

Environmental impact evaluation using a cooperative model for implementing EMS (ISO 14001) in small and medium-sized enterprises

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Abstract

Certification of an ISO 14001 Environmental Management System (EMS) is currently an important requirement for those enterprises wishing to sell their products in the context of a global market. The system's structure is based on environmental impact evaluation (EIE). However, if an erroneous or inadequate methodology is applied, the entire process may be jeopardized. Many methodologies have been developed for making of EIEs, some of them are fairly complex and unsuitable for EMS implementation in an organizational context, principally when small and medium size enterprises (SMEs) are involved.

The proposed methodology for EIE is part of a model for implementing EMS. The methodological approach used was a qualitative exploratory research method based upon sources of evidence such as document analyses, semi-structured interviews and participant observations.

By adopting a cooperative implementation model based on the theory of system engineering, difficulties relating to implementation of the sub-system were overcome thus encouraging SMEs to implement EMS.

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1. Introduction

Environmental legislation and rules as well as the regulations that apply to the most diverse productive sectors have been encouraging organizations to implement an Environmental Management Systems (EMS – ISO 14001). These norms are being constantly improved, especially when the multidisciplinary nature of relationships between man and the environment are taken into account. These systems essentially aim at reconciling economic with environmental issue [21]. An EMS is a systematic process known in corporations, with the purpose of prescribing and implementing environmental goals, policies, and responsibilities, as well as regular auditing of its elements [12,33]. Despite being a voluntary standard, its adoption, over the medium and long term, may lead enterprises to

improve the control of their processes, products and services, while also helping to save costs and enhance profits [14,34].

This is particularly important when we consider that the implementation of an EMS may affect enterprise capability to sell products globally [32]. The importance of the role of SMEs in the business context must be considered in relation to a country's balance of trade. For enterprises with this profile it may be difficult to implement an EMS; these difficulties are particularly associated with budgetary and/or human resource limitations. According to Miles et al. [25] SMEs, in general, control less management capital and fewer labor resources and typically enjoy substantially fewer “slack” or discretionary resources that may be relocated to environmental management.

The SMEs are responsible for a significant share of the total environmental burden [16]; although no generally accepted figures on the actual environmental burden are currently available. Reducing this burden requires environmental improvement at the micro level, a goal which has been stubbornly

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elusive in many parts of the world. While little is known about the actual total impact of SMEs, even less is known about the burdens of individual SMEs [15]. The environmental impact of SMEs is not known at national or regional levels. It is often quoted that, as a sector, SMEs could contribute up to 70% of all industrial pollution [20]. Environmental certification can provide the following types of benefits for SMEs: enhanced reputation, better access to the market, lower insurance costs and lower costs due to a more efficient process may compensate SMEs for the ISO 14001 registration [25].

The limited availability of financial and human resources further highlights the need for a well conducted implementation of an EMS. Various indicators point to the fact that a dominant aspect of the implementation and up-keep of an EMS is associated with the planning stage, especially of the sub-system (requisite) of environmental aspects and impacts, mostly due to the complexity of the adopted methodologies. According to Pöder [28], experience obtained from numerous companies has demonstrated that limited transparency and reproducibility of the assessment process serves as a common shortcoming. Despite rather complicated assessment schemes that are sometimes used, the evaluation procedures have been largely based on subjective judgments because of ill-defined and inadequate assessment criteria.

Nevertheless, in a review of the international literature, few references were found that address, in depth, the methodological subjects associated to implementation of the process of EIE within the scope of an EMS ISO 14001 for SME. This may be closely related to the focus on large size organizations because of their greater level of impact.

Motivation for this research was that in Brazil few SMEs have ISO 14001 certification. Based upon this fact, efforts were made to develop a model for implementing an objective, simplified and economic EMS that is appropriate for the needs of SMEs. This author used 'Systems Engineering,' (SE) as the theoretical point of reference, as well as the cooperative approach (For further details, see Section 4.1) to implement and integrate systems. The model that is the object of this work was developed by systemization of empirical knowledge of the process for the implementation of EMSs in Brazilian enterprises using as a reference the systematic vision and instruments proposed by SE.

The model is comprised of three phases: first, planning the system's implementation, second, implementation and third, adjustments of the system to achieve certification. Because of the complexity inherent in the process of EMS implementation, the focus of this document reviews the methodology used to identify the SMEs environmental aspects and to analyze the associated impacts and their inter-relationships with the legal and other requirements. These sub-systems are fundamental for the planning phase of an EMS and to develop a successful implementation process.

2. Theoretical reference point

Difficulties associated with the full understanding of the many institutional or organizational problems are centered on

the tendency to concentrate them within a very restricted system. Therefore, what should be considered as a system is taken as a sub-system. That is, significant inter-relationships between the system and its sub-systems are sometimes lost and/or are only superficially analyzed or completely ignored [29].

In an organization an EMS may be viewed as a sub-system of a larger system; an organizational management system as a whole which would be the outcome of its interaction with all the other organizational sub-systems. The difficulty of viewing the implementation process of an EMS effectively as a system may be substantiated by the fragmented way in which many specialists understand and implement procedures.

However, it is noteworthy that this is the outcome of how ISO 14001 is structured, which does not lead to a systemic overview of inter-relationships and interdependencies. For instance, the Environmental Policy is viewed as a sub-system of the EMS as well as of the sub-systems: planning, implementation, checking/corrective action and management review. However, when structuring these sub-systems, environmental policy should appear as a sub-system and procedure of the planning phase which should be included after the sub-system of aspects and impacts, since the environmental policy must be established in accordance with the organization's significant impacts. In turn, the procedure of aspects and impacts should be preceded by an identification of the legal requirements (municipal, state, federal) which is the main filter of significance in the assessment of environmental impacts. This discloses the need to better understand the implementation process of an EMS according to a systematic approach.

SE is a tool that applies the theory of systems to the project management process; its function is to make feasible the planning, development, construction and assessment of systems [24]. This methodology, developed at the Zurich Polytechnic, is designed to provide a method for developing solutions to complex problems. The efficiency of this method has been tested in private and public sectors' projects [19]. Of these applications, a fairly recent example was the development by Mullooly [27] of a model for the decision-making process aimed at managing the risks involved in buying enterprises in corporate merger processes because of the strategic importance of taking specific decisions associated with these mergers. The model created allowed for a choice between various action alternatives and the types of risks involved in each alternative.

As a systematic methodology, SE, in its relationship with industrial processes, is at the center of issues related to the environment [42]. Its application is particularly relevant in an organizational context when seeking to understand the ramifications of its internal operational dynamics within a specific social and environmental context. It enables the logical and coordinated development of each unit of a project in terms of planning procedures and techniques, structure and control. The use of this approach brings about a solution that meets the enterprise's objectives within the planned limitations imposed by costs and time. This approach is characterized by an interactive process in which definitions of the project, i.e. statement of the problem, go together with finding a solution.

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