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Success factors for environmentally sustainable product innovation: a systematic literature review

Janine Fleith de Medeiros, Jose Luis Duarte Ribeiro, Marcelo Nogueira Cortimiglia*

Universidade Federal do Rio Grande do Sul, Industrial Engineering, Av. Osvaldo Aranha, 99, 5° Andar, 90035-190 Porto Alegre, Brazil

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ABSTRACT

The growing awareness regarding environmental sustainability has fully reached business reality. Consumers and companies alike are looking for alternatives to mitigate pressing environmental demands resulting from continuous population and economic growth. On the other hand, companies must deal with an increasingly competitive scenario where innovation is regarded as a survival need in most markets. It is thus clear that systematic academic research is paramount to guide companies to succeed in environmentally sustainable product innovation. In this context, this paper (i) consolidate extant research and aggregate findings of different studies on environmentally sustainable product innovation through an interpretative framework of published literature on the topic, and (ii) map critical success factors that drive the success of product innovation developed in this new logic of production and consumption. To achieve these objectives, a systematic literature review on environmentally sustainable product innovation was conducted. Results show that there are four main critical success factors for environmentally sustainable product innovation: market, law and regulation knowledge; interfunctional collaboration; innovation-oriented learning; and R&D investments. The factors identified in this research and corresponding variables were subjected to a brief empirical test by professionals. The test allowed a preliminary approval of the developed framework and identification of the most important variables within each factor. A research agenda based on the state-of-the-art on the topic is also proposed.

1. Introduction

Innovation means change or novelty (Tidd et al., 2001). At the beginning of the 20th century, Schumpeter (1939) stated that economy expansion is directly dependent on innovation. According to him, innovation can take the form of new products, new production processes or methods, new markets or even new sources of supply. Since then, the concept of innovation has been extensively discussed and improved upon (see, for instance, the recent interest in the concept of business models documented by Boons et al., 2013; Schneider and Spieth, 2013), but the core aspect of novelty as determinant of change and economic progress has been preserved.

Given the increasingly competitive context of the contemporary economy, as well as equivalence in terms of offering in many market segments, it is argued that innovation can support differentiation and generate sustainable competitive advantage for organizations. However, other than developing strategically and economically viable novelty, innovation nowadays is understood as a latent need that has to be undertaken in a way that social and environmental issues are also contemplated. This particular aspect validates the sustainability triple bottom line approach, concept introduced by Elkington (1997) according to which an organization's results must be measured against the interrelated environmental, economic and social dimensions.

Thus, the quest for environmentally sustainable performance levels is relevant not only to environmentalists and ecologists, but also to social, political, economic and managerial scientists and practitioners. In this context, government, society and market are driving forces towards the increase in both consumers' and companies' ecological awareness (Roberts, 2003; Matos and Hall, 2007; Gold et al., 2010). This is why organizational management must acknowledge not only prescriptive models and deliberate strategies, but also descriptive models and emergent strategies that contemplate organizational growth through low environmental impact practices (Sharfman et al., 2009). Considering that several companies face growth limits because of environmental issues, the practice of sustainable innovation deserves even greater importance (Zsidisin and Siferd, 2001; Handfield et al., 2005; Zhu et al.,

* Corresponding author. Tel.: +55 51 3308 4005.
E-mail addresses: janine@producao.ufrgs.br (J.F. de Medeiros), ribeiro@producao.ufrgs.br (J.L.D. Ribeiro), cortimiglia@producao.ufrgs.br (M.N. Cortimiglia).

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Table 1
Papers in each search and journal.

Journals	Search 1	Search 2	Search 3	Search 4	Selected papers
Business Process Management	0	0	0	5	1
Design Studies	2	5	22	4	0
Ecological Economics	41	41	14	339	10
Ecological Modelling	4	0	0	58	0
Environmental Management (NY)	8	8	1	56	0
Environmental Modelling & Assessment	0	0	1	9	0
Environmental Quality Management	18	25	7	35	0
Environmental Research	0	0	0	7	0
Environmental Science and Technology	77	18	7	132	0
Environmental Science & Policy	4	6	1	87	0
European Business Review	1	5	1	12	0
European Journal of Innovation Management	1	5	1	31	2
European Management Journal	10	12	3	9	0
Harvard Business Review	2	5	0	12	1
Industrial Marketing Management	9	11	5	11	1
International Journal of Operations & Production Management	6	11	4	19	4
International Journal of Production Economics	4	29	24	37	4
International Journal of Production Research	1	25	18	14	2
Journal of Business Ethics	20	55	4	111	11
Journal of Business Research	11	19	0	17	1
Journal of Cleaner Production	161	129	212	378	20
Journal of Environmental Management	21	17	18	162	2
Journal of Economic Behavior & Organization	0	2	0	6	0
Journal of International Business Studies	0	0	0	0	0
Journal of Product Innovation Management	0	2	0	0	0
Journal of the Academy of Marketing Science	0	0	0	14	1
Management of Environmental Quality	0	8	6	0	0
Management Science	1	2	0	1	1
Research Policy	8	14	3	23	2
Science of the Total Environment	7	9	7	55	0
Technological Forecasting & Social Change	9	11	3	72	1
Technovation	7	14	4	12	3
Total	433	488	366	1726	67

2008; Sharfman et al., 2009). To face this pressing issue, dissemination of technological and organizational innovation oriented towards improving life quality and considering both current and future environmental needs is required.

Thus, although consumption increase can be considered an environmental risk, when analyzed through an ecoefficiency paradigm that contemplates the reduction of natural resource use, it can generate opportunities for sustainable innovation diffusion (Freeman, 2003; Berchicci and Bodewes, 2005).

In this sense, there are already important academic research contributions regarding development of green innovation products (Geffen and Rothenberg, 2000; Zhu et al., 2005; Zhu and Sarkis, 2007; Verghese and Lewis, 2007; Ras and Vermeulen, 2009) and proposal of reference models capable of identifying and aggregating competences for sustainable innovation (Bowen et al., 2001; Berchicci and Bodewes, 2005; Handfield et al., 2005; Vachon and Klassen, 2008). However, there is still ample room for research in this area.

Among the existing gaps, the lack of a validated set of success factors driving market performance of environmentally sustainable products stands out (Green et al., 1996; Christmann, 2000; Darnall and Edwards, 2006). It can be argued that methods to measure market performance of traditional products may be not enough to capture the success dynamics for products developed within an environmentally sustainable approach, that is, green products (also known as eco-friendly or environmentally sustainable products). Green products are those that hold the potential to aggregate long-term benefits, reduce consumer stress and ameliorate customer environmental responsibility while maintaining its positive qualities (Maxwell and van der Vorst, 2003; Cambra-Fierro et al., 2008; Triebswetter and Wackerbauer, 2008). In this context, the objective of this paper are: (i) to consolidate extant research on environmentally sustainable product innovation through an interpretative framework of published literature on the topic, and (ii) to map critical dimensions of success factors that drive the success of products developed in this new logic of production and consumption. These objectives are achieved through a systematic literature review.

This paper is structured as follows. First, methodological procedures employed in the systematic literature review are discussed in Section 2. Results of the systematic literature review on critical success factors for environmentally sustainable product innovation follow in Section 3, where an interpretative framework mapping the main domains of research in environmentally sustainable product innovation success factors is proposed. Finally, a consolidated list of critical success factors for green product innovation is proposed in Section 4 and conclusions are presented in Section 5.

2. Method

To identify critical success factors for environmentally sustainable product innovation and consolidate published research on the topic, a systematic literature review was conducted. Systematic reviews are characterized by a planned and structured approach to reviewing published academic research by using organized and replicable methods to identify, select, and critically assess literature searches (Tranfield et al., 2003; Jones, 2004). As the method allows for relatively high procedural and analytical objectivity and replicability, systematic reviews are increasingly being employed in management literature (Hallinger, 2013).

The methodology followed for the literature review included two main phases: selection and analysis. The selection phases comprised gathering a comprehensive set of publications in the desired areas, while the analysis phases consisted of a careful and