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Model for Assessment of Environmental Responsibility in Health Care Organizations

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INTRODUCTION

Sustainability is considered a paradigm for businesses in the 21st Century (Garcia et al., 2016). Despite this, the existing tools for helping to introduce strategies and manage activities to promote sustainable business are few (Garcia et al., 2016). These deficiencies become more important in Health Care Organizations owing to its particular conditions of resource consumption and waste production. Health Care Organizations are the only type of company which can generate all the classes of waste, from waste without risk to waste that is potentially infectious, carcinogenic, mutagenic, teratogenic or radioactive. The risk to people and to the environment from this waste is much greater if it is not correctly segregated. It is also vital to carry out action to reduce the consumption of limited natural resources such as water and energy, while increasing the protection and conservation of the environment, including reducing the emission of pollutant gases, protecting biodiversity or considering the role of suppliers in action to prevent or reduce waste.

It is, therefore, essential to have objective tools to assist in monitoring environmental sustainability in this type of organization, taking into account a number of factors. That is, by assessing how improvement actions, within a process of continuous improvement, are contributing to improvements in sustainability. However, it is clear that there is little linkage between sustainability reporting and management control systems (Cintra & Carter, 2012).

Nonetheless, despite its importance, the literature on the development of systems for environmental assessment in Health Care Organizations is very limited.

This Chapter therefore sets out a multicriteria assessment system constructed by extension to a fuzzy environment of the Technique for Order Preference by Similarity to Ideal Situation (TOPSIS), to assess the environmental responsibility of a Health Care Organization. This model allows joint evaluation of a significant number of decision criteria, which include any event that may cause adverse effects on water, ground, seas and rivers, wild species or their habitats; it also considers the existence of possible measures to be carried out in Health Care Organizations to minimize the probability of an event, or to eliminate all risk. However, it should be noted that this model is not intended to perform an environmental audit in the field of health care, as it would need to include economic, technical, legal and other criteria, or a system of environmental impact that would require the assessment of a variety of risks and consequences. The aim is to provide a hospital with a model which is easy to apply, with criteria specific to health care, and which allows its responsibility with regard to the environment to be monitored over time. Following the methodology laid down in Carnero (2015), criteria were used that were assessed depending on the number of admissions or annual services provided, making it possible to compare results over time for a single organization, or between organizations. The model has been used in a Public Hospital.

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BACKGROUND

The literature includes a large number of contributions on environmental questions (Aragones-Beltran et al., 2009; Higgs et al., 2008; Hsu & Hu, 2008; Kang et al., 2007; Lamelas et al., 2008; Liang et al. 2006; Madu, Kuei & Madu, 2002; Pilavachi, Chatzipanagi, & Spyropoulou, 2009; Tzeng & Lin, 2005; Tseng, Lin, & Chiu, 2009; Van Calker et al., 2006). However, these are invariably related to manufacturing, transport or energy companies. In the case of service companies and, in particular, in Health Care Organizations, the contributions are practically non-existent (Carnero, 2015).

Health Care Organizations, places dedicated to the improvement and development of preventive measures in health care, with respect to their users, those who live in the area and their workers, should be involved in minimizing their own environmental impact, as there is a strong correlation between the two (Comunidad de Madrid, 2005). In order to improve environmental sustainability of a Health Care Organization, however, it is vital to monitor sustainability over time for decision making and management of activities that constitute an organization's system processes (Salvado et al., 2015).

A system of environmental assessment should combine many factors, which may be technical, social, political, economic and environmental, which often conflict with one another (Lahdelma et al., 2000); it may also be necessary to include a number of individuals or decision groups, with different perspectives or responsibilities within the Health Care Organization; as well as the need to incorporate a great deal of information, quantitative but in many cases qualitative, relating to uncertainties, scenarios, goals, etc. (Munda, 2005). These characteristics make the use of Multi-Criteria Decision Analysis (MCDA) methods highly suitable for supporting decisions about sustainability (Santoyo-Castelazo & Azapagic, 2014). The fact that the model produced, based on mathematical techniques, is objective, also helps to guarantee public acceptance of the solution or result obtained (Huang, Keisler, & Linkov, 2011). MCDA methods then, although not suited to all environmental problems, are very convenient in environmental impact assessment, as they give information in a structured fashion, which can be easily interpreted by the decision makers (Neste & Karjalainen, 2013). All this has led to an increase in the literature applying MCDA in the environmental field over the last two decades (Carnero, 2014).

Because of the pressure brought to bear on companies by different stakeholders and by society to address ecological and social sustainability (Garcia et al., 2016) a variety of research has been carried out applying MCDA methods in this area. Gumus (2009) presents a methodology for selection of the most suitable hazardous waste transportation firms using a fuzzy Analytical Hierarchy Process (AHP). A similar technique is used by Heo et al. (2010) to get the weightings of the criteria to establish ex-ante and ex-post stages of renewable energy dissemination programmes in Korea. Reza et al. (2011) combine morphological analysis and AHP to choose new sustainable products from the earliest stages of conception. The study of Chan et al. (2012) is along similar lines, but using fuzzy AHP. Boran et al. (2012) use intuitionistic fuzzy TOPSIS to assess renewable energy technologies for electricity generation, such as photovoltaic, hydro, wind, and geothermal energy in Turkey. Wang et al. (2012) produce a model for selecting of green initiatives in the fashion industry. Vinodh et al. (2014) describe an assessment model to determine the best method for recycling plastics. Pourebrahim et al. (2014) made a selection of criteria and alternatives for conservation development in a coastal zone. Galvez et al. (2015) propose a model combining Mixed Integer Linear Programming optimization and AHP to assess possible scenarios for the implementation of an anaerobic co-digestion logistics network used to create sustainable energy production processes from biogas. Al Garni et al. (2016) use AHP to assess renewable power generation sources including solar photovoltaic,

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