ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS) IN THE CONTEXT OF SMALL BUSINESSES: A STUDY CONDUCTED IN THE SOUTH OF BRAZIL*

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Abstract:

The aim of this article is to present the results of a study on environmental management systems (EMS), which was conducted among small companies in the State of Santa Catarina. The purpose of the study was to verify which of the 17 requirements of the ISO 14001 Standard† are the most essential and applicable to the reality of small businesses and, using this information, to propose a model for the implementation of an EMS which is better suited to their needs. It is an exploratory study, which combines qualitative and quantitative research. In terms of the nature of the work, it can be classified as an applied study, in that it makes use of bibliographic and field research, the latter being carried out in two different stages. The initial stage involved interviews with professionals working on EMS implementation, and the second used questionnaires that were sent to small businesses in the State. Both results were analyzed, and provided support for the formulation of an EMS model that is better suited to the needs of small companies. The article also assesses whether small businesses tend to replicate EMS implementation models that are more appropriate to the context of large organizations.

Keywords: environmental management system (EMS), small companies, ISO 14001 Standard, enviromental requirements, continuous improvement.

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† ISO is an International Organization for Standardization. ISO 14001 is a standard recognized in Brazil as NBR (Norma Brasileira) ISO 14001.

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1. Introduction

The concern with environmental preservation has assumed a position of great importance among the issues that plague Brazilian businesses. The behavior of the consumer market is changing, in the search for the so-called "green products" while the Government, for its part, has responded to the growing pressure from society by creating mechanisms of stricter legislation. This has led businesses to seek tools that will enable them to meet the legal and commercial requirements and ensure the survival of their companies.

According to Maimon (1996), the ISO 14000[‡] series of environmental standards is one of the tools that can be used, enabling, at the same time, a commitment to complying with the environmental legislation, protection of the environment and improvement in the competitiveness of companies.

A number of works have been published in Brazil, such as those of Cyro Eyer do Valle (1995) and Ênio Viterbo Júnior (1998), aimed at demonstrating the mechanisms and tools used by national and international companies for the implementation of an effective environmental management system. Research groups have also contributed through the publication of books, thesis and articles which describe new models for the introduction of an EMS, such as those of Scherer (1999), Lerípio (2001), Campos (2001) and Maimon (1999). These works can help organizations to assess the procedures for adopting effective methods of obtaining the ISO 14001 certification for Environmental Management Systems (EMS). The same authors outline action plans, which enable companies to create a method for implementing the requirements of the standard in their procedures.

For Valle (1995), an effective environmental management system can help an organization to establish and assess the real situation of the processes and procedures established for the application of an environmental management policy and its objectives. ISO 14001 is a standard that sets out international guidelines and standards in relation to methods and analyses, which specify the requirements of an environmental management system.

The requirements of the standard are applicable to organizations of all types and sizes, and they certify that a specific organization has an environmental management system (EMS), that its processes of production, distribution, use and disposal are in accordance with the

[‡] ISO 14000 is a series of environmental standards, and ISO 14001 is the one related to Environmental Management System Implementation.

relevant environmental legislation, and that they do not cause, or at least reduce to a minimum, damage to nature. However, according to ISO 14001 (1996, p.8), "it should be noted that this International Standard does not establish absolute requirements for environmental performance beyond commitment, in the policy, to compliance with applicable legislation and regulations and to continual improvement. Thus, two organizations carrying out similar operations but having different environmental performance may both comply with its requirements".

Also according to ISO 14001 (1996, p.8):

> The adoption and implementation of a range of environmental management techniques in a systematic manner can contribute to optimal outcomes for all interested parties. However, adoption of this International Standard will not in itself guarantee optimal environmental outcomes. In order to achieve environmental objectives, the environmental management system should encourage organizations to consider implementation of the best available technology, where appropriate and where economically viable. In addition, the cost effectiveness of such technology should be fully taken into account.

Thus, introducing an environmental management system, in accordance with the ISO 14001 Standard or other environmental management standard, is normally a process that requires financial investments and time. The implementation of EMS is currently becoming more widespread among large organizations, a fact that is justified by their need to export certain finished products.

However, some small companies also end up forming part of the production chain of larger organizations, in that they feed the latter companies with products. Thus, the pressure on small companies is leading them to seek to comply with the requirements of the environmental management standards and implement their own EMS.

Cancellier (2005) argues that developing models and appropriate tools for small and medium Brazilian companies is a great challenge, taking into account their peculiarities in relation to the availability of financial, material, human and organizational resources. Considering this point of view, the aim of this article is to present the results of a study carried out in the State of Santa Catarina, Brazil, intended to determine which of the requirements of

Standard ISO 14001 are more important for small companies, and through this information, to propose a model for the implementation of an EMS that is better adapted to their needs.

2. The Standards and Models for Environmental Management Systems

Environmental Management Systems (EMS), as they are known, emerged at end of the 1980s and beginning of the 1990s. The main characteristic of these systems is that they promote a process of continual improvement, attempting to control the company's processes, as well as their environmental aspects and impacts.

An EMS "is part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for the development, implementation, achievement, critical analysis and maintenance of the environmental policy" (ISO 14004:1996, p. 5).

The main objective of an EMS is to ensure a systematic control of the environmental performance, promoting continual improvement. The EMS is comprised of environmental procedures which establish specific responsibilities and define when, where and what should be observed in order to ensure that the company's activities are carried out in accordance with the environmental policies established, and integrated with existing efforts in other areas. The systematic approach of an EMS is illustrated by Gilbert (1995), as shown in Figure 1.

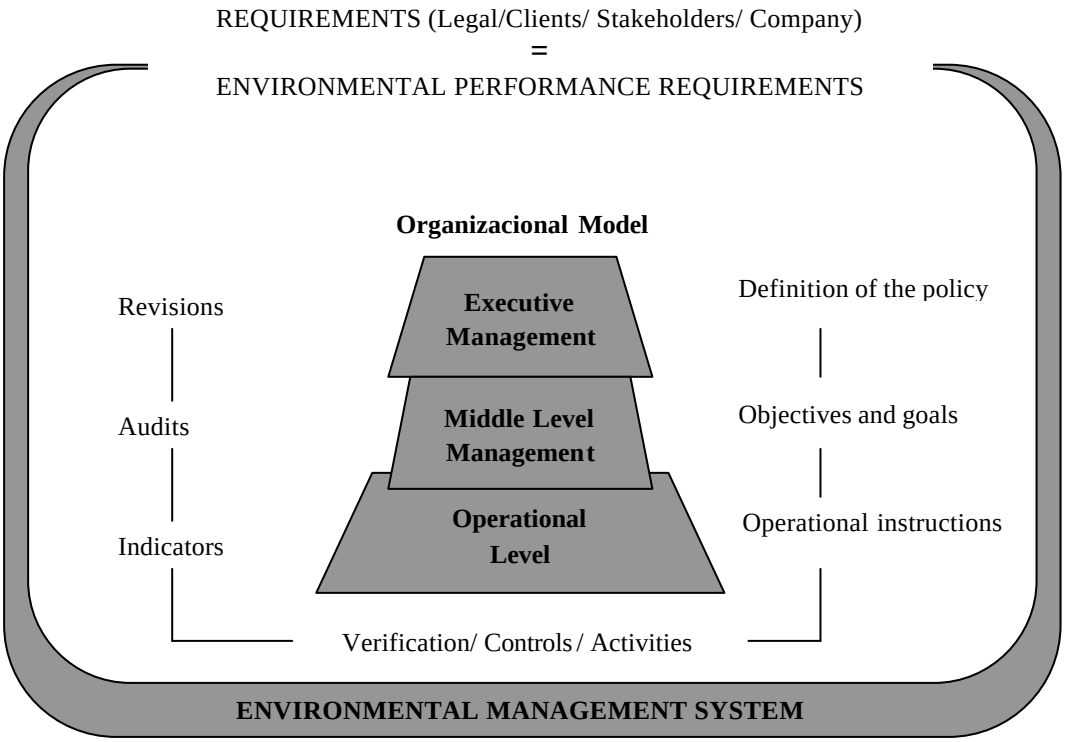

Figure 1 – Environmental Management System Related to a Business Model

Source: Adapted from Gilbert (1995, p. 9).

According to Gilbert (1995), the executive management, at the top, takes the strategic decisions and defines policies; the middle level management translates these policies into objectives and specific goals; and at the operational level, plans are implemented to reach these goals. Activities are implemented, controlled, verified and measured. Audits and revisions are conducted to assess whether the desired objectives are being achieved, the progress of the managerial analysis and the results. In the case of the EMS, all these stages of a business management model are dealt with from an environmental focus. The requirements of the EMS should be related to the law, clients, other stakeholders and the company itself; all of them establish the performance standards to be met.

According to Moreira (2001), the implementation of an EMS depends on three fundamental pillars: the organizational, the technical and the legal. The organizational pillar refers to the establishment of administrative and operational routines, the operational structure, responsibility and authority, planning, resources, etc; the technical pillar deals with knowledge of the environmental aspects associated with the activities, facilities, products and services, and how to control them; knowledge and compliance with the legal and other requirements of relevance to the organization comprise the legal pillar.

It is important to bear in mind that, as with any other process of change, it will only be possible to introduce an adequate environmental management system if there is commitment on the part of the leaders of the company, beginning with the shareholders, passing to the executive officers and reaching all levels of management (REIS, 1995).

Table 1 shows a summary of the principal standards and environmental principles with their main characteristics, which have been developed over the years, with the aim of harmonizing the procedures of the business world for the good of the environment.

Table 1 – Summary of Environmental Management Systems and Principles

Standard or Principle	Year	Main characteristics	Certifiable/Not Certifiable
Responsible Care Program	1984	Consists of guideline principles, six codes of management practice, a public consultation panel and leadership groups. http://www.americanchemistry.com	Voluntary, not certifiable. Required by the Chemical Manufacturers Association. In Brazil, it has been coordinated by ABIQUIM since 1990.
WINTER Model	1989	A system which integrates administration with ecological awareness, created by George Winter, in Germany. Consists of twenty integrated modules aimed at facilitating the implementation of the EMS. http://www.inem.org/htdocs/inem_board.html	Voluntary. Not certifiable.
CERES	1989	Consists of ten directive principles that emphasize the need for organizations to protect the planet and act in a responsible manner in relation to the environment. http://www.ceres.org.br	Voluntary. Not certifiable.
STEP	1990	A guide for the American petroleum industry, which enables companies to improve their environmental, health and safety performance. http://www.un.org/esa/sustdev/mgroups/viaprofiles_STEP.html	Voluntary. Not certifiable.
EMAS	1993	A system that enables industries of the European Community to obtain a record published in the official journal of the European Union. http://www.emas.org.uk	Certifiable through publication in the official journal of the European Union.
BS 7750	1994	A specification for the development, implementation and maintenance of an EMS, in order to guarantee and demonstrate conformity with the statements of the company regarding its environmental policy, objectives and goals. http://www.quality.co.uk/bs7750.htm	Voluntary. Certifiable
ISO 14001	1996	An international environmental standard that specifies the requirements relating to an EMS, enabling the organization to formulate its policy and objectives, taking into account the legal requirements and information relating to the significant environmental impacts. http://www.tc207.org http://www.iso.org	Voluntary. Certifiable

Source: Adapted from Campos (2001)

Based on the definitions of the specific requirements for each of the EMS standards, various implementation models have been created. Scherer (1999) divides these into two major streams. The stream commonly known as “conventional implementation models”, with a strong British influence (from Standard BS 7750), and another stream, influenced by the Scandinavian and Canadian schools of EMS implementation.

According to Scherer (1999), the first type, the “conventional”, has three basic characteristics: a large amount of detailing in the stage of investigating the environmental aspects, without due concern for the future feasibility of maintaining and updating these

records; an initial emphasis on the training of auditors (control) but not in learning; and a lack of concern to incorporate the concept of interested parties and participatory management in the process. The second type of EMS seeks, in turn, to place greater emphasis on improving environmental performance, paying closer attention to the controls, through monitoring and measurement.

Also according to Scherer (1999), the criticism of the conventional models arises from the observation of and the reflection on some risks associated with these models: the narrow, determinist view of implementation; the bureaucracy involved in the standards; the loss of focus and efficiency; organizational stress (auditing as a means of control); and the lack of learning tools. In Scherer's view, conventional models do not add important concepts to the implementation process, such as: participatory management, organizational learning and productive and economic eco-efficiency.

The second type of EMS implementation normally uses mechanisms for self-improvement of performance that can be more useful for ensuring correct environmental performance, such as:

a) participatory management and visual performance tools;
b) programs of economic stimulation for improvement and environmental innovation;
c) Continual training and performance improvement programs.

It should be noted, however, that both types include methodologies which have been used by companies to introduce their systems, successfully enabling them to gain ISO 14001 certification.

3. Benefits and Costs of an Environmental Management System Implementation

The implementation of an EMS has a wide variety of impacts on different levels of a company. There is no general answer to the question of costs and benefits of an EMS. These differ for every company, especially considering their type, size and activities.

In general, according to Sturm and Upasena (1998), there are some benefits from implementing an EMS, such as:

- optimized products and production processes lead to less material input and lower costs;
- cost savings due to use and recycling result in less excess material input and lower material costs;
- cost savings due to waste reduction, reuse and recycling result in lower waste disposal costs;

- lower transportation and storage costs due to less material and energy input;
- easier compliance with environmental standards;
- lower compliance costs;
- lower risk of redesigning costs due to changing regulations or customer perception;
- lower impact leads to reduced charges and pollution penalties;
- lower environmental risk leads to lower insurance costs and compensation payments; among others.

Most of these benefits are associated with large companies; however, they can also be reached in medium and small companies.

Despite the benefits, Sturm and Upasena (1998) mention some negative impacts or costs of an EMS implementation, such as:

- additional costs of implementing an EMS can reduce profit margin;
- investment in pollution abatement technology to comply with environmental regulations leads to higher production costs and market prices;
- as a consequence of the public environmental report, financial markets suddenly realize the environmental risk of an organization, its products and services.

Therefore, an organization whose management system incorporates an EMS may have a structure that is capable of balancing and integrating economic and environmental interests, thus achieving significant competitive advantages.

The introduction of an EMS can combine improvements in industrial processes with environmental preservation, and through this and the new global demands. According to Reis (1995), Russo and Fouts (1997), Daroit and Nascimento (2000), Moreira (2001) and Ott and Dalmagro (2002) among other authors, companies can end up establishing environmental production targets, adopting procedures for recycling materials, reducing emissions of effluents and ensuring the life cycle of their products.

From the strategic perspective, according to Klassen and McLaughlin (1996), the literature indicates that businesses should consider the environmental impacts of the products and manufacturing processes, as well as the environmental legislation, requiring initiatives by companies in the areas of technologies and environmental management. Thus, the corporate strategy will determine the company's environmental orientation.

According to Klassen and McLaughlin's (1996) and Reis (2002), environmental management is an important aspect of functional strategies, particularly of operating strategies, and as part of the corporate strategy, it affects environmental performance, which,

after becoming public knowledge, will be observed and assessed by the market. Thus, environmental management affects both structural and infrastructural aspects, involving the selection of products, technology and processes and management systems. With alterations in these components through environmental management, the financial performance is affected due to a reduction in costs and market gains.

Thus, combining the environmental and financial issues of implementing an EMS and its subsequent certification, Table 2 classifies the economic benefits (translated as cost reduction and revenue increase) and the potential strategic benefits generated by the implementation of an EMS, as well as the potential costs of not doing so.

Table 2 – Potential Benefits and Costs of Having or Not Having an EMS

Potential Economic Benefits of having an EMS	**Potential Strategic Benefits of having an EMS**
Cost Savings - Decrease in waste and savings due to the reduction in consumption of resources (water, electricity, fuel and other raw materials). - Savings due to recycling and re-use of various materials. - Lower cost on final disposal of garbage and residues (recycling and re-use with less garbage sent to landfills and incineration). - Decrease in effluents. - Reduction in expenses on lawsuits, with fines and penalties for pollution. - Reduction in insurance costs. - Reduction in costs on control, corrective actions, lost hours due to stoppages and accidents, achieved through the standardization of processes. Increased Revenue - Sales of recycled products and residues. - Increase in marginal contribution of 'green products which can be sold at higher prices. - Increase in market share through the innovation of products and less competition. - New product lines for new markets. - Increase in demand for products that help to lower pollution.	- Guarantee of better performance and adaptation of environmental standards. - Reduction in wastage, recycling, etc. - Increased productivity and an opportunity to renew product portfolio. - Preventing risk of environmental accidents, application of fines by environmental bodies, lawsuits, etc. - Sharing of responsibility for environmental problems among everyone in the company, and high level of staff commitment. - Homogenization of the form of environmental management throughout the company, particularly where units are geographically scattered. - Greater competitiveness and access to restricted national and international markets, based on a more visible environmental awareness. - Improvement in institutional image, with a good reputation among governmental and environmental bodies, the community and NGOs. - The possibility of forming partnerships, particularly local ones. - Greater chances of obtaining financing at reduced rates from banks which promote environmental preservation. - Intangible benefits, such as: better management through a systematized culture, standardization of processes, personnel training, high level of commitment of personnel and improvement in working relations, improvement in creativity for new challenges, traceability of technical information, etc.
Potential Costs of not having an EMS	
- Environmental liabilities. - Stock of solid residues and waste. - Lawsuits and fines. - Environmental accidents. - Work stoppages. - Damage to the company's image and loss of national and international competitivity. - Doubtful reputation with environmental bodies, the community and NGOs, which could make future partnerships unviable.	

Source: Adapted from North *in* Donaire (1995) and Reis (2002), Porter and van der Linde (1995b), Moreira (2001), *Revista Meio Ambiente Industrial* (2002) and Alberton (2003).

According to Porter and van der Linde (1995a, 1995b), the many examples of opportunities to reduce costs and lower pollution are the rule rather than the exception and, in general, efforts to reduce pollution and maximize profits follow the same basic principles, which include efficient use of the resources, replacement with less expensive materials and the elimination of unnecessary activities. In this sense, Scherer (1999) views the importance of developing management tools like an EMS not only from an operational perspective, as a means of ensuring satisfactory performance and dealing with the various pressures from stakeholders, but also as a tool for strategic planning, for conciliating visions and investment strategies, and managing costs.

4. Small Companies in Brazil and Santa Catarina: a brief description

According to Maluche (2000), any entity that is legally constituted to exploit any economic activity, be it agricultural, industrial, mercantile or for the provision of services, and that has profit as an aim, is considered a company. The classification of companies in terms of size is one of the factors that differentiate them amongst themselves. The differences can be found, for example, in the organizational structure, in the processes and in the form of tax for which they are liable. However, the manner in which the companies can be classified does not always follow the same criteria.

According to Goedert (1999), finding a concept by which small businesses can be defined is a difficulty faced by many researchers. The classification criteria almost always view these companies in a quantitative way, classifying them, for example, by the number of employees or by the volume of turnover or annual sales. These criteria, though important, end up being very vague, since they do not include all the characteristics of the companies.

The specialized literature in the field contains various proposals and methodologies suggesting conceptual approaches to the problem of classifying small businesses. However, most of them are unsatisfactory and at sometimes limited for use under any circumstances.

Small businesses in Brazil can be classified, from a legal point of view, by annual profits, according to Federal Law 9.317, published on 31st December 1996, called *Lei do Simples*, which stipulates the tax regime for small companies. However, this criterion may not be very representative, bearing in mind the market in which the companies operate, their area of activity and their technological capacity.

Another criterion which is often used, particularly by SEBRAE, is the "number of employees", whereby companies are classified according to the table 3 below.

Table 3 – Number of Employees for Each Company According to SEBRAE.

Size	Industry	Commerce	Provision of Services
Micro	01 - 19	01 – 09	01 – 09
Small	20 - 99	10 – 49	10 – 49
Medium	100 - 499	50 – 99	50 - 99
Large	Over 500	Over 100	Over 100

Source: MALUCHE (2000)

The concept that defines small companies, irrespective of the criteria used, should not be limited, and the classification should take into consideration both the quantitative and qualitative aspects of the companies.

Normally, small companies do not have a clearly defined organizational hierarchy. According to Raccioppi (2000), the formalization of a hierarchical structure, in the majority of companies, exists only in the minds of the president or an executive officer. When a structure does exist, it is far removed from the reality, or is not followed. In the majority of the models used in practice, the administrative power is centered around the owner and one technical person responsible for the production. Medium companies have a more clearly defined structure. The majority is departmentalized into the various sectors required to run a factory. "The administrative structure of the company should be in accordance with its needs, without limiting it or placing a burden on its products" (BATALHA, 1990, p. 51).

However, the factor that particularly characterizes small companies is their limited resources. The majority of small companies have little available cash flow during their first few years in operation, and are highly vulnerable to sudden changes. According to Cândido (1998), another essential factor that characterizes small companies is the basic requirement that the owner-manager administers and maintains control of all aspects of the company. This makes the decision-making process highly centralized. Due to the fact that they have a lean structure, internal information circulates more easily within small companies, and the employees are able to understand the organization more easily.

There has been growing worldwide discussion, in recent years, concerning the characteristics of these companies. For França de Paula (2001), the countries which show a high level of economic development are those which discovered earlier on the potential of small companies, and developed policies to promote them as a whole.

The importance of micro and small companies can be seen by analyzing SEBRAE data (CHAGAS, 1999), which shows that these companies constitute up to 97% of all Brazilian companies, accounting for 48% of production, 60% of jobs and 25% of the Brazilian GDP. A small company, when seen in isolation within its sector, would be almost insignificant, but when seen collectively, it surpasses the result of the large companies in the sector.

This significant participation of the micro and small companies is observed in each one of the sectors: industrial, commercial and services, as much in the offered jobs as in the generated income. In Brazil, the micro and small companies correspond to 96% of the establishments in the industrial sector, 99% of the establishments in the commercial sector and 97% of the establishments in the sector of services. In relation to the distribution of the jobs, it is verified that they are responsible for 33% of the man power of the industrial sector; 68% of the manpower of commerce and 36% of the man power of the services sector (REVISTA PEQUENAS EMPRESAS GRANDES NEGÓCIOS, 1998). Such data demonstrate it's the significant participation of micro and small companies in the national economy.

In the 1980s, a study of the World Bank (MELARAGNO, 1982), about jobs and development of small companies, considered that these companies were more stimulated, through the creation of jobs, to correct distortions of the under development that excludes a worldwide population from participating in the national income. Among other advantages, the study relates the creation of small companies with the increase of the number of direct jobs for invested capital, with the generation of indirect jobs for the tendency of purchase of the inputs in the local market and with the generated income. Other positive aspects attributed to the micro and small companies are the formation of manpower for medium and large companies and the ample space distribution that contributes to minimize the regional inequalities (SILVA, 1998).

Many studies have been carried out, and are currently in progress, addressing the operation of small businesses as their main theme. Nowadays, the importance of small businesses, as generators of jobs and development in the areas where they are located, has been a topic of much discussion; in short, they make a wide variety of important contributions to the Brazilian economy. The study of small companies is important, since they perform an important role in society, generating jobs and income with less invested capital and stimulating the economy of the regions where they are located.

Since they generate a great number of direct and indirect jobs, and purchase their supplies on the national market, these companies have made a major contribution at a socio-economic level. These companies are no longer seen merely as important players for generating jobs and improving the distribution of income, but rather, as instruments of economic development,playing a fundamental role in emerging economies and even in well-established ones.

Irrespective of the level of economic development or political regime of a country, the role played by small companies goes far beyond quantitative and economic aspects. According to Drucker *apud* Goedert (1999), all the industrial job losses in the United States were in large companies. In the period from 1988 to 1990, small organizations provided 3.2 million new jobs in the United States.

Table 4 shows the percentage of companies, by size, in the Brazilian workforce and their industrial production.

Table 4 – Percentage of Small and Micro Companies in Brazil

Size	Percentage of the workforce	Industrial production
Micro	35.20%	13.40%
Small	24.0%	14.82%
Medium and large	40.60%	71.78%

Source: http://www.sebraesp.com.br; SEBRAE – 1998, accessed on 08/07/2002

In Brazil, small and micro companies absorb 59.2% of the total workforce, but account for only 20% of the GDP and export only 1.7% of all Brazilian exports.

Bearing in mind some trends, not only at national but also at global level, it can be stated that the number of small companies is on the increase. Chagas (1999) mentions some of these trends: the need of large companies to transform their production complexes into small companies; an enterprising spirit and the need for personal fulfillment; early retirement; computerization and automation of companies, thereby dispensing with personnel; an increase in services related to information, and tax and bureaucratic aspects that create some benefits for companies.

It should be remembered that just as the number of small and medium companies has risen, a large number of failures has also been seen. According to data from SEBRAE (*apud* CHAGAS, 1999) approximately 50% of all companies manage to get through their first year and only 20% get through their second, for various reasons: lack of working capital, economic recession, high tax burden, bad payers, competition, lack of clients, unsuitable location, lack of credit, i.e., lack of knowledge of the market.

Degen (1989) also touches upon some points that can hinder development or lead to lack of success: lack of objectivity, which can camouflage important information that fails to be heard or analyzed; lack of knowledge of the market in which the business is operating; wrong estimation of financial requirements; underestimation of technical problems; failure to differentiate the company's products and service from those of the competition; ease of imitation by other competitors due to lack of barriers to their entry; lack of knowledge of the legal aspects involving new business, and the choice of wrong partners for the type of business to be developed, as well as being in the wrong location for the business.

Longenecker, Moore and Petty (1997) accredit the failure to economic factors or lack of experience. Economic factors may include inadequate sales, insufficient profits, weak growth prospects and financial causes. Lack of experience, meanwhile, is related to the quality of management, i.e., lack of knowledge of the business, lack of experience in the area or even a lack of managerial experience.

It is emphasized that, despite their importance, small companies have been undergoing drastic changes as a result of some variables. Firstly comes the globalization of markets, which has made relations between companies closer and helped to increase the competition at international level, forcing national companies to adapt to new production and commercialization standards and changing their relationship with consumers, who are becoming more demanding and aware of the role of organizations. Secondly, the development of information technology has altered market relations, bringing changes in the production process and making information a driving force for the creation of management and marketing policies for companies.

The percentage of small companies in Santa Catarina is higher than the national average, which means that these companies are making a significant contribution to the economic development of the State. Even with all the potential that exists in the State, companies still face problems that hinder their full development. Among the various problems affecting companies in Santa Catarina, the most significant ones are in the areas of production. The absence of an efficient production schedule or planning leads to delays in delivery, paralysis of the assembly lines and surplus stock. This lack of production scheduling or planning also leads to excessive losses of raw material, and a high level of waste generation, waste which is often thrown into the environment without any form of treatment.

All these aspects reflect a need that still exists, for further study on these companies, to give them techniques that will enable them to manage their processes more efficiently,

eliminating or decreasing the waste generated, transforming them into a source of income and profit and creating opportunities for job creation and income generation.

In this way, Environmental Management System (EMS), if well implemented, can help small companies to save money, to improve their reputation and market position, among other benefits. For this reason the present research tried to recognize the most important requirements of ISO 14001 that can really bring more benefits than costs to small companies, during the EMS implementation.

5. Methodological Principles

Based on studies conducted on the principal models and methods of EMS implemention, and the characteristics of Small Companies in the State of Santa Catarina, the researchers sought to identify the main needs of these companies in relation to environmental issues and EMS implementation processes.

The study was classified, in terms of its objectives, as an exploratory study. Regarding the form of its approach, it is a qualitative/quantitative study, since it uses techniques and methods that are both quantitative and qualitative. As for the nature of the work, it can be classified as applied research. In terms of the technical procedures used to carry out the study, two types of research were used, according to the classification suggested by Gil (1994): Bibliographic Research (characterized as a theoretical study) and Field Research, carried out at two different times.

Firstly, interviews were carried out with five professionals working in the implementation of environmental management systems, either directly or indirectly, and who had some characteristics in common: they all had contact with Small Companies in the State; they had led or implemented EMS; they had more than 10 years of practical experience; they worked in the State of Santa Catarina. The interviews were semi-structured, with open questions. All the interviews followed the same set questions and were carried out directly with each of the interviewees[§]. The questionnaire used with professionals is presented in Annex A.

[§] In a first moment, 20 professionals were identified and contacted. The list was prepared based on information from FIESC and UFSC. These professionals were contacted because they had participated in courses, training, and workshops, related to EMS, from 1997 to 2001. From this list, 05 professional were selected according to criteria and characteristics important for the research, such as: they all had contact with small companies; they had led or implemented EMS; they had more than 10 years of practical experience; they worked with EMS implementation in the State of Santa Catarina.

The second stage involved the application of a multiple-choice, closed question questionnaire,which was sent by e-mail to small companies in the State of Santa Catarina. This questionnaire is presented in Annex B.

Initially, around 1250 companies were identified among all the small companies in the State of Santa Catarina that could be interested in implementing an EMS. The criterion used to select the first 1250 companies was related to their main activities. First, companies that supplied some type of product to other companies (medium or large) and that could form part of a production chain that, in some form, caused major negative impacts on the environment were selected. For example, companies supplying products for: the textile, cellulose, and metal-mechanical industries, among others. Small service companies were excluded from the initial sample, such as clinics, schools, offices, etc.

After this initial selection, the electronic addresses of 870 of these companies were identified. E-mails were sent out to all 870 companies, to investigate their interest and availability to respond to a questionnaire about the main requirements of these companies in relation to environmental issues and EMS implementation processes. Of the 870 small companies contacted, 335 responded to the e-mail sent and only 127 said they would be interested in taking part in the research. The remaining 208 companies contacted, which responded to the e-mail, showed lack of interest in the research. The main reasons given were as follows: lack of time, lack of interest in EMS and lack of knowledge about EMS.

Of the 127 questionnaires sent by e-mail, 83 were completed. Coincidentally, it can be seen from the FIESC (Federation of Industries of Santa Catarina) that almost 75% of these companies had already taken part in any FIESC course or initiative on the environmental theme. This information reinforces the representativeness of this sample (yet small) in relation to the theme of the study.

Unfortunately, it is impossible to affirm that all 83 respondents were familiar with EMS models or methodologies. Otherwise, it is possible to infer that, because of their interest in participating in the research, and because of their participation in courses about the theme, at least they knew something about EMS implementation or environmental questions.

The main results from the two stages of the research, as well as a cross-reference analysis based on these results, are shown in the items below.

6. Research Results

The next items present, in two distinct phases, the results of the research and the EMS model for small companies, according to the views of consulting professionals and the views of small companies.

6.1. The Environmental Issue and the EMS in Small Companies in Santa Catarina: The View of Professionals working with Implementation

Based on an analysis of the statements of five professionals working directly in the implementation of EMS in the State of Santa Catarina, the following can be observed:

- interest on the part of the business people in relation to environmental issues is still directly linked to economic benefit or to the image that the issue can bring to their companies, irrespective of their size;
- lack of knowledge and lack of preparedness among businesses, as well as lack of incentives on the part of the Government have contributed to the non-dissemination of the environmental issue among small companies;
- in general, lack of information and lack of commitment to the environmental cause, on the part of business owners, is seen in small companies;
- in the view of many business people, being ecologically correct means building an effluent treatment station and reducing the pollution of their production to avoid penalties from the inspection bodies, i.e. environmental management is still closely related to control or correction;
- when a small company implements an EMS, examples of success or failure of large companies in the implementation of the EMS are taken into account;
- the small number of employees in small companies and the diversity of tasks to be carried out makes EMS implementation difficult in this type of organization;
- the implementation of an EMS in a small company is seen, at first, as extremely costly;
- a system for a small or medium company should be easy, rapid and should not require huge amounts of information or very complex information systems, otherwise its implementation and maintenance could be time consuming and costly.

In relation to the interviews carried out with the professionals, it can be said that larger companies have more experience as a result of their position and operations in the market.

Therefore, they are able to deal with the administrative and bureaucratic issues more easily. Yet, the main interest of companies is to comply with the legislation.

Small companies do not have sufficient infrastructure to implement an EMS because their time, ability and knowledge are absorbed in their daily activities. Normally, small companies are unable to have a technical team, or a responsible person who is able to take on the implementation. The best option for these companies, therefore, is to invest in other technologies that bring faster results, such as cleaner production[**] or even programs like the 5S[††].

Despite the difficulties mentioned, the professionals were unanimous in the belief that the same EMS model implemented in large and medium companies can be implemented in small companies, provided that certain alterations are made, such as changes in the order of implementation, reduction of some types of control that can create excessive bureaucracy for the company, reductions in expectations and demands regarding the time needed for implementation, and the use of simpler methods and tools, which are designed for the needs of the organization.

Then, the second phase of the research began: to identify the stages of the traditional EMS implementation model, or requirements of Standard ISO 14001, the small companies believe to be more important for their context.

6.2. The Environmental Issue and the EMS in Small Companies in Santa Catarina: the View of Small Companies

Given that there are many standards and methods for the implementation of an EMS, this study opted for the structure and requirements of one of the most well-known and most widely used EMS standards; ISO 14001.

Based on the 17 requirements of this standard, a questionnaire (Annex B) was designed, which was sent to the 127 small companies who agreed to take part in the research. Of the 127 questionnaires sent, 83 small companies returned completed questionnaires. The main results are shown in table 5 below:

Table 5 - Results of the Questionnaires Sent to the Companies

[**] Cleaner Production (CP) is the international term for reducing environmental impacts from processes, products and services by using better management strategies, methods and tools. CP is called Pollution Prevention (P2) in North America, and Producion Mas Limpia (PL) in Latin America. Related terms include green business, sustainable business, eco-efficiency, and waste minimization.

[††] 5S is one of the total quality methods or tools developed and used in Japan to achieve low cost production, high productivity, and quality while meeting prompt deliveries. 5S methodology is widely applied in many well-known multi-national firms.

Question	Requirement of the Standard	Average	Level of Importance
1	Environmental Policy	4.07	**High**
2	Environmental Aspects	3.93	**High**
3	Legal Requirements	3.67	**High**
4	Objectives and Goals	2.47	Medium
5	Environmental Management Program	3.27	Medium
6	Structure and Responsibility	3.67	**High**
7	Training, Awareness and Competence	3.53	**High**
8	Communication	2.60	Medium
9	EMS Documentation	3.47	**High**
10	Document Control	3.27	Medium
11	Operational Control	3.40	**High**
12	Preparation for and Action in Emergency	3.0	Medium
13	Monitoring and Measuring	3.40	**High**
14	Non-conformity and Corrective/Preventative Action	3.27	Medium
15	Records	3.00	Medium
16	EMS Auditing	3.00	Medium
17	Critical Analysis	2.93	Medium

The questionnaire comprised 17 questions, based on the 17 requirements of ISO 14001. A glossary was sent with the questionnaire, explaining the meaning of each of the requirements of the Standard. The aim was to investigate which of these requirements are more important to small companies, and to propose a model that were appropriate to their needs.

When the company considered a requirement to be more important, it attributed a HIGH level of importance,which is equivalent to 5 (five) points in the total calculation. When the requirement was considered to be of MEDIUM importance, 3 (three) points were attributed to the item and when the requirement was considered to be of low or no importance for the EMS in relation to small companies, a LOW level of importance was selected, which was equivalent to 1 (one) point.

After calculating all the data from the completed questionnaires, the researchers decided to identify an average level for each of the requirements in the questionnaire. The following criteria were used:

- for an item with an average between 0.00 and 1.67, the requirement would have a **LOW** level of importance;
- for an item with an average between 1.68 and 3.33, the requirement would have a **MEDIUM** level of importance**;**

- for an item with an average between 3.34 and 5.000, the requirement would have a **HIGH** level of importance;

According to the criteria adopted, of the 17 elements or requirements of an EMS, based in ISO 14001, eight were attributed a high level of importance by the sample chosen. In order of importance: Environmental Policy; Environmental Aspects; Legal Aspects; Structure and Responsibility; Training, Awareness and Competence; EMS Documentation; Operational Control; and, Monitoring and Measuring.

6.3 The Proposed Model

Based on the observations made, the interviews with the five consultants, and the responses from the 83 small companies in the State of Santa Catarina, this study ended with the proposal of an EMS model that is more appropriate to the needs of these organizations. The proposed EMS model has five modules, each of which represents a stage of development of the company in relation to its environmental performance. The idea is that the implementation can be developed in modules, i.e. completing one of the modules leads on to the next.

The first module deals with the organization's decision to implement an EMS and the development of an environmental policy that is committed to the continual improvement of the company's organizational and environmental performance. The second module deals with the collection of the necessary information for carrying out actions related to environmental protection, by identifying environmental aspects and impacts, as well as legal information regulating the company's business. The third model covers the planning of the system and the definition of the structure of the EMS, and the responsibilities of each member of the organization in relation to it, as well as the work of raising awareness at all levels of the organization, seeking to ensure that each employee understands his or her role in the EMS and is totally committed to implementing the system. The fourth module deals with the monitoring of the EMS through its documentation, as well as the control of the company's operations. The fifth and final module is responsible for the monitoring and control of the performance of the system. The models can be sequential, and the basic premise of the model should be continual improvement. Figure 2 below illustrates in a more didactic way, the model and its modules.

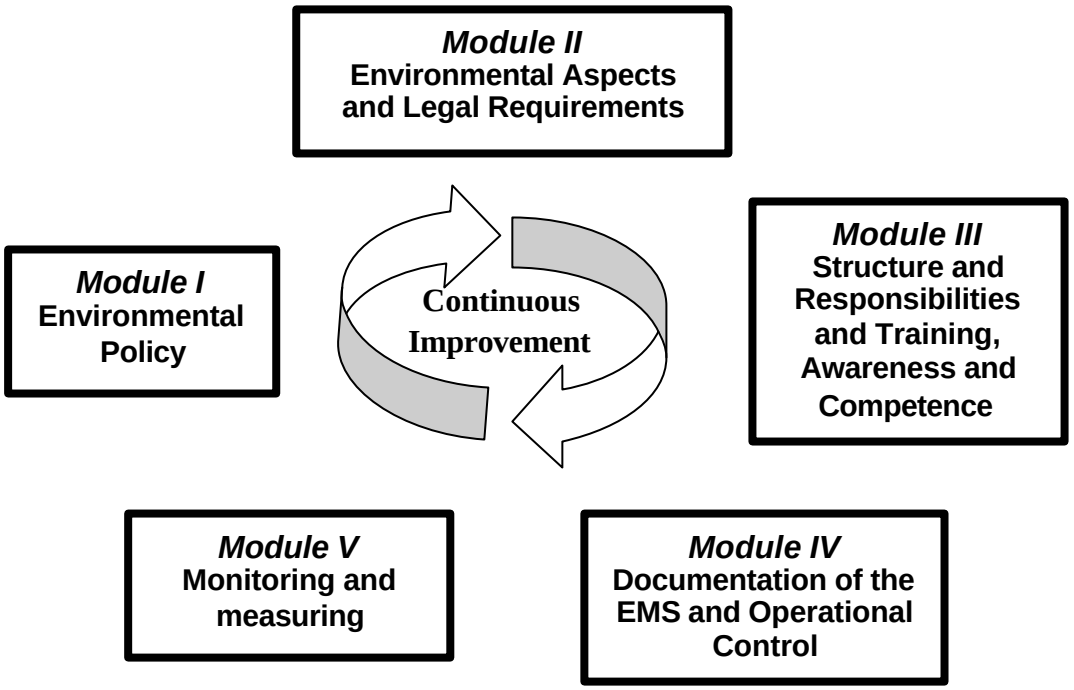

Figure 2 – Illustration of the EMS Model for Small Companies.

Module I – Environmental Policy

Based on Responsible Action, the first point is the commitment of the upper administration to the practices of environmental protection. This commitment should be made clear to all the employees of the company, through the publication of an Environmental Policy. This document should be signed by the highest executive in the company, and should include the company's position regarding the environment and its commitment to continual improvement.

The upper administration should ensure the understanding of the Policy by all employees. In a medium or large organization, there are various ways of doing this: publishing it in the form of a letter from the President, publishing it in the in-house news bulletin, hanging it on the walls, including it in the employee's agenda, etc. In the case of small companies, this can be done, for example, through conversations or informal training.

It was not surprising that environmental policy was the most important item, in terms of level of importance, among the requirements of an EMS for small companies. Despite the major differences that exist among small, medium and large companies, the belief that the policy is the initial item of a system proved to be common sense among the professionals of small companies.

Module II – Environmental Aspects and Legal Requirements

An environmental aspect deals with any element of the activities, products, services, or waste that can interact with the environment. It is deemed significant when it has or could have a significant environmental impact. An environmental impact, in turn, encompasses all the positive or negative effects caused to the environment.

It is therefore important to carry out assessments in all sectors of the organization, in order to determine the environmental aspects and discover which ones have positive or negative potential, and the level of each of them.

Thus, based on the environmental policy, the aspects with negative potential should form part of a program to have their effects mitigated, an attempt to eliminate or control this aspect.

Besides the environmental aspects, another important item of the model is the identification of the legal requirements. The company should also be capable of identifying and keeping up to date with the legal requirements, at federal, state and municipal levels, which relate to the installation and operation of its activities.

The company should carry out an initial investigation on all the international, federal, state and local legislation, as well as the internal requirements, such as standards and guidelines, which are associated with the aspects and impacts of their activities.

At first this may seem like a very complicated task for small companies,but it should be remembered that it is really an important requirement, without which the company will have no knowledge of which of its activities could be infringing some applicable legislation.

Module III – Structure and Responsibilities and Training, Awareness and Competence

Within the structure of the company, all the employees, at all levels, be they operators, support staff, administrators or higher management, must have clearly defined responsibilities within the EMS.

Likewise, the conduction of training and its efficiency are of great importance for the success of an EMS, whether in a large or small company. The company should ensure that all employees are aware of their responsibilities in relation to the law, as well as all the procedures and standards of the company. It should be verified that all the employees understand these procedures.

The company should ensure that everybody is aware of the importance of adhering to the system, the potential environmental effects and their roles and responsibilities.

Module IV – Documentation of the EMS and Operational Control

An environmental management system requires a system of documentation in order to collect, analyze record and retrieve information. Decisions are generally related to solving problems.

In a traditional implementation process, documentation is needed to describe the EMS being implemented. To implement an environmental management system, some documents need to be prepared. These documents consist of: The Environmental Management Manual, Procedures, Work Instructions and Records. To manage these documents, specific control techniques need to be implemented.

The Environmental Management Manual is a document that sets out the company's policy on the subject. It contains a description of the system being implemented. It usually contains the Environmental Policy and the company's organizational structure, including the position responsible for ensuring the maintenance of the environmental system activities , as well as a list of all the company's procedures.

Each of the requirements of the Standard should be detailed in organizational procedures. These procedures are used to clarify which activities will be carried out, by whom, under what conditions and with what objectives. In general, the procedure explains the activities and responsibilities of the different departments of the organization involved in an activity. These relate more to management than to technology.

The aim of the operational control of an EMS is to identify the operations and activities associated with the more important environmental aspects that should have some type of control.

It should be stressed that the proposal for this module goes against the views of the interviewed professionals, who work with EMS implementation. For them, control is something that should be minimized in an EMS model that is adapted for small organizations. Contrary to this idea is the view of the professionals who responded to the questionnaire and represent small companies in the research. According to the responses obtained, documentation and operational control are important requirements for the EMS in their organizations.

Module V – Monitoring and measuring

The item monitoring and measuring was another surprise in the responses obtained from the small companies. Monitoring and measuring are also types of control and, once

again, this factor was mentioned to the detriment of the other requirements that did not obtain a high level of importance, such as “corrective and preventative actions”, “environmental auditing”, or “critical analysis”. This may have been due to a false understanding, on the part of those who responded to the questionnaires, that the requirement monitoring and measuring corresponds somewhat to auditing and facilitates in the critical analysis.

An alternative to make the proposed model more flexible would be to replace this monitoring and measuring module by one dealing with the EMS auditing requirements and critical analysis of the system, ignoring the information obtained through the questionnaires.

7. Conclusions

The results obtained corroborate the arguments of the authors who defend that small companies need proper and special models for their reality, as also pointed Scherer (1999), Cancellier (2001 and 2005), Campos (2001), Lerípio (2001), among others.

The theoretical revision carried out showed that the models and systems of environmental management present complex stages with high costs for small companies or, when simpler and applicable, present restrictions regarding extent and competence. Thus, the main contribution of EMS system presented herein consists of being constructed and rooted in the reality of the small companies, becoming closer to this type of organization than the traditional models.

During the research conducted to develop the EMS model for small companies, some differences were observed between these companies and larger companies, which need to be taken into consideration when implementing any kind of management or process control system. One of these relates to the knowledge and to the interest to take part in the implementation of environmental management projects. Due to market demands and the availability of resources, large companies are much more willing to take part in projects related to the theme.

It was surprising that small companies, imitating the model of larger companies, were concerned with complying with the legal aspects that are subject to inspections. Another surprise was the presence of the three requirements relating to control – system documentation, operational control and monitoring and measuring – among the eight most important requirements for an EMS in small companies, contradicting even the view of the professionals who took part in the first stage of the research.

In relation to the model types presented by Scherer (1999), the EMS implementation model for small companies is closer to the second type, since it includes concerns with

improving environmental performance, and pays more attention to controls through monitoring and measurement. However, this model does not include in the implementation process important concepts such as: participatory management, organizational learning and productive and economic eco-efficiency, all of which are characteristics of models of the second type.

Despite the small number of companies and professionals in the research, when compared with the total number of small companies in the State of Santa Catarina, this study can make a contribution in the sense that it seeks to explore a theme that traditionally belongs more to the world of larger organizations within the scope of small organizations. The low adherence to the research may be derived from various factors, including the extremely low number of small companies that export their products (1.7% of the total products exported in Brazil). The pressure to implement an EMS in small companies is not as great as it is on large companies.

There are similarities and differences between the EMS model for small companies and the main implementation models used for large companies. The similarities lie in the fact that the environmental policy is the point of departure for both, and the order of implementation is similar. The main differences relate to the number of requirements to be implemented (17 for large companies and 8 for small companies) and the objective of the implementation. While in large companies the main focus is the certification, in this EMS model for small companies, the focus should always be on continual improvement and reduction of environmental impacts, since certification with the implementation of just 8 of the 17 requirements is unfeasible.

Thus, the EMS model for small companies should not be merely a replica of that used in large or even medium organizations. Aspects such as the availability of labor, time and differentiated financial resources may be the main reasons for this fact.

This research told the visions of the professionals working in the environmental area and of the small companies interested in good environmental management practices. It should be clear that that the presented proposal is exhaustive and the EMS model presented is not unrestricted or the most appropriate for the studied organizations, independently of their nature. As a continuation of this work, two new questionnaires are being applied to the suppliers and customers of the searched companies. This action intends to close the chain that includes information from the consultants, the micro and small companies, and their customers and suppliers, thus verifying which requirements of ISO 14001 are considered more important for an EMS in these companies.

References

ALBERTON, Anete. **Meio Ambiente e Desempenho econômico-Financeiro**: o impacto da ISO 14001 nas empresas brasileiras. 2003. 307 p. Tese (Doutorado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **NBR ISO 14001**: Sistemas de Gestão Ambiental – Diretrizes para Implementação. Rio de Janeiro: ABNT, 1996.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. **NBR ISO 14004**: Sistemas de Gestão Ambiental – Diretrizes gerais sobre princípios, sistemas e técnicas de apoio. Rio de Janeiro: ABNT, 1996.

BATALHA, Mário Otávio, DEMORI, Flávio. **A pequena e média indústria em Santa Catarina.** Florianópolis: Editora da UFSC, 1990.

CAMPOS, Lucila Maria de Souza. **SGADA – Sistema de Gestão e Avaliação de Desempenho Ambiental:** Uma Proposta de Implementação. 2001. 183 p. Tese (Doutorado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

CANCELLIER, Éverton Luís Pellizzaro de Lorenzi. A Formulação de Estratégias em Pequenas Empresas: um Estudo na Pequena Indústria Catarinense. In: ENCONTRO NACIONAL DA ASSOCIAÇÃO NACIONAL DOS PROGRAMAS DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO (ENANPAD), 25., 2001, São Paulo. **Anais...** São Paulo: ANPAD, 2001. 11 p. 1 CD-ROM.

CANCELLIER, Éverton Luís Pellizzaro de Lorenzi. **Sistema de monitoramento ambiental para a pequena empresa – um estudo em empresas de base tecnológica**. 2005. 181 p. Tese (Doutorado em Administração) – Programa de Pós-Graduação em Administração (PPGA), Universidade de São Paulo (USP), São Paulo.

CANDIDO, Marcondes da Silva. **Gestão da Qualidade em Pequenas Empresas:** uma contribuição aos modelos de implantação. 1998. Dissertação (Mestrado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

CHAGAS, Fernando Celso Dolabela. **O segredo de Luíza.** São Paulo: Cultura Editores Associados, 1999.

DAROIT, Doriana; NASCIMENTO, Luis Felipe. A busca da qualidade ambiental como incentivo à produção de inovações. In: ENCONTRO NACIONAL DA ASSOCIAÇÃO

NACIONAL DOS PROGRAMAS DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO (ENANPAD), 26., 2002, Salvador. **Anais…** Salvador: ANPAD, 2002. 10 p. 1 CD-ROM.

DEGEN, Ronald. **O empreendedor: fundamentos da iniciativa empresarial.** São Paulo: McGraw-Hill, 1989.

DONAIRE, Denis. **Gestão ambiental na empresa**. São Paulo: Atlas, 1995.

FRANÇA DE PAULA, Oscar Luiz. **Desenvolvimento de PCP para Micro e Pequenas Empresas Utilizando como Base o PERT-CPM.** 2001. 115 p. Dissertação (Mestrado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

GIL, Antonio Carlos **Métodos e Técnicas de Pesquisa Social**. São Paulo: Atlas, 1994.

GILBERT, Michael J. **ISO 14001 / BS 7750**: Sistema de Gerenciamento Ambiental. São Paulo: IMAM, 1995.

GOEDERT, Adriano Rogério. **Redes de Inovação Tecnológica para Pequenas e Médias Empresas:** Um estudo Exploratório para o Setor Apícola Catarinense. Exame de qualificação, PPGEP/UFSC, 1999.

KLASSEN, Robert D.; McLAUGHLIN, Curtis P. The impact of environmental management on firm performance. **Management Science**, v. 42, n. 8, p. 1199-1213, Aug. 1996.

LERÍPIO, Alexandre de Ávila. **GAIA – Um Método de Gerenciamento de Aspectos e Impactos Ambientais**. 2001. 174 p. Tese (Doutorado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

LONGENECKER, Justin G.; MOORE, Carlos W.; PETTY, J. William. **Administração de pequenas empresas:** ênfase na gerência empresarial. São Paulo: Makron Books, 1997.

MAIMON, Dália. **Modelo ISO 14001 Passo a Passo**. Rio de Janeiro: Qualitymark, 1999.

MAIMON, Dália. **Passaporte Verde: Gestão ambiental e Competitividade.** Rio de Janeiro: Qualitymark, 1996.

MALUCHE, Maria Aparecida. **Modelo de Controle da Produção Para Pequenas Empresas Como Garantia da Qualidade.** 2000. 247 p. Dissertação (Mestrado em Engenharia de Produção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

MOREIRA, Maria Suely. **Estratégia e implantação do Sistema de Gestão Ambiental** (Modelo ISO 14000). Belo Horizonte: Editora de Desenvolvimento Gerencial, 2001.

MOREIRA, Maria Suely. **Estratégia e implantação do Sistema de Gestão Ambiental** (Modelo ISO 14000). Belo Horizonte: Editora de Desenvolvimento Gerencial, 2001.

OTT, Ernani; DALMAGRO, Caroline. Gestão e contabilidade ambiental. In: ASSEMBLÉIA DO CONSELHO LATINO-AMERICANO DE ESCOLAS DE ADMINISTRAÇÃO (CLADEA), 37., 2002, Porto Alegre. **Anais...** Porto Alegre: EA – Escola de Administração/UFRGS, 2002. 10 p. 1 CD-ROM.

PORTER, Michael E.; VAN DER LINDE, Claas. Green and competitive. **Harvard Business Review**, p. 120-134, Sept./Oct. 1995a.

PORTER, Michael E.; VAN DER LINDE, Claas. Toward a new conception of the environment-competitiveness relationship. **Journal of Economic Perspectives**, v. 9, n. 4, p. 97-118, Fall 1995b.

RACCIOPPI, Eduardo. Cultura ambiental na empresa. **Banas Ambiental**, Ano 1, n. 5, Abril de 2000.

REIS, Helvécio Luiz. Os impactos de um Sistema de Gestão Ambiental no desempenho financeiro das empresas: um estudo de caso. In: ENCONTRO NACIONAL DA ASSOCIAÇÃO NACIONAL DOS PROGRAMAS DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO (ENANPAD), 26., 2002, Salvador. **Anais...** Salvador: ANPAD, 2002. 13 p. 1 CD-ROM.

REIS, Maurício J. L. **ISO 14000 – Gerenciamento Ambiental**: um novo desafio para a sua competitividade. Rio de Janeiro: Qualitymark, 1995.

REVISTA MEIO AMBIENTE INDUSTRIAL. O Brasil atinge a marca das 600 empresas certificadas em conformidade com a norma ISO 14001. São Paulo: Editora Tocalino Ltda., ano VII, 38. ed., n. 37, jul./ago. 2002. 202 p. Edição Especial.

RUSSO, Michael V.; FOUTS, Paul A. A resource-based perspective on corporate environmental performance and profitability. **Academy of Management Journal**, v. 40, n. 3, p. 534-559, 1997.

SCHERER, Ricardo. **Sistema de Gestão Ambiental**: Ecofênix – um modelo de implementação e aprendizagem. 1999. 314 p. Exame de Qualificação (Doutorado em Engenharia de Produtção) – Programa de Pós-Graduação em Engenharia de Produção (PPGEP), Universidade Federal de Santa Catarina (UFSC), Florianópolis.

SEBRAE-SP http://www.sebraesp.com.br; SEBRAE – 1998, acesso em 08/07/2002.

SILVA, Anielson Barbosa da. A pequena empresa na busca da excelência. João Pessoa: Universitária, 1998.

MELARAGNO, M. L. Banco Mundial: employment and development of small enterprises-sector policy paper. Revista de Administração de Empresas, v. 22, n. 4, p.82-84, 1982.

REVISTA PEQUENAS EMPRESAS GRANDES NEGÓCIOS. Rio de Janeiro: Globo, v. 10, n. 118, 1998.

STURM, Andreas; UPASENA, Suji. **ISO 14001 – Implementing a Environmental Management System** (manual version 2.02), 1998.

VALLE, Cyro Eyer do. **Como se preparar para as normas ISO 14000**. São Paulo: Pioneira, 1995.

VITERBO JÚNIOR, Ênio. **Sistema integrado de Gestão Ambiental:** Como implementar um sistema de gestão que atenda à norma ISO 14001 a partir de um sistema baseado na norma ISO 9000. São Paulo: Aquariana, 1998.

Annex A – Questionnaire: Professionals

1 – Interviewee's personal data:

Name:

Function:

Local of work:

How long have you worked with environmental:

How long have you worked with EMS:

2 – Are the companies for which you work nowadays (or have worked) concerned with environmental issues? Please give details (in your opinion): in what way, why, since when?

3 – Related to your professional experience, have you ever worked with EMS implementation in Small companies? In Santa Catarina? What was your function in the process? For how long?

4 – Our research is related to small companies. In your opinion, which are the main problems or needs for small companies related to environmental questions? Are they prepared to formal environmental systems?

5 – In our research, until this moment, we have learned that in an EMS implementation it is impossible to treat in the same way small, medium and large companies. In your opinion, which are the main differences, related to environmental questions (not only EMS) among small, medium and large companies? Do you think that these environmental questions should be treated in different ways? Why? What about EMS implementation?

6 – In your opinion, which are the main barriers for those small companies that decide to implement an EMS?

7 – In your opinion, which are the factors that influence executives to invest in environmental protection or prevention? Or in an EMS? Which are the factors that influence them not to invest?

8 – In a large or medium company that is implementing an EMS, which are the factors that should delay or suspend the implementation? How does that compare to the case in a small company?

9 – Do the methodologies that you know for EMS implementation give attention or have any differential for small companies?

10 – From the 17 requirements of ISO 14001, which are, in your opinion, the most important ones for small companies? Why?

11 – Regarding the EMS 17 requirements that should be more easily absorbed by small companies, do you see any strategy that could help this absorption?

12 – In your opinion, what should be the priority in a small company: Aspects and Impacts or Responsibility and Structure? Why?

Annex B – Questionnaire: Small Companies in Santa Catarina State (Brazil)

Read the actions described below and choose if it's **very much important** (5), **important** (3) or **not important** (1) for your company.

	5	3	1
To define an Environmental Policy, or a principle or commitment in relation to the environment			
To identify the environmental aspects of it's the company's activities, products or services, on which it has influence and that can be controlled, in order to determine those that have or can have significant impacts.			
Your company would be capable to identify and to stay up to date with federal, state and municipal legal matters, related to installation requirements and the operation of the activity developed.			
To establish objectives and environmental goals, based on the policies defined for the company for each level of the organization taking into consideration the legal requirements, the environmental aspects, technological and financial resources, as well as operational requirements and the vision of the interested people of the company.			
To establish and to keep a program of environmental management describing the objectives and goals of the organization to be reached, including a chronogram and responsible staff for the operational actions.			
To establish specific representatives who can, independently of other attributions, assure that the procedures to reach the objectives and goals are established, implemented and kept, informing the high administration about the performance so that it can be analyzed.			
To identify the necessities of training for employees and to assure that they understand the meaning of the environmental impacts (real and potential), the benefits to the environment resulting from the improvement of their personal performance, and their function and responsibility in emergency situations.			
To establish standards of internal communication between the levels and functions of the organization and for actions such as receiving documentation and replying to the pertinent communications from external people interested in the company.			
To establish and keep information organized, in paper or electronic, regarding law, norms, standards, licenses, specific programs of management, operational inventories of effluent emissions and residues, procedures, systems of control and monitoring and measurement data.			
To guarantee that documents can be located and periodically analyzed and revised by authorized and responsible staff whenever necessary; that up to date versions of pertinent documents are available in all the places where essential operations are executed; and that the obsolete documents are readily removed from all the points of emission and use.			
To identify operations and activities associates to environmental aspects; to plan such activities in order to assure that established administrative procedures are executed under specific conditions..			
To analyze and to revise, whenever necessary, emergency preparedness and response procedures; to revise procedures periodically, particularly after the occurrence of accidents or emergency situations.			
To carry out periodic monitoring and measurement of the environmental performance, environmental attendance to the legislation and pertinent regulations through operational controls and equipments, control or registered evaluations.			
To define responsibility and authority to investigate imperfections in the procedures established by the organization, adopting measures to mitigate any impacts.			
To maintain environmental registers, including training registers and the results of audit reports and critical analyses, guaranteeing that these registers are readable and identifiable.			
To determine if the procedures for the fulfillment of the environmental objectives and goals had been implemented and understood and are in conformity to environmental management by means of periodic audits.			
Periodic revision of the principles, objectives and goals of the organization through the critical analysis carried out by the high administration.			