

## Chapter 90

# Technological Forecasting of Sustainable Products: Analysis of Eco-Innovations

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### ABSTRACT

*The purpose of the work described in this chapter is to analyze the eco-innovations about hybrid cars. The data collection method consisted of a technological forecast. The research was carried out on the patent base Derwent Innovations Index from Web of Science. The United States is the leader in the ranking of hybrid car patents. However, countries such as Japan, China and Germany demonstrated a considerable increase. This study contributes toward other studies that focus on the acceleration of decisions in applications for inventive patents and aims to identify new technologies which can be quickly used by the productive sector and universities stimulating the licensing and encouraging the innovation in many countries.*

### INTRODUCTION

If on the one hand, the theme of innovation has remained strictly connected with the concern of economic order such as competitiveness, demand pressures and investment, on the other hand, the environment area has found difficulties in incorporating the technology processes. There are many studies in the innovation management area and their processes as well as in the environmental sustainability area. However, there is little research and few actions that deal with the interface between these two areas which result in theoretical and methodological uncertainties (Andrade, 2004; Andersen, 2006, 2008; Baumgarten,

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2008; Kim and Park, 2008; Arundel and Kemp, 2009; Sánchez et al, 2011; Srivastava, 2011; Rodríguez and Gómez, 2011; Crane and Meyer, 2011; Torrecillas and Brandão, 2011; Sen and Ghandforoush, 2011; Sanchez and Bisang, 2011; Silva et al., 2012a; Silva et al., 2012b). The absence of studies in the green technology area indicated by researchers was also found during this study, especially in relation to the international publications.

The green technologies assumed a very important position in the development of global sustainability. In agreement with several countries about the importance of developing these technologies to avoid global climate change, other governments began to see the relevance of patents to stimulate green technologies in their countries. In 2009, the national patent offices in Japan, Israel, South Korea, the United States, Australia and Canada created pilot-programs to accelerate the examinations of patents directed to green technologies, initially concentrated on some specific areas with the purpose to decrease the time of patent examinations in two years.

Only the areas that reduced the climate change impact and emitted less or removed the CO<sub>2</sub> out of the atmosphere are part of these programs. Also following these principles, the inventions should be related to waste management, alternative energy, agriculture, or energy conservation.

The purpose of this work was to analyze the global scenario of the hybrid cars, indicating the strategies created by some countries searching for an increase in those technologies as the promotion for eco-innovation mechanism.

The method used for data collection consisted of a technological forecasting about green technologies. The research was carried out on the patent base Derwent Innovations Index from Web of Science. The mining data was treated using the Vantage Point.

The choice of using the base of patent Derwent Innovations Index was done because it is a powerful patent research tool, combining with Derwent World Patents Index®, Patents Citation Index™ and Chemistry Resource, a database of chemical structures that can be used to locate patents which contain chemical information. Furthermore, the Derwent Innovations Index is weekly updated and it contains over 16 million practical inventions from 1963 to the present day. Patent information was collected with 41 patent issuing authorities worldwide. Then information was classified into three categories or sections; Chemical, Engineering and Electrical/ Electronic.

The research consisted of a forecast about an example of green technology related to alternative energy, in which hybrid cars were analyzed. The analyzed period of patent generation for hybrid cars was from 1980 to 2011.

## **Eco-Innovation**

The literature of innovation focused on eco-innovations has shown that increasing investments in eco-innovation are influenced by the ability of firms (Kemp et al., 1992). In particular, companies that build their practices of organizational capabilities such as the reduction of resources, recycling, pollution prevention, and green product design tend to invest more in eco-innovation (Georg et al, 1992; Winn and Roome, 1993; Hsieh et al., 2012). Additionally, Florida et al. (2001) show that two types of organizational factors, that is, organizational resources and performance and monitoring systems, play an important role in the adoption of eco-innovations.

Eco-innovations are the combination of processes, new or modified systems, practices and products that benefit the environment, whose positive environmental impact is the central element. In order to evaluate environmental innovations, greenhouse gas emissions, energy use, water pollution, noise,

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