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''CLEANER PRODUCTION INITIATIVES AND CHALLENGES FOR A SUSTAINABLE WORLD''

Environmental Indicators of the Industrial Companies in São Paulo

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Abstract

A major challenge for organizations is to establish an appropriate measure for their performance, considering the growing need for inclusion of more stakeholders other than the traditional ones and issues related to sustainability, such as the insertion of a Triple Bottom Line approach - which comprises the economic, social and environmental dimensions. The aim of this paper is to highlight the use of indicators within the environmental dimension, using as its basis the proposal of the GRI (Global Reporting Initiative). The field research is of the survey type and had the participation of 149 companies both in the industry sector and associated to CIESP (Center of Industries of the State of São Paulo). Its main results suggest different uses of environmental indicators, with an emphasis on those more directly linked to the industrial productive processes.

Keywords: *environmental indicators, performance measurement, Global Reporting Initiative (GRI).*

1 Introduction

Contemporary society has increasingly manifested its concern with social and environmental issues. More and more, topics such as global warming, clean energy sources, lack of water, pollution and misuse of natural resources, among others, emphasize the discussions from a vision that includes aspects of sustainability – the initiatives in the short term that are taken without compromising resources in the long term, while maintaining the conditions for future generations (WCED, 1987).

In this fashion, companies are key elements in this debate since they are holders of great economic, social and political power, and may influence on a large extent the context in which they act (Hart, 2007). Therefore, companies have begun to face these issues as critical to the development of their activities that, traditionally, only have dealt with concerns of a financial and economic nature.

The issue of performance in the pursuit for sustainability as a license to operate is criticized by Warhust (2002), who advocates that one company should go beyond compliance and that independent performance control mechanisms should be created; and also that such mechanisms meet the differing perspectives and needs of different

stakeholders, particularly those belonging to the communities most directly affected by the actions of that organization (Neely et al, 2002).

Thus, discussions on relations between business and sustainability have evolved continuously, attracting the attention of both the academia, which has responded with an increasing series of researches, and the organizations themselves, which have largely been involved in these discussions (Kolk; Mauser, 2002, p. 15).

One of the basic concepts of sustainability is the "Triple Bottom Line" (3BL). This concept encompasses three distinct dimensions: "(i) economic - a sustainable economic system must be able to produce products and services in a continuous way, without taxes or without generating financial problems to its various participants in the value chain; (ii) social - a social system achieves sustainable social justice and income generating opportunities through social services such as health and education, and equal treatment to all its members; and (iii) environmental - an environmentally sustainable system does not compromise the foundation of resources, either renewable or nonrenewable, using them sparingly, and seeking to maintain biodiversity, atmospheric stability and other functions of the ecosystem" (Harris; Wise; Gallagher; Goodwin, 2001, xxix). Despite contrary opinions to the concept, (MacDonald; Norman, 2004, 2007), in which the impossibility of its effective implementation is argued, the 3BL concept has been expanded since its acceptance and has been more and more widespread (Elkington, 2001).

This paper will examine one of the aspects of the Triple Bottom Line approach, specifically the environmental dimension. According to Perotto et al. (2008 p. 517), in the field of environmental management in companies, there are different definitions regarding environmental performance - considered as a result of managing the environmental aspects of a company - but they all rely on the need to raise what these aspects are. Therefore, environmental performance can be understood as the set of "measurable outcomes of managing an organization about its environmental aspects[1] (causes)" (Perotto, et al., 2008, p. 517).

From the understanding of what the environmental performance in an organization really is, one must define the indicators that would represent it. And there are a number of possible meanings for it (Tyteca, 1996; Bennett et al, 1998; Johnston et al, 2001; Metcalf et al, 1996; Jasch, 2000). According to ISO 14031, environmental performance indicators (EPIs) are expressions that provide specific information about the organization's environmental performance (Perotto et al., 2008, p. 516).

Strictly speaking, they should reflect the environmental efficiency of a production process involving input and output quantities (Tyteca, 2004 p. 4); in a practical sense, they measure the environmental performance of an organization and compare the results with goals established by their managers (Hermann et al., 2007, p. 1787).

Moreover, in the so-called information age, we see that the current wide availability of environmental data and information favors the inclusion of such issues at different levels of society, from the consumer's purchasing decision for environmentally friendly products to international and global political issues (Briggs, 2001, p. 90-91).

[1] Environmental aspect is defined as part of the activities, products or services that can interact with the environment, provoking both beneficial and adverse impacts. In this sense, the environmental aspect is the cause and the environmental impact is the effect (BARBIERI, 2006, p. 155).

Due to the aforementioned reasons, organizations need to know the results of their actions, precisely in order to manage them in a more effective and responsible manner, particularly when we treat an important subject such as environmental impacts.

In short, this study aims to identify the use of the main elements relating to the employment of environmental indicators of industrial companies in the State of Sao Paulo. The sample consisted of 149 companies associated with the CIESP (Center of the Industries of the State of Sao Paulo). The set of environmental indicators used in the research was based on the relation proposed by the guidelines of the GRI (Global Reporting Initiative), which is considered an important international reference when it comes to sustainability reports.

2 Methodology

This study aims to identify the use of sustainability indicators for industrial companies, by presenting the results of a survey-type research project, conducted with managers of these companies. Survey is a tool that consists of a "self-reporting" of facts or opinions that can be applied to a homogeneous group, with at least one common characteristic, as belonging to the same industry, for example (Flynn, B.B.; Kakibara; Schroeder; Bates, Flynn, E.J., 1990). Using a survey-type research is "common and popular in researches in management"; often used to answer “the questions who, what, where, and how much”, "in exploratory and descriptive researches," and considered "important for people in general and as easy to explain, as to understand"(Saunders; Lewis; Thornhill, p.138).

The instrument of data collection consisted of a nine-item list taken from the sustainability indicators of Global Reporting Initiative (GRI) guidelines. The GRI is a network with the participation of experts and representatives from various sectors of society (business, non-governmental organizations, experts, government agencies, among others), present in over 40 countries around the world, whose working groups and governance bodies determines the GRI guidelines, in order to help organizations to develop their sustainability reporting processes (GRI, 2008). Throughout the discussions, standards and procedures for determining the process of putting together sustainability reports were set up, with the inclusion of organization’s stakeholders and to describe the economic, environmental and social impacts of an organization (GRI, 2008).

Table 1 shows the list of aspects defined by the GRI guidelines contained in the instrument for data collection. It consisted of a list of nine aspects related to environmental indicators proposed by GRI aiming to identify the degree of implementation for each of them, respecting a scale of 1 to 7, with 1 being "not at all" and 7 "at a great extent" with verbal anchors at the extremes.

Table 1: Dimensions and aspects of the GRI indicators

	Aspects related by GRI
Environmental Indicators	Indicators relating to materials (use and recycling).
	Indicators relating to energy (direct or indirect energy consumption).
	Indicators relating to water (withdrawal by source/ spring).
	Indicators for biodiversity (biodiversity value and impacts on areas owned or administered by the organization).
	Indicators relating to emissions, effluents and waste.

	Indicators relating to environmental aspects of products and services (the mitigation of environmental impacts and recovery of packaging).
	Indicators relating to environmental compliance (fines and penalties for environmental non-compliances).
	Indicators relating to transportation (impacts of transporting goods and workers).
	Indicators relating to general environmental issues (investment on environmental protection).

Source: Adapted from GRI (2008)

The sampling is of the intentional type, i.e., following a criterion for judging who meets the criteria established by the researcher (Cooper; Schindler, 2003, p. 169) and of the volunteer type, i.e., individuals can express freely their desire to take part in the survey, from a communication starting point (Saunders; Lewis; Thornhill, 2007, p. 233). It is therefore a non-probability sample, with a characteristic that is "arbitrary (non-random) and subjective" (Cooper; Schindler, 2003, p. 152). Despite the disadvantages in terms of generalization and extrapolation typical of non-probability sampling (Sampiero; Collado; Lucio, 2003, p. 326), the procedure may allow for "obtaining rich information to explore the research question" (Saunders; Lewis; Thornhill, p. 226), given the characteristics and purposes of this study.

4 Results and discussion

Responsible for more than 31% of Brazilian GDP (São Paulo, 2010), the State of Sao Paulo has a large group of industrial companies responsible for hiring more than 2.5 million people and for a net revenue of nearly 593 billion Brazilian Reais (IBGE, 2007).

There are a number of institutions linked to the industry in the State of São Paulo. One of them is the CIESP (Center of Industries of State of São Paulo). This is a private non-profit organization which brings together industries and other companies linked to the productive sector, as well as companies and associations whose objectives are activities directly related to the interests of industry in the state (CIESP, 2010). The authors thank CIESP that allowed the dispatch of the questionnaire to all their members – around 8,000 –, which enabled this research.

Due to the complexity of the environmental issues nature, in this study we chose to use the list of the nine aspects that encompass the environmental indicators proposed by the GRI (see Table 1, above). This list acts as a proxy to treat the aspects that should be considered relevant in terms of the environmental dimension for the analyzed companies.

The reliability of an instrument of data collection refers to the consistence of the measurement of a concept, enabling the replication of this instrument in other occasions. The most used method to measure the reliability is by calculating the Cronbach's Alpha (Cooper; Schindler, 2003; Van Der Velde; Jansen; Anderson, 2004). As criteria for levels of reliability, Hair, Black, Barry and Anderson (1998, p. 118) recommend that the Alpha calculated should be not less than 0.7 for general studies and 0.6 for exploratory studies. Thus, Cronbach's Alpha was calculated for the set of variables in the instrument of data collection, and the result was 0.929, considering the nine items. As this value was higher than the 0.7, the instrument of data collection may be considered reliable.

The following Table 2 shows the main descriptive measures obtained in respect to the set of indicators presented in the research. The environmental indicators studied showed different behaviors for the companies. *Energy* was the one which obtained the highest mean, well above the others and the only above 5. It is assumed that this can occur due to the nature of the indicator and the procedures it refers to: both the energy used in productive processes and in non-productive areas have relatively simple established means of control and are vital items (and often of high value) in the composition of cost, which may even compromise the competitiveness of a company. Otherwise, companies may be investing in more efficient use of energy as a driving force and pursuing alternatives that show better environmental benefits in the view of the ISO 50.000 regulation, whose publication is scheduled for the third quarter of 2011 and whose certification by the company will facilitate the communication of this effort.

Table 2: Variables studied and statistical analysis

Variable Description	Mean	Median	Mode	Standard Deviation	Variance	Minimum Value	Maximum value
Materials	4.5034	5	4	1.8586	3.4544	1	7
Energy	5.0470	5	7	1.8022	3.2478	1	7
Water	4.5168	5	6	2.1264	4.5217	1	7
Biodiversity	3.8054	4	1	2.2138	4.9011	1	7
Emissions, effluents, Waste	4.6980	5	7	2.0491	4.1987	1	7
Environmental Aspects Prod./Serv.	4.4362	5	7	2.0478	4.1935	1	7
Environmental Conformity	4.3289	5	7	2.2763	5.1817	1	7
Transport	4.2617	4	4	1.9707	3.8837	1	7
General Environmental Aspects	4.3490	4	4	2.0266	4.1071	1	7
Total (9 items)	4.4400	4,67	6	1.636	2.677	1	7

Secondly, the indicator on *Emissions* stands out, ranking second on mean. The assumption here is that because of the possibility of being fined by the public agency responsible, companies have begun employ effective controls for their emissions; otherwise, issues related to uncontrolled emissions, if disseminated by the press would also severely harm the company regarding its image.

Coming in third place is the indicator related to *Water*, also an important component in many production processes and to which growing importance has been given in recent years and which has been the object of concern by some government agencies, through campaigns of planned and conscious use as well as the incentive of wastewater reuse in production processes.

At the other end of the table, *Biodiversity* indicators show the lowest average – less than 4 and with mode 1, which means that most of the sample awarded minimum scores to that item. A likely explanation is that this would occur in the light of the location of the companies, the State of Sao Paulo, an area in which biodiversity –

despite always relevant – has been less emphasized than in other areas of the country, richer in fauna and flora.

With respect to the dispersion identified in the sample, indicators of *Energy* and *Materials* have a standard deviation lower than the others. Again, the assumption is that this occurs due to the fact that they are direct components of production costs, which would require greater stringency of control, reflecting on its importance. In addition, the indicator on *Energy* held mode 7, ratifying its importance, because it was the most frequent score in this topic for respondent companies.

The item that presented the highest dispersion was *Environmental Compliance*. The significance of this result is that there are companies in the two ends of a continuum: those that have policies and procedures with greater concern regarding Environmental Compliance and another group still with shortcomings in this area, which may be regarded as natural, according to the heterogeneity of the sample, which contains companies in several stages of maturity, with more than 73% of SMEs companies.

As a last highlight, all items were awarded scores between 1 and 7. Having as premise that the answers were reliable, it can be noticed that there are companies which still do not give any importance (according to their scoring 1) to indicators relating to the environmental dimension, despite all the regulation and debates on the theme.

5 Conclusions

From the growing debate and consolidation of the relevance that surrounds the theme of sustainability, different management models have been developed to obtain results from the perspective of the sustainable development (Barbieri; Simantob, 2007). However, the question of the management and operationalization of sustainability still needs further development. It is also common to hear of sustainability indicators, but there is little discussion concerning the actual practicality and applicability of these concepts in organizations.

The research showed that the concentration of the use of environmental indicators happens precisely in those that reflect more directly the activities of the company and represent direct impacts on its cost and its competitiveness. As a sequence to this work, we suggest an investigation of the reasons for the use of this type of indicators over others. After that, it would be possible to say with greater conviction what direction the management of companies' environmental performance is taking: if only to fulfill legal requirements and, therefore, having a reactive posture to meet the demands or if there is a consistent concern, in fact, with sustainability itself.

Thus, in general, a change can be noticed - in fact, in different fronts and in different levels and speeds, as noted by the results of the research - in the organizational context, as pointed out by Elkington (2001, p. 355): "The transition to sustainability will require us to make the shift from emphasis on economic growth (with its emphasis on quantity) to the development of sustainability (with its focus on economic, environmental and social quality)." It is, therefore, a new way to see the businesses and organizations, which in turn, demand new knowledge, new management practices, and new perspectives and skills from their managers and employees.

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