



Environmental management systems in small and medium-sized enterprises: an analysis and systematic review



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ARTICLE INFO

Article history:

Received 7 May 2013

Received in revised form

5 March 2014

Accepted 10 March 2014

Available online 22 March 2014

Keywords:

Small and medium enterprises

SMEs

Environmental management systems

EMS

Bibliometric analysis

Systematic review

ABSTRACT

This article seeks to answer the following question: based on the scientific publications on this topic, what aspects of environmental management systems are small and medium enterprises incorporating into their production processes? A bibliometric analysis and systematic review was performed to formulate a response. The study yielded a portfolio of 27 articles directly related to the research available online in the Web of Knowledge and Scopus databases. The bibliometric analysis identified the most relevant articles, authors, keywords and journals published without time slicing on studies between 1999 and 2013, while the systematic review allowed for the compilation of definitions, authors, research types, results and research opportunities. The primary aspects of the environmental management systems incorporated by small and medium enterprises were (1) certification, (2) fault analysis and improvement implementation, (3) environmental responsibility and (4) impact mitigation. Most of the articles in the portfolio database were associated with the study of environmental management systems implementation in small and medium enterprises with an emphasis on results, such as: (1) lack of knowledge on environmental impacts, (2) the need for training, policy, consulting, business cooperation and the integration of systems, (3) high costs at the beginning of implementation and (4) moral gains and cost reduction paired with sustainability in the medium term. Image improvement and the acquisition of new customers were also factors cited in the studies, highlighting the possibility of acquiring competitive advantages through environmental management systems.

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1. Introduction

Market requests and increasingly conscientious consumers have demanded that companies exhibit greater concern for environmental issues, regardless of their size (Campos, 2012). Among the specific actions available for managing environmental impacts is the implementation and certification of environmental management systems (EMS).

However, small and medium enterprises (SMEs), in particular, are often unaware of their impact on the environment and lack the knowledge and expertise needed to implement and manage EMS (Ortiz et al., 2013). These companies have exerted significant pressure on the environment, either individually or through a

combination of sectors. For example, the SMEs in Europe have been responsible for approximately 64% of the region's industrial contamination (DG Enterprise, 2010). This context has heightened the need to implement systems for monitoring and promoting improvements in the environmental management performed by SMEs.

Thus, the focus on EMS in SMEs has grown due to the challenge of improving their production processes to consider environmental aspects. The SME's heterogeneity and lack of strategic action has made it difficult to generalize about its practices (Hillary, 2004). However, adopting EMS has been stimulated through recognition of its importance in developing a sustainable economy (Campos, 2012).

Several studies about the implementation of environmental management in SMEs have been performed around the world in recent years (Hillary, 2004; Seiffert, 2008; Gunnarsson et al., 2010; Zorpas, 2010; Atanase and Visan, 2011; Roxas and Coetzer, 2012; Campos, 2012). Other studies of SMEs, such as Labodová (2004),

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Clancy (2001), Coşkun and Karaca (2008), Rao et al. (2009), Codreanu et al. (2009) and Shi et al. (2010), have focused on researching aspects related to risks, barriers to innovation, cost, technical and technological innovations and environmental indicators, respectively. Some studies have highlighted the importance of EMS as a potential tool for implementing environmental management at SMEs (Ammenberg et al., 1999; Hillary, 2004; Ardente et al., 2006; Burke and Gaughran, 2006; Labodová, 2004; Zobel, 2007; Nawrocka, 2008; Seiffert, 2008; Zorpas, 2010; Campos, 2012).

Given this context, the research problem guiding this study emerged: what aspects of environmental management systems (EMS) are small and medium enterprises incorporating in their production processes according to the scientific publications on this topic? Turning the main objective of this study. The following aspects of environmental management systems (EMS) were considered in this paper: (1) corporate environmental policy and planning sets, (2) resource availability, (3) environmental management training, (4) planning, documentation, measurement, monitoring, and evaluation of implementation goals for environmental responsibility, (5) certification and compliance with ISO standards, (6) failure analysis, course corrections and improvements to environmental policy, and (7) minimizing environmental impact and improving environmental performance.

The article is presented in five sections, with the first being this introduction. The second part presents the methodology used in the study, while the third section presents the theoretical issues associated with the use of environmental management systems in SMEs. The fourth section exhibits the results and the discussion, highlighting what aspects of EMS are small and medium enterprises incorporating into their production processes. Finally, the fifth section presents the conclusions and a number of recommendations.

2. Methodological procedure

This section presents the classification of research and the methodological procedures used in the construction and analysis of the bibliographic portfolio on EMS in SMEs. These methodological procedures have been developed to identify references with high relevance in academic databases accessed via websites, using bibliometric analysis to select the articles for further systematic analysis of the subject content. Campbell et al. (2010) have claimed that bibliometric analysis is a tool supported by a scientifically recognized theoretical basis that enables the use of statistical and mathematical methods to map information from bibliographic records of documents stored in databases. This technique helps the researcher to understand the behavior of a particular knowledge area through the measurement, mapping, interpretation, assessment and collection of indicators on the scientific results (Tasca et al., 2010). Within this process, systematic analysis allows researchers to identify the year of publication, title, authors, objectives, constructs and concepts, methodology, results and future recommendations in articles selected from the database.

2.1. Research classification

The research on this topic is of a theoretical nature. That concerned with technical procedures has been categorized as a bibliographical study because it analyzes already-published studies on the subject (Creswell, 2009). The objectives are exploratory and descriptive, seeking specific information on what is being studied. In accordance with Tasca et al. (2010), this type of study has been classified as a mixed method because it combines quantitative (the bibliometric study) and qualitative methods (the systematic

analysis of articles, which also includes the analysis of content) (Bardin, 2011).

2.2. Research procedures

The method used to perform bibliographic research was comprised of three different stages: data collection, data analysis and synthesis of the results.

These three stages led to the following procedures.

- a) Criteria for choices and database fields: Web of Knowledge and Scopus were chosen as databases for this study.
 - **Web of Knowledge** was chosen for consultation due to its status as a multidisciplinary index with the most cited journals in their respective areas. The database has more than 9000 indexed journals. It was also chosen for its broad scope, and it is the only database to allow full integration with the software used in this research.
 - **Scopus** is a database of abstracts and citations of scientific literature and information sources on the Internet at the academic level. Scopus contains over 15,000 indexed journals, nearly 265 million websites, 18 million patents, and other documents.
- b) Criteria for inclusion or exclusion:
 - The selected articles contained a title, abstract, or the presence of keywords referring to terms concerning EMS and SMEs within the body of the text.
 - The articles were available with full text access through CAPES (Coordination of Improvement of Higher Education), Google[®], Google Scholar[®], Microsoft Academic Search[®] or sent by email to the authors.
- c) Terms used in the research:

The strategic search was based on the following query: (“environ*manage*syste*” OR ems) AND (“small and medium enterp*” OR “small and medium business*” OR “small and micro enterp*” OR sme OR smb OR “Small companie*”). This same query was used in the databases, resulting in the bibliographic portfolio.

- d) Software: EndNote X6 software was used to manage and treat the collected references. This tool is a reference manager produced by Thomson Scientific that can be integrated with the databases consulted. EndNote X6 facilitates research and scientific writing by gathering references from online databases, importing metadata and grouping them in various ways.
- e) Criteria for the selection of articles for bibliometric analysis: In addition to noting the title, abstract, and location of keywords in the body of the text, articles were selected by identifying whether they included terms concerning EMS at SMEs. It was found that the prior reading of articles allowed greater for reliability in analysis. Thus, it was possible to find cohesion with the theme or assess the article's potential contribution and level of connection with the main goal of the bibliometric research. Articles available in their entirety were also the subjects of bibliometric research. The following fields of expertise were defined to meet the criteria of the systematic analysis: year, author, title, key EMS settings, article type (theoretical/empirical, qualitative/quantitative), main results and recommendations for future research. It was also necessary to account for analytical ability and subjective researcher interpretation (Maanen, 1979; Denzin and Lincoln, 2006; Bardin, 2011).
- f) Criteria for the systematic analysis: the following criteria for the systematic analysis were defined according to the model

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