion, these research lines will contribute to a better understanding and clearness of the scope of eco-innovation in emerging economies.

The remainder of the paper is organized as follow. After presenting the research problem and justification in the Introduction, section two shows the theoretical framework of eco-innovation definitions and the eco-innovation determinants extracted from the