Barriers for Implementation of EMS: A study in the Construction Industry of Brazil and Slovenia

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Abstract
This article aims to present a framework of barriers to implementation of environmental management systems. The article presents a structure in sections that were also used in designing a questionnaire applied to identify the main barriers to implementing an EMS in Brazilian and Slovenian companies in the construction sector.

Keywords: construction industry, environmental management, ISO 14001, barriers.

Introduction
The building and construction industry (B&C) is an essential component of many of the world’s economies, because its results enable the operation and growth of other industries. In addition, it significantly contributes to GDP (Gross Domestic Product) in most countries as well as other indicators. This industry generates a great deal of jobs (Testa et al. 2011) and develops key infrastructure e.g., roads and highways, railways, dams, housing; thus, it renders public services and increases people’s quality of life (Seopan 1992).

Furthermore, the growing interest in the study of environmental issues reflects the demand from enterprises to implement policies, procedures and techniques for managing the environmental impacts of their activities. Environmental issues cannot be addressed in isolation, because they make up a system that requires planning, implementation, monitoring and continuous improvement, which highlights the importance of implementing Environmental Management Systems. Thus, Srdic and Šelih (2011) claim that building...
companies need a systemic approach to environmental management at the project, structure and organization levels.

Given the importance of the research on environmental impacts in the construction industry, a project of International Cooperation - Bilateral Agreements between Brazil and Slovenia (CNPq/MHEST), has been prepared and is now under implementation with researchers from the Federal University of Santa Catarina and the Federal University of Santa Maria (Brazilian institutions), and the University of Ljubljana (Slovenia institution). The aim of the project is to conduct a comparative study between the Brazilian states of Santa Catarina (SC) and Rio Grande do Sul (RS) and the construction industry in Slovenia, from the point of view of environmental management and ways of implementing environmental Management Systems (EMSs).

The objective of this paper is to present part of the results of this research, a group of questions to be answered by companies of construction sector from Brazil and Slovenia related to: a) the relation between Environmental Management Systems (EMS) and Quality Management Systems (QMS); b) reasons to implement a QMS and an EMS; and, c) barriers to implement an EMS. The article presents a structure in sections that were also used in designing the questionnaire applied to analyze the main barriers to implementing an EMS in Brazilian and Slovenian companies in the construction sector. The paper is organized as follows: introduction, theoretical framework, results, concluding remarks and references.

**Theoretical Framework**

The review of the literature revealed that construction companies need a systemic approach to environmental management at the project, structure and organization levels (Srdic and Šelih 2011). At the organization level, it is necessary to establish a formal structure that implements environmental management, i.e., an Environmental Management System. An EMS is a part of the management system of the organization that aims to manage environmental aspects associated with the organization's activities, products and services (Perotto et al. 2008; Campos and Melo 2008). However, Gluch (2009) emphasize that environmental practices are not included in the project culture, and a challenge that remains for the construction industry is that of aligning the permanent structures of the organization – as performed by an EMS – with the temporary organization (projects). The gap between the organization and its projects results in contradictions that negatively affect the way the environmental long-term goals are understood and implemented in projects.

This situation is confirmed by Gluch and Räisänen (2012), who conducted a study aiming to analyze the interrelationships between the practices of project design and environmental management, based on the case study of two large construction companies in Sweden (IntCon and NorCon), both strategically committed to their "greening", ISO 14001 certified and followers of GRI (Global Reporting Initiative). The results show how new environmental management practices were inherently contradictory to the culture of the projects. As a result, the members of the project and of the organization struggled to reach different aims and goals. Thus, management needs to create spaces where members of the two units can align practices and routines.

Liyin et al. (2006) observed that improving environmental performance in construction activities implies the full cooperation of all parties involved in the project, and this should be clearly communicated as a common goal of the project team. If there is a lack of client involvement in the promotion of environmental management, there is no effective implementation of EMS throughout the construction industry chain.
However, some authors argue that the implementation of an EMS does not guarantee improved environmental performance of the organization (Sekaran 1992; Nawrocka, Parker, 2009). Melnyk et al. (2003) also investigated this relationship, but they concluded that it is necessary to develop more in-depth studies on the direct and indirect relationships between EMSs and performance, because the standards of ISO 14001 do not require organizations to have a great level of environmental performance, but they describe a system to help them achieve their own environmental goals.

Turk (2009) and Zeng et al. (2003) reinforce the idea that the construction industry makes human activities easier and encourages social development. However, there is significant environmental impact of construction activities, products and services (Ofori et al. 2000). When life cycle is considered, construction products account for 20 to 35% of impact from all products within the main types of environmental impact, for example: global warming, abiotic depletion, human toxicity and reduction of ozone layer (Tukker et al. 2006).

Although the focus of this paper is the Environmental Management System (EMS), we can observe that companies with the ISO 9001 certification for quality tend to pursue ISO 14001 environmental certification. This finding is supported by the literature in the area. Corbett and Kirsch (2001, 2004) and Vastag (2003), for example, found that the number of ISO 9001 systems implemented in a country encourages the adoption of ISO 14001.

Geipele and Tambovceva (2011) argue that one way to achieve the principles of sustainable development and corporate social responsibility is to implement ISO systems. In this respect, systems integration is becoming one of the most popular buzzwords in today's business environment, and several management systems (ISO 9000, ISO 14000 and OHSAS 18000) are gaining popularity. However, management becomes costly if it occurs separately. Thus, organizations believe that there are benefits from the integration of systems, such as: reduction of time and costs, only one source of documentation, occurrence of both internal and external audits. Disadvantages of integrated systems are the high degree of bureaucracy, complexity and high demand for resources.

Pheng and Tan (2005), in a study with 96 companies in the construction industry of Singapore, concluded that ISO 9001 serves as a timely platform for construction companies to pursue ISO 14001 certification by means of integration. Zeng et al. (2010) addressed the advantages of implementing Integrated Management Systems for companies in China, including: meeting customers’ requirements, responding to calls from the government, dealing with the stress caused by competition and reducing management costs.

One possible explanation for the high number of IMSs in construction companies in Latvia, the object of study of Geipele and Tambovceva (2011), may be related to the fact that the country is very small, so there are not many consultants. Thus, the consultants have already implemented ISO 9000 systems and, therefore, it becomes easier to integrate it with ISO standard 14000 and/or OHSAS 18000. In this study, the majority of respondents stated that they are aware of the advantages of integrating their management systems: 76% had integrated ISO 14001 (EMS) with other management systems; 64% of them, ISO 14001 with a QMS, especially ISO 9001; 40% had integrated ISO 14001 with Health System and Safety Management, and 4%, with the Corporate Social Responsibility Management System.

The main objective in our research is better understanding the relationship between the companies and the implementation of an EMS. For this we revised the literature of the area (Environmental Management and EMS in Construction Sector) in order to prepare a group of questions to be applied in companies of this sector in Brazil (Santa Catarina and Rio Grande do Sul States) and Slovenia.
Results

The structure of the questionnaire has three sections or parts: a) the relation between Environmental Management Systems (EMS) and Quality Management Systems (QMS) (tables 1, 2 and 3); b) reasons to implement a QMS and an EMS (table 4); and, c) barriers to implement an EMS (table 5), the main objective of this paper.

Table 1 - Partial list of QMS and EMS items. Source: Designed by the authors.

<table>
<thead>
<tr>
<th>ISO 9001</th>
<th>ISO 14001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has Company already defined some sort of quality policy?</td>
<td>Does the Company maintain an environmental management policy?</td>
</tr>
<tr>
<td>Does the Respondent have already specified objectives and procedures for quality management in the company?</td>
<td>Does Respondent have defined environmental objectives and procedures?</td>
</tr>
</tbody>
</table>

Geipele and Tambovceva (2011), when developing a study with construction companies in Latvia, surveyed difficulties in implementing the elements of ISO 14001, and confirmed that environmental policy is perceived as the easiest element to implementation.

In general, as stated by Christini, Fetsko and Hendrickson (2004), an EMS should be based on a documented environmental policy of the organization, and it should include: i) Objectives, methods, and a timetable for meeting environmental requirements and commitments made by the company voluntarily; ii) Procedures for maintaining proper documentation according to previously established goals; iii) Definition of structure and responsibilities for each task, as well availability of resources; iv) Corrective and preventive actions as well as emergency procedures; v) A plan for employee training with regular training updates to set EMS goals, responsibilities and risks, and vi) A regular audit plan to assess whether an organization can achieve its goals and how an EMS helps the organization to achieve such goals (Cascio 1996; Matthews 2001).

Moreover, the results of a study conducted by Šelih (2007), in Slovenia, showed that within the group of large firms, 90% have an environmental policy or at least an informal EMS. Another question posed by our study refers to the implementation of any type of QMS or EMS, as shown by Table 2:

Table 2 - Partial list of QMS and EMS items. Source: Designed by the authors.

<table>
<thead>
<tr>
<th>ISO 9001</th>
<th>ISO 14001</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company has implemented any of the Quality Management System?</td>
<td>The company has established any type of Environmental Management System or another program that meets the environmental policy?</td>
</tr>
<tr>
<td>What is the certifying body for the QMS ISO 9001?</td>
<td>What is the certifying body for the QMS ISO 14001?</td>
</tr>
</tbody>
</table>

According to Christini, Fetsko and Hendrickson (2004), few construction companies have fully implemented an EMS. Such systems are most commonly adopted by manufacturing companies, which have a relative stability and greater experience with environmental regulations. Another question refers to the certifying body, if the company already has an ISO 9001 (QMS). This question was asked in one of the set of items relative to the ISO 14001 (EMS):

Table 3 - Partial list of QMS and EMS. Source: Designed by the authors.

<table>
<thead>
<tr>
<th>ISO 9001</th>
<th>ISO 14001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide an estimate (in %) of your previously</td>
<td>How much of the previously existing EMS could</td>
</tr>
</tbody>
</table>
The objective was to raise the percentage of QMS and EMS (previous to the implementation of ISO 9001 and 14001) that could be maintained by the company. According to Šelih (2007), 42.30% of respondents from operative construction companies in Slovenia did not indicate the percentage of previously existing QMS. However, 23.07% of them reported that 76-100% could be maintained, while 15.38% maintained 51-75%, 19.23% maintained 26% to 50%, and 3.84% of the companies were able to use 100% of the previous QMS ISO 14001. It was considered important to question whether the number of contracts has increased since the implementation of ISO 9001. Besides, it was also relevant to find out why a quality management system ISO 9001 had been established: to meet customer requirements, improve the management of the company, to face pressure from competitors or to reduce costs. Pheng and Tan (2005) questioned the respondents about the benefits of an integrated system, indicating their degree of agreement with these benefits on a scale of 1 to 5, from "strongly disagree" to "strongly agree." The two highest averages were: Multiple audits - reduced and simplified (3.85); Increased customer confidence and improved market image.

In the set of items, if the company has not established an ISO 9001 for quality management system, the respondent is asked to rate the reasons why there was no implementation. On EMS-related questions, the respondents were asked to list previously existing elements of environmental management. These reasons were listed according to their incidence in the literature. Some points are commented in Table 4.

<table>
<thead>
<tr>
<th>Area</th>
<th>Some authors used as a reference for designing the items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy savings</td>
<td>Liyin et al. (2006); Geipele and Tambovceva (2011)</td>
</tr>
<tr>
<td>Waste Management</td>
<td>Geipele and Tambovceva (2011); Kralj (2008); Tam et al. (2007)</td>
</tr>
<tr>
<td>Noise control</td>
<td>Liyin et al. (2006)</td>
</tr>
<tr>
<td>Air pollution control</td>
<td>Liyin et al. (2006)</td>
</tr>
</tbody>
</table>

The construction sector is a major consumer of non-renewable resources, accounting for around 30-40% of global energy consumption (UNEP, 2007). It is also a major source of waste. In addition, it causes water and air pollution, thus leading to deforestation (UNEP, 1996). It is estimated that this industry consumes about 40% of the materials used in the world economy per year and 25% of wood supplies (Kein et al. 1999). For Geipele and Tambovceva (2011), large volumes of waste result from the production, transportation, and use of construction products and materials.

According to Kralj (2008), waste management lies within environmental management, whose aims are: (1) waste minimization, (2) reduction of the use of fossil fuels by recycling, (3) improvement of the recycling process; (4) optimization of the use of available resources, (5) improvement of intellectual capital, (6) optimization of processes, (7) improved organizational performance, credibility and sustainability, and (8) cost reduction. Tam et al. (2007) stresses the economic and environmental benefits of minimizing waste. Geipele and Tambovceva (2011) observed that companies have been focusing on waste control, energy savings, reduction of water and air pollution. They showed the differences between large and small companies (e.g. energy savings are more important in large firms), and the incidence of QMSs.

According to Liyin et al (2006), pollution in the air, on land and in water caused by construction activities can be local or global. At the global level, construction pollutants can...
cause reduction of the ozone layer and warming. At the local level, they cause: noise, bad odors, dust emission, vibration, chemical emissions of particles, toxic gases, solid waste and water pollution. Because construction activities generate these pollutants, health problems become increasingly severe, for example construction practices in Hong Kong.

Regarding specifically about the main barriers for implementation an EMS we have reviewed the literature and we have found a list of the barriers. The companies should evaluate the importance of each barrier from the least important (5) to the most important (1). The main barriers are show in Table 5.

Table 5 - Some barriers to EMS implementation. Source: Prepared by the authors.

<table>
<thead>
<tr>
<th>Some barriers to EMS implementation</th>
<th>Some authors used as a reference for designing the items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of government/legislative pressure</td>
<td>Zeng et al. (2003)</td>
</tr>
<tr>
<td>Lack of customer support</td>
<td>Livin et al. (2006); Tse (2001)</td>
</tr>
<tr>
<td>High costs for implementation of EMS</td>
<td>Livin et al. (2006); Chen et al. (2004); Ofori et al. (2000); Turk (2009); Šelih (2007); Zeng et al. (2010); Shen e Tam, (2002); Zeng et al. (2003)</td>
</tr>
<tr>
<td>Sub-contracting creates problems for implementing an EMS</td>
<td>Zeng et al. (2003); Liyin et al. (2006)</td>
</tr>
<tr>
<td>Lack of environmentally friendly technologies and materials</td>
<td>Chen, Li e Hong (2004); Anumba e Ruikar (2002); Skibniewski e Nitithamyong (2004); Marsh e Flanagan (2002)</td>
</tr>
<tr>
<td>Inadequacy of patterns (different interpretations in the construction industry)</td>
<td>Šelih (2007)</td>
</tr>
<tr>
<td>Complex documentation process</td>
<td>Geipele e Tambovceva (2011)</td>
</tr>
<tr>
<td>Lack of support from staff</td>
<td>Livin et al. (2006)</td>
</tr>
<tr>
<td>Weak environmental culture among competitors</td>
<td>Livin et al. (2006); Perotto et. al. (2008); Campos e Melo, (2008); Gluch et. al. (2009); Gluch e Räisänen (2012)</td>
</tr>
<tr>
<td>The project is separated from execution</td>
<td>Livin et al. (2006)</td>
</tr>
<tr>
<td>No company in the construction sector takes the initiative</td>
<td>Livin et al. (2006)</td>
</tr>
</tbody>
</table>

As supported by research in the literature, several authors mention the difficulty in implementing ISO 14001 because of high costs (Shen and Tam 2002; Ofori et al. 2000; Turk, 2009; Šelih 2007). Furthermore, Chen, Hong and Li (2004) state that the cost-benefit ratio is not clear, i.e., it is unclear if the benefits outweigh the costs.

Regarding the inadequacy of standards (different interpretations in the construction industry), 61.54% of respondents in the study of Šelih (2007) ranked this question between 1 and 3 (with 1 as the most important).

Technology is another difficulty pointed out by Chen, Hong and Li (2004); according to results of the study they conducted on construction companies in Mainland China, technology is important for the adoption of ISO 14001. If construction companies have appropriate technology to minimize and control the adverse effects of their activities on the environment, they tend to be ISO 14001 certified. However, according to the results of their study, contractors are interested in technological conditions (construction techniques and construction management methods) that can help engineers reduce adverse impacts to the environment, but restricted to legal requirements. Henderson and Ruikar (2010) have drawn on Skibniewski and Nitithamyong (2004) to emphasize that the construction industry, more
than any other industry, is subject to a high degree of fragmentation. Many authors highlighted this lack of unity as a key drawback to be overcome in order to achieve success in implementing new technologies (Anumba and Ruikar 2002; Skibniewski and Nitithamyong 2004). This fragmentation also causes the delay of the construction industry in the uptake of new technologies compared with other industries (Skibniewski and Nitithamyong 2004; Marsh and Flanagan 2002; Anumba and Ruikar 2002).

However, Liyin et al. (2006) emphasize that there are several methods to help contractors to engage in environmentally friendly practices. Among these measures is ISO 14001, which was developed as an important tool for professionals to improve their environmental performance. It has been implemented at local and national level, for example: Building Research Establishment Environmental Assessment Method (BREEAM) in the UK (Baldwin et al. 1998), Environmental Building, Performance Assessment Criteria (BEPAC) in Canada (Cole et al. 1993), Green Building Challenge (GBC Assessment Framework) in the United States (Cole and Larsson 1999) and Hong Kong Building Environment Assessment Method (HK-BEAM), in Hong Kong (Cetl 1996). The implementation of these measures emphasizes that environmental protection is an important commitment during any construction. Based on their study on the construction industry in Hong Kong, the researchers concluded that the main methods developed to protect the environment in the construction industry are government regulations, economic measures and EMS. However, their application is limited by the conflict between costs and environment (cost versus benefit); lack of initiative - in the construction industry - towards the environment, lack of support from customers (lack of cooperation between the people involved in the project); conflict between contract length and the time for implementing methods for environmental management. Moreover, the practice of environmental management is mainly driven by external pressures such as government incentive programs for law enforcement. However, efficiency cannot be achieved if there is no internal motivation.

Liyin et al. (2006) state that construction business, considering the construction phase itself; its maintenance and use (bridges, roads, buildings) produce a great impact on the environment, both locally (noise, particulate matter, air pollution) and globally (climate and ecosystem changes). Thus, construction has an important role to play in improving environmental performance. These impacts can be considered within the following aspects: (1) use of generic resources (energy, water, materials and land); as for energy, consumption continues throughout the life cycle of construction projects. At the construction site, construction activities require energy for tools, lighting, winches, cranes, concrete mixers and other facilities. In addition, during the post-construction period, energy is needed for heating, lighting and operation of electrical appliances, for example. (2) Generation of waste. Construction activities produce substantial volumes of solid waste from wood, concrete and asphalt, sanitary sewer, stone tables, lime, scrap; among other waste generated due to changes in project design, mistaken purchase or transportation, handling of materials, machine operation, and even by bad weather. All such waste requires proper disposal in landfills.

Another aspect to be assessed is subcontracting. According to Geipele and Tambovceva (2011), many small businesses are subcontracted to perform some parts of business projects. Even if these companies do not have the ISO 14001 certification themselves, when they work on projects with large companies that have the accreditation, they have to comply with all relevant requirements. According to Liyin et al. (2006), the operations of suppliers and contractors have a significant environmental impact, and strict control over their operation is necessary. Communications and possible training sessions are suggested for suppliers and contractors to be aware of their environmental duties and responsibilities while carrying out their activities.
Zeng et al. (2003) posed as motivations for the ISO 14001 certification of Chinese construction companies the standardization of procedures for environmental management, social recognition and customer trust (as it improves the company's image), increased environmental awareness among contractors, and cleaner construction sites. And the major drawbacks are the following: financial burden, imbalance between costs and benefits, low environmental awareness and lack of government pressure. Tse (2001) adds: lack of customer support, high costs and problems relative to subcontracting.

Final Remarks

The identification of key barriers and motivations of companies in the construction sector (Slovenia and Brazil) may help researchers and entrepreneurs increase their awareness of the gains and challenges so that they can achieve a thorough understanding of Systemic Management Systems, especially the Environmental Management of these organizations. The results of the survey conducted throughout the construction industry, which encompasses everything from engineers to contractors and consultants, contractors and supply chain, can demonstrate the difficulties relative to the integration of the different interests in terms of a common goal: EMS. This system requires a permanent organization structure with regular audits, documentation and ongoing monitoring. However, the construction industry is inherently based on projects, causing contradictions between this temporary structure and the permanent structure demanded by an EMS.

In this sense, this study introduced the theoretical basis for the design of a framework of barriers for implementation of an EMS, to be answered by the participants, in a comparative study of the construction industry in Santa Catarina and Rio Grande do Sul (Brazilian states) and Slovenia. The review of the literature reported the work of several authors that highlighted barriers and motivations for EMS implementation in the construction industry. These barriers include the high costs that seem to be a common difficulty in adopting EMSs in most industries. A question remains: do the benefits outweigh the costs involved? After all, even when a company shows a better performance after implementing an EMS, this improvement may not have been caused solely by the system.

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Reference


