RESEARCH ARTICLE

RANKING COMPANY'S BEST PRACTICES FOLLOWING THEIR ENVIRONMENTAL PERFORMANCES

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ABSTRACT

It is certain that some company's activities have an impact on natural environment. These impacts can be related to resources use by company, pollution generation, consequences of its activities on natural habitats.etc. Thus, to reduce their environmental impact, companies should adopt an integrated approach which takes into account the wider implications of their best practices from an environmental point of view.The purpose of this work is to provide both a simplified and quantified tool for a more complex composition of several environmental issues. It can be used to inform decision makers about development trends in their companies. However, it can also be included in a more focused context, such as thinking about company state as regards sustainability, providing informations to critical decisions of process or being able to form the basis for running company in a certain direction.Through this paper, we want to make available a way to assess environmental performance of company's best practices before to decide in their applications or not.

*Key words:*Environmental performance; Company; Best practices;Issue; Analytic Hierarchy Process (AHP) method.

1. INTRODUCTION

Environmental management, or ecomanagement, refers to management methods of an entity (company, service, etc.) designed to consider environmental impact of its activities, to evaluate this impact and to reduce it. Environmental management is part of a sustainable development perspective. Entity motivations can be of several types: to respect regulations, to improve entity image, to improve relations with local residents (for polluting entities), to make savings, to obtain an environmental certification demanded by entity customers or an ecolabel.Also, environmental management system is defined as "component of overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources to establish, implement, achieve, review and maintain environmental policy "(ISO 14050 standard which defines the EMS), the latter uses tools such as ecobalance to determine impact of organism's activities on environment. Environmental impacts are assessed according to their severity and frequency. Potential effects should also be considered, for example in the event of an accident.Awareness of co-responsibility of company's managers in face of environment has only emerged as for all other population groups, when collectively, researchers have tried to impose resources scarcity principle and to consider it as a universal fact. Entrepreneur, whose efforts are focused on a mini-parcel of ecosystem - namely his own company - needs tools and methods to take on this responsibility (Bracker, 1998). These tools and methods concern his job, in its technical aspects, but also financials, commercials, humans ... etc.Reluctance of managers to consider environment in daily life of company is mainly related to the lack of tools, methods and training applicable to this field.

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2. Environmental performances matrix of company's best practices

An environmental impact can be defined as an environment modification, because of the proven or supposed human intervention, direct or indirect, which can have a detrimental effect on the sustainability of natural environment and ecosystems, and, a priori, therefore, on human health (Baumann, 2011). Literature analysis allows us to select four major issues which can characterize company's environmental performance, which are Environmental Management, Resources Use, Pollution and Hazardous Materials.Company is organized around several processes, and each process includes one or more best practice of management (P_k). The latter is appreciated by its degree of implementation. In figure 1, we present links between a company characterization model and environmental performancesof best practices of this company.
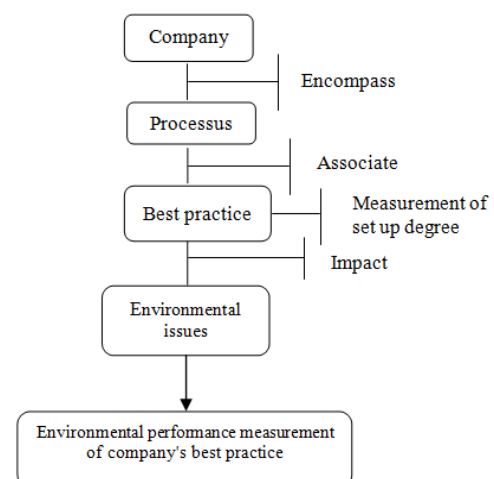

Figure 1. Model of environmental performance evaluation of company's best practice

2.1 Best practices of company's management

Definition

In literature are several definitions of "Best Practice", among which we quote:

- "... any practice, knowledge or skill which has demonstrated its efficiency or value in one part of company and is applicable in another part of company" (Prax, 2000).
- "... a process, a technique, the innovative use of a technology, equipment or resource which has generated a significant improvement in cost, quality, performance, safety, environment or any other measurable factor impacting the organization" (Bronet, 2006).

Choice of best practices of company's management: There is a lot of literature on company's management practices. To identify the best practices of company's management most commonly implemented, we have based on three well-known references in the logistics field: SCOR (SCC, 2008), ASLOG (ASLOG, 2006) and EVALOG (Galia, 2007). The characterization of supply chains management in the form of processes, allowed to select 26 practices in the literature, by trying to homogenize our selection among the processes, more than being aware of the importance of support processes, we focused on the processes of realization, which are the processes carrying value.

2.2 Maturity levels of practices: Maturity of a practice is characterized by two properties (Baumann, 2011):

- **Practice stability**: Refers to the regularity of establishment of this one by company, it can be occasional (according to opportunities) or systematic.
- **Practice extent**: Refers to the perimeter on which it extends. It may concern only some products /services or all products/services.

And as a practice occasionally installed on some products will not produce the same impacts as a systematic practice implemented on all products, (Baumann, 2011) proposes four degrees of maturity (Figure 2):

- **Degree 0**: Practice is little or no implemented. Therefore, its implementation will not impact significantly the criteria.
- **Degree 1**: Occasionally, this practice is in place for certain products/services of the logistic chain.
- **Degree 2**: Practice is implementing systematically for selected product/service or occasionally for all products/services.
- **Degree 3**: Practice is implementing consistently for all its products/services.

2.3 Impacts assessment scale

We have chosen a mathematical normalization which consists in applying to data a mathematical transformation (function) which makes sure that they remain between a lower bound and an upper bound (for example, - 1 and + 1 or 0 and 1). Then we propose to evaluate impacts of each management practice (P_k) according to a scale of three qualitative values:

(+1):If impact of practice (P_k) is seen as positive on a given criteria;
(0):If impact of practice (P_k) is seen as neutral on a given criteria;

(-1):If impact of practice (P_k) is seen as positive on a given criteria;

3. Model of environmental performance evaluation of company's best practices

During aggregation we faced a difficulty which affects the inequality of importance of environmental issues (corporate strategy, the type of industry, ...) that leads us to weight issues to express their importance relative. To do this, we use weighting principle of AHP (Analytic Hierarchy Process)method (Saaty, 1980). AHP method is simple to use and allows to consider both quantitative and qualitative criteria. In addition, objectivity lack in assessing the relative importance of the criteria is reduced (Forman and Gass, 2001). We adopt this method to calculate composite index of environmental performance of company's best practices. calculating method of this index is divided into several parts (Figure 3).
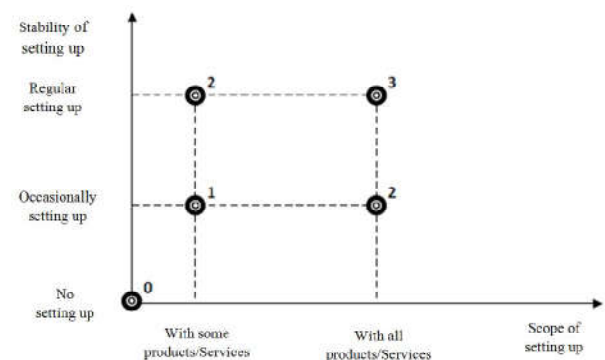

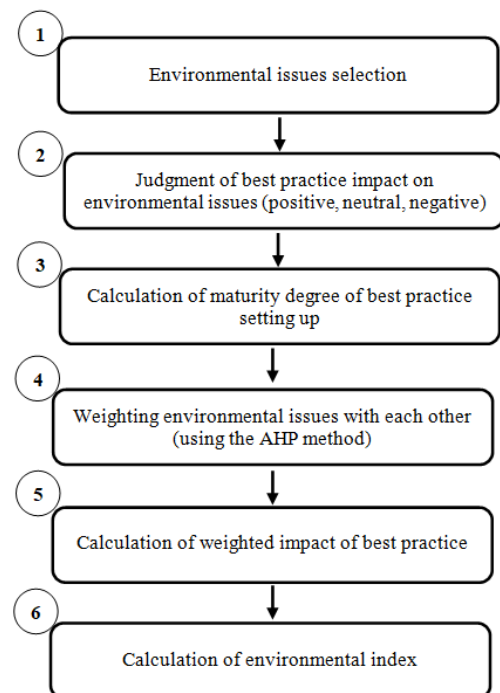**Figure 2. Maturity levels of practices implementation (Baumann, 2011)**

Figure 3. Procedure for calculating environmental index of company's best practices

Step 1: We define I(P_k, Env_i), the measure of the impact of the P_K practice on the ith environmental issue as follows:

I(P_k, Env_i)∈{ -1 ; 0 ; 1}   ∀k   i: environmental issue $1 \leq i \leq 4$

To consider implementation importance of a given practice in company (figure 2), we propose to evaluate weighted impact of each practice as follows: $W_{i, Env}$= Weighted impact de (P_k, E_{nvi}) =I(P_k, Env_i) × w(P_k) ; oùw(P_k) ∈ {0, .., 3} and -3 ≤$W_{i, Env}$ ≤3

Knowing that w (P_k) is the maturity degree of implementation of practice P_k.

Step 2: We construct a matrix A = (n x n); where environmental issues are compared 2 by 2 by decision maker. The comparisons are made by asking the question which of the two issues i and j is more important from an environmental point of view in the company. The intensity of the preference is expressed on a scale from 1 to 9 (table 1). The value 1 indicates the equality between the two issues whereas a preference of 9 indicates that an issue is 9 times greater than the one to which it is compared. This scale was chosen because in this way the comparisons are made in a limited range where perception is sensitive enough to make a distinction. In the matrix A if issue i is "p-times" more important than issue j, then j is necessarily "1 / p times" more important than i, where the diagonal a_{ii} = 1 and a_{ji} = 1 / a_{ij} where (i, j = 1, .., n) and n is the number of environmental issues chosen (4 in our case).

Weight w_{id} of environmental issue i is given by the formula below:
:

$$w_i = \frac{\sum_{i,j=1}^{n} \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}}}{n} \quad avec \ 0 \leq w_i \leq 1$$

Table 1. Comparison scale of Analytic Hierarchy Process (Hafeez, 2002)

Preference factor, p	importance definition
1	Equal importance
3	Moderate importance of one over another
5	Strong or essential importance of one over another
7	Very strong or demonstrated importance of one over another
9	Extreme importance of one over another
2,4,6,8	Intermediate values
Réciproque, 1/p	Reciprocal for inverse comparison

One disadvantage of AHP method outlined in literature (Dyer, 1990) is the problem of intransitivity preferences. Indeed, pairwise comparison may lead to the non-transitivity that cannot be removed as part of AHP method. However, perfect consistency rarely occurs in practice. In AHP method the pairwise comparisons in a judgment matrix are considered to be adequately consistent if the corresponding consistency ratio (CR) is less than 10% (Saaty, 1980). CR coefficient is calculated as follows: first a consistency index (CI) needs to be estimated. This is done by adding the columns in the judgment matrix and multiply the resulting vector by the vector of priorities (i.e., the approximated eigenvector) obtained earlier. This yields an approximation of the maximum eigenvalue, denoted by λ_{max}. Then, CI value is calculated by using the formula:

CI = (λ_{max} - n)/(n - 1). Next, CR is obtained by dividing CI by random consistency index (RI) as given in table 2.

Table 2: RI values for different values of n (Alonso et Lamata, 2006)

Matrix A must be evaluated: CR = CI / RI

Thus, we calculate environmental index as follows:

n	3	4	5	6	7	8
RI	0.52	0.88	1.11	1.25	1.34	1.41

n	3	4	5	6	7	8
RI	0.52	0.88	1.11	1.25	1.34	1.41

n	3	4	5	6	7	8
RI	0.52	0.88	1.11	1.25	1.34	1.41

n	3	4	5	6	7	8	9	10	11	12	13	14
RI	0.52	0.88	1.11	1.25	1.34	1.41	1.45	1.49	1.51	1.54	1.56	1.57

Interpretation

I_{Env} ∈ [-3; 0[: Selected practice has a negative environmental impact on company;

I_{Env} = 0: Selected practice does not has any environmental impact on company;

I_{Env} ∈]0; +1.500[: Selected practice has a positive environmental impact on company but insufficient;

I_{Env}∈ [+1.500; +3]: Selected practice has a positive and sufficient environmental impact on company;

So, if company wants to be green, it has to adopt best practices which have an I_{Env} that verify below equation:

$$0 \leq I_{Env} \leq +3$$

4. CONCLUSION

Through this work, we have contributed to reducing the negative impact of companies on the environment. Indeed, we have developed a model to evaluate environmental performance of company's best practices through an indix I_{Env}. I_{Env} helps highlight opportunities for improvement and where best practices could be found. It provides early warning in formations and follows company's sustainable development. Decision-makers could easily interpret IEnv and then try to find a trend in many different environmental issues. If included in annual report on sustainable development, I_{Env} could also be used to present company progress for the various stakeholders interested in sustainable development in company. Also, since I_{Env} would be applied to different companies, it would be possible to compare and classify them in terms of environmental performance. Finally, and based on our model, we can decide whether or not we will apply a given company's practice according to its environmental performance. In the same way and based on this evaluation model, we can also classify all company's best practices according to their environmental performances.

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