

STUDY OF SOCIO ENVIRONMENTAL ACTIONS OF ENERGY AND NUCLEAR RESEARCH INSTITUTE OF SÃO PAULO (IPEN/CNEN-SP)

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ABSTRACT

Over the years the evolution of environmental concept comes solidifying increasingly through programs, conferences and various activities taking place in Brazil and worldwide. As a result of this development, sustainability and social responsibility began to be seen as something present in day to day business and institutions. In particular, the Institute of Energy and Nuclear Research (IPEN), state authority associated with University of São Paulo (USP) and managed by the National Commission of Nuclear Energy (CNEN)¹, subordinate the Ministry of Science and Technology, which is the focus of this work, has the mission the commitment to society as regards: improving the quality of life of the population, producing scientific knowledge, developing technologies, generating products and services and training human resources in nuclear and related. Based on the mission of IPEN and in the lack of assessment tools of social actions, this paper aims to propose an instrument for assessing social responsibility and serve as a methodological option, strongly committed to the pursuit of improvements of IPEN. Through indicators and dimensions, built up a methodology that seeks to assess social responsibility and identify strengths, to be encouraged and weaknesses, which can be studied and improved. This methodology was applied to IPEN and the results that are presented in this work identified positives regarding their actions to their domestic audience and points to be improved in relation to their external audience. As an initial evaluation, the results were satisfactory; however, this work will continue in order to suggest the implementation of social and environmental actions feasible to be applied in IPEN.

1. INTRODUCTION

The concept of Corporate Social Responsibility (CSR) is complex and dynamic, with different meanings in different contexts, requiring many thoughts on the subject. The movement for effective environmental action gained strong momentum and organization in the early 1990s due to the results of the First and Second World Industry Conference on Environmental Management occurred in 1984 and 1991. In subsequent years the conference, there were several movements that charged by social and environmental changes [1].

According United Nations Department of Economic and Social Affairs [2], the achievement of sustainable development is a goal of universal coverage and the choice of indicators reflects the situations and characteristics of each country. They serve to indicate changes, behaviors, processes and trends, and comparisons between countries, regions, companies, state needs and priorities for the formulation, monitoring and evaluation of policies. This

¹ CNEN is a federal agency established in October 10, 1956 and under the Ministry of Science and Technology. As higher body planning, guidance, supervision and inspection, standards and regulations in radioprotection and licenses, inspects and controls the nuclear activity in Brazil. CNEN also develops research in the use of nuclear techniques for the benefit of society [3].

paper will address three important aspects that must be considered in socio-environmental issues: corporate citizenship, transparency and human capital.

Corporate citizenship encompasses a wide variety of areas that touch people's lives, including social welfare, culture and arts, volunteer services, academic programs, environmental protection and international trade. Practices of corporate citizenship, can also be translated as greater employee commitment in relation firms, thereby increasing productivity and giving back to the institution [4].

Transparency is an important factor that comes just as a way to improve relations between the various areas that involve the institution and it does so largely through accountability, both in public and in private. Several reports in standardized formats are generated and published to the whole society is aware of the actions of the institution in question and his plans for the future [5].

Human capital should be investigated from the perspective of the wealth created by each employee. This indicator can signal the wealth created by the institution in relation to labor-labor employed in its production. It is interesting to see, within the hierarchical pyramid of the institution, the position of each position or function and what environmental actions that each performs. People who work in an organization, whether public or private or third sector, representing the fuel needed to move the entire organization [6].

This work aims to develop and evaluate a methodology of social responsibility. This methodology is based in the three important factors mentioned above. The methodology will be applied to IPEN, which will serve as the backdrop for this analysis.

IPEN has excellent performance in various sectors of the nuclear activity. It should be emphasized that the results of these activities have provided significant advances in the field of technology in the production of materials and the generation of economic and strategic value for the country, making it possible to extend the benefits of nuclear energy to larger segments of our population [7]. Throughout its history, IPEN has developed measures for environmental control and monitoring, in addition, over the years, all radiological protection measures have been integrated into reports that are consolidated into monthly and annual reports [8].

It is in this context that this paper intends to operate in a context where social and environmental action, is gaining more space between public and private institutions, becoming the focus of management attention and becoming one of the main items of the strategic actions of corporations and where IPEN has strived to become an institute increasingly committed to these actions.

2. METHODOLOGY

Whatever the theory that would guide the practices of social responsibility, there will always be difficult to implement them and the reasons are many, starting with the fact that it involves a diversity of issues that translate into rights, obligations and expectations of different stakeholders, internal and external to the organization. The different understanding about the organization and its relationship with society and the environment is a source of

complication. Add even all this is done concurrently with the activities and operations of organizations in search of favorable results. One way traditionally successful face a complex situation through the breakdown of its components. This is the approach used by Carroll, one of the leading exponents of the movement of corporate social responsibility, whose work has been an inexhaustible source of inspiration [9].

At this stage, based on a literature exploratory, associated with some insights and perspectives very strongly based on work done by the Ethos Institute², identified seven dimensions and their respective attributes and indicators that synthesize and satisfy the demand, namely: values transparency and governance, workforce, environment, suppliers, consumers and customers, the community and ultimately the government and society. It should be clarified that it was selected a cast of dimensions that were amenable to measurement [10].

2.1. Defining Dimensions

The dimensions listed below were based on indicators Ethos of social responsibility [11].

The dimension relating to strategy, **ethics** and transparency seeks to demonstrate the extent to which the institution shows and disseminates through its strategic global practice of socially responsible management, considering the opening to discuss strategic issues and seeks to assess whether it effectively practicing transparent management based on structured dialogues with stakeholders, information is shared with other institutions and finally it releases the results obtained by publication of Social and management reports.

The dimension for the **internal public** attitudes and highlights efforts committed to the welfare of its workers in every way, recognizing its value, combating discrimination, maintaining and expanding the current levels of employability, promoting training programs and promoting policies to benefit employees and their dependents.

The dimension that refers to the **environment** will investigate possible environmental impacts caused by its activities, seeking to identify if the institution meets these impacts and focuses on preventive processes that offer potential damage to health and safety of their workers and surrounding population, is established and develop environmental education programs to the community in which it operates, it produces impact analyzes of all processes regardless of compliance with legal action and is used in a coherent and rational natural resources and materials involved in the execution of their activities.

The dimensions relating to **suppliers** and **consumers** demand value the relationship of the institution with these entities. Verifies that offers its customers the same range of benefits obtained when negotiating with suppliers. Assesses whether there is a partnership between the institution and the suppliers, if it seeks beyond price assess how the supplier is also socially responsible. Assesses the relationship between the institution and its customers if

² Ethos, a Greek word, means the study of the customs, character, moral science, the "spirit" of a time, determining the tone of the feeling of a people or a community. Ethos derives ethics as a science of human duty in its broadest sense, a set of rules of conduct of the interaction between people [12].

there is an open line of communication and support needed in the general context of this relationship.

Community is the dimension that points to an effective relationship and socially responsible to the community to which the institute is inserted and brings together issues that require objective evidence by the institute. It is common to say that under the "backdrop" of a performance really committed to the interests, concerns and community needs, many organizations are using this gimmick of philanthropy to reduce or mitigate the impact of the neutrality of their work in communities. While philanthropy is considered as an important part of actions to promote social justice, it should be noted that it is only a part of the whole, and as it operates in the fundamental causes of social imbalances, has its power limited only to the alleviation symptoms of these imbalances. Thus social responsibility, involves much more than philanthropy.

The dimension of **government and society** evaluates the behavior of the Office in respect of their relationships and actions directed at government and social aspects. It measures the participation in associations, business forums, active and proactive attitudes that contribute to the development of programs, processes and concrete proposals of public interest and social character known proven.

2.2. Analysis of The Dimensions

The analysis of the dimensions of social responsibility of IPEN, proposed by this article, is centered on a questionnaire and the results will provide a diagnosis of the real situation is that the IPEN. It also, will support managers in the preparation and the consequent spread of social goals of the Institute, as well as in the construction of indicators that will help moth and assess compliance with the targets set by IPEN [10].

This questionnaire takes into account the process by which the dimensions of social responsibility are intertwined with the strategy that is developed and implemented by the institution. This planned in order to identify the perceptions of how strategic decisions are made and how they may relate to the practices of management and performance to justify, by objective evidence, to be classified as a socially responsible. According Farias Filho [13], strategic decisions are those that:

"[...] characterized by a large commitment of resources, are concerned by issues of substantial importance to the organization in general, preferably with longer periods than short, whose impact or significance involve more than one function." [13].

The dimensions and their coded indicators are shown in table 1. These dimensions and indicators are based on Ethos's indicators and were taken as the basis for the conceptual model. Fig. 1 shows the dimensions and indicators of Social Responsibility proposed in this work and Fig. 2 shows conceptual model.

Table 1 - Coding of Indicators and Their Dimensions

COD.	INDICATOR	DIMENSION
A1	ethical commitments	ETHICS
A2	social balance	
A3	corporate governance	
A4	Quality assurance	
B5	Health care safety and working conditions	INTERNAL PUBLIC
B6	additional benefits	
B7	Hiring criteria	
B8	Valuing diversity and promoting equality	
B9	Inclusion of people with disabilities	
B10	Relations with union	
B11	Commitment to professional development and employability	
B12	Access to information	
C13	Management of impacts on the environment and the life cycle of products and services	ENVIRONMENT
C14	Institute's commitment to improving the environmental quality	
C15	Environmental education and awareness	
D16	Criteria for selection and evaluation of suppliers	SUPPLIERS
D17	Employees of suppliers	
D18	Social responsibility of suppliers	
D19	Supporting the development of suppliers	
E20	Service excellence	CUSTOMERS
E21	Questions suggestions and complaints	
E22	Satisfaction of consumers / customers	
E23	Business communication	
E24	Knowledge management and the potential damage of products and services	
F25	Management of the company's impact on the surrounding community	COMMUNITY
F26	Relationship with the surrounding community	
F27	Encouraging volunteering	
F28	Company's involvement in social action	
F29	Relations entities benefited	
F30	community participation	
F31	Business Benefits	
G31	Participation and influence union	GOVERNMENT AND SOCIETY
G33	Involvement in political campaigns	
G34	Participation and monitoring of government	
G35	Improvements in public and governmental support for social initiatives	

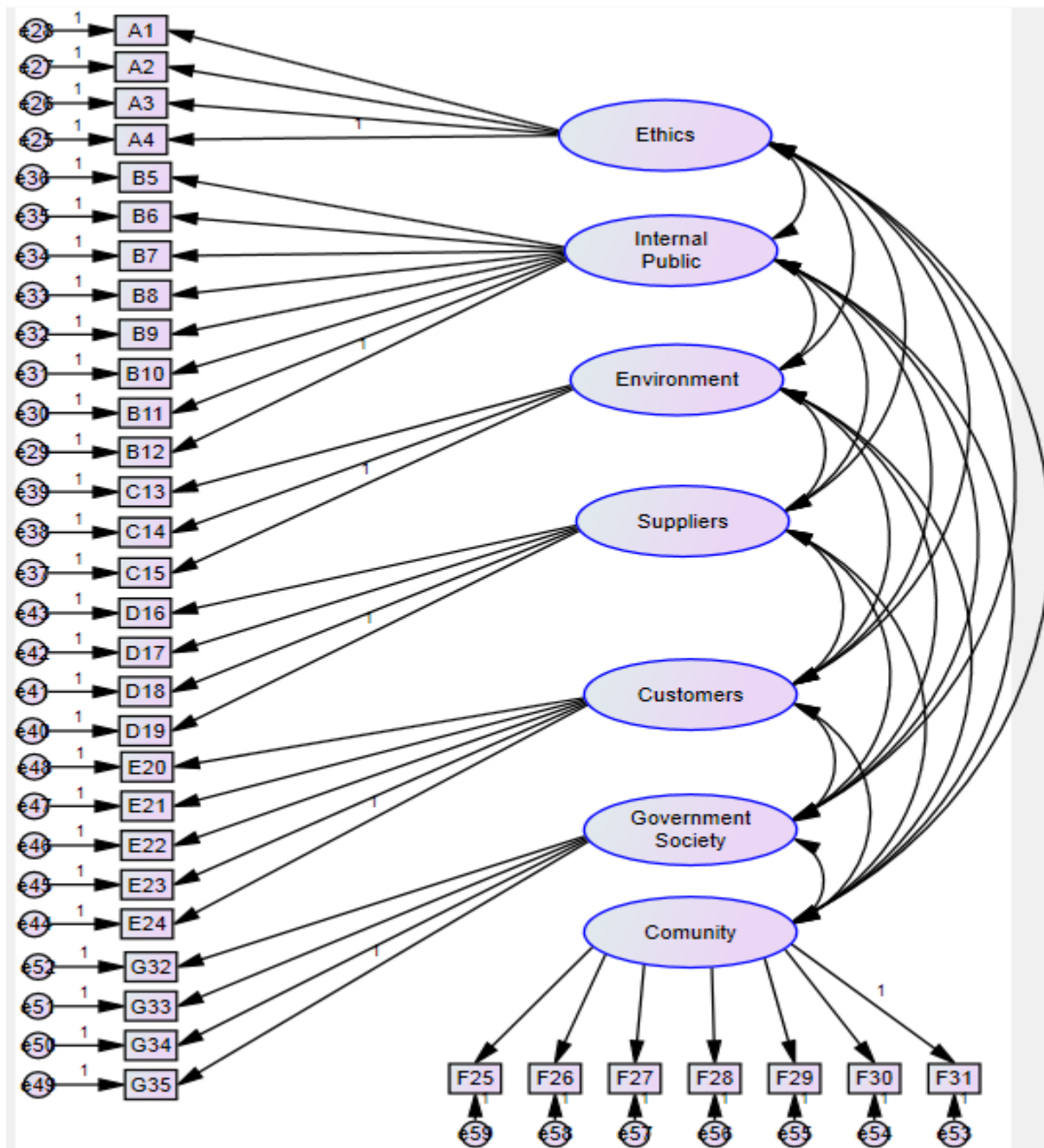


Figure 1: Dimensions and Indicators of Social Responsibility proposed in this work

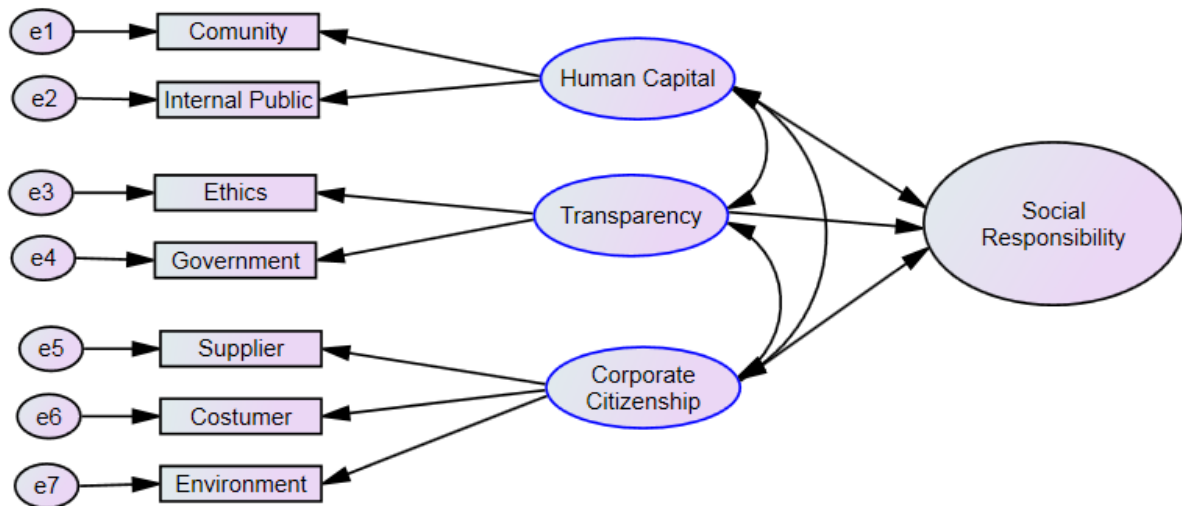


Figure 2: Conceptual Model

2.3. Planning and Sample Definition

IPEN has 495 employees, distributed in 5 boards and 9 research centers. To prepare this article, it was decided that the study would be focused on the population of the Center for Nuclear Engineering - CEN³. The total population of CEN is composed of 80 people.

The CEN was chosen to be a department with a significant amount of staff, multidisciplinary, where the average time on the job of every employee is around 20 years.

2.4. Preparation of Database

The survey was conducted on a random sample of 45 people, which, in this sample, 30 questionnaires were returned and analyzed. Before starting the work of statistical analysis, it was necessary to check the data collected in the field, purging the database cases where there was only partial filling of the questionnaire or inconsistencies in responses. Following the appointment of Hair [14], questionnaires were eliminated over 15% of responses in white. Then, they were excluded where there were problems with the fill, as answers often repeated. At the end, 30 respondents were considered for univariate and multivariate analysis.

2.5. Data Analysis

The processing and analysis of the collected data were performed with the help of *software MS-Excel*® for analysis and descriptive statistical software "*Statistical Package for Social sciences*" (SPSS®) version 20.0 for multivariate analyzes.

2.6. Univariate Analyzes Descriptive Sample

The descriptive analysis includes the characterization of the profile of the respondent.

³ The Centre for Nuclear Engineering (CEN) is a technical-administrative unit of the Institute of Nuclear Energy Research and the National Commission of Nuclear Energy (IPEN / CNEN-SP). The principal activities of CEN are acting in research, development, teaching, and consulting services specialized [14].

Table 2 refers to the sex of the respondents, indicating a male predominance, occupying 70% of the sample. Table 3 indicates the level of education of respondents, where everyone has higher grade, and 80% have graduate programs. Table 4 refers to the time the home of the respondents indicating that 73% of the sample has more than 20 years of stay in the institution in question. Table 5 indicates the function of each respondent within the institution, where we can observe that 13% are managers, 77% research and 10% exercise administrative positions or are students. Finally, Table 6 refers to the age of the respondents, indicating a large seniority of the sample, where 70% are over 50 years.

Table 2 - Sex of Respondents

Sex		
	Frequency	Percentage
Male	21	70%
Female	9	30%
Total	30	100%

Table 3 - Level of Education of Respondents

Level of Education		
	Frequency	Percentage
Higher education	6	20%
Post Graduation	24	80%
Total	30	100%

Table 4 - Years in the Institution

Years		
	Frequency	Percentage
2 to 10 years	5	17%
11 to 20 years	3	10%
21 to 30 years	15	50%
More than 30 years	7	23%
Total	30	100%

Table 5 - Function of respondents

Function		
	Frequency	percentage
Administrative	1	3%
Student	2	7%
Manager	4	13%
Research	23	77%
Total	30	100%

Table 6 - Age of Respondents

Age		
	Frequency	Percentage
25 to 30 years old	3	10%
31 to 40 years old	0	0%
41 to 50 years old	6	20%
51 to 60 years old	16	53%
More than 60 years	5	17%
Total	30	100%

2.7. Multivariate Analysis

Multivariate analyzes undertaken with data collected include: (1) **analysis of the reliability of the scale** and (2) **factor analysis**. Initially we attempted to use structural equation modeling using *software* SPSS AMOS ®, but the sample size relative to the amount of observed variables was not compatible, the sample was too small for the large number of variables, preventing this so as to run the *software*.

2.7.1. Analysis of reliability of the scale

The reliability of the scales was assessed by Cronbach's alpha coefficient, which represents the correlation between items that constitute each construct [16].

The recommendations of Hair [14], Cronbach's alpha, in exploratory studies, is acceptable from the value of 0.60. In addition to this factor, the item-total correlations were examined, this correlation is taken as evidence that the scale has a strong relationship with the latent

variable that seeks to measure. Thus, it is also a measure of internal consistency, because high correlations confirm the measurement of the same construct by all variables this work we used a minimum of 0.5 for item-total correlations, as a way of providing greater reliability and to facilitate the purification of the scales.

For all the constructs analyzed, that is, for all dimensions, we observed a good Alpha, ie above literature says that, except for the dimension Government and Company which had an alpha of 0.497, or somewhat lower suggested by the literature is 0.60. The item which gave rise to the problem was the G33 ("The Institute is careful about his involvement in political campaigns.") That presented a item-total correlation below the limit of 0.2, indicating a low internal consistency of the size that sought to measure.

One possible explanation for this problem stems from the fact that the question is very general and give rise to various interpretations. The item was removed and inadequate correlation was calculated again Cronbach's alpha for the scale, which improved considerably increasing from 0.497 to 0.762.

The test results of scale reliability through Cronbach's alpha, after revisions empreendedadas are presented in Table 7.

Table 7 - Analysis of Reliability

Cronbach's Alpha	
Dimensions	Cronbach's Alpha
Transparency	0,776
Internal Public	0,764
Environment	0,806
Suppliers	0,876
Consumers	0,737
Community	0,859
Government and Society	0,762
Total	

Performed the analysis and review of the scale, the next step was the test the proposed conceptual model. The Factor analysis is a technique that examines the interdependence relationships between variables and allows you to check if they are grouped into factors / dimensions. The main objective of factor analysis is to understand the underlying structure among the variables of the analysis [17].

2.7.2. Factor analysis

The factorial analysis is used to identify constructs or basic dimensions of the data and reduce the number of variables by eliminating redundancy. The input data in the factor analysis, typically takes the form of a set of variable values for each object or individual in the specimen. Actually any square matrix whose components provide a measure of similarity

between variables may be subject to factor analysis. The similarity measure need not be a correlation, although it is generally [18].

Each dimension was analyzed as the dependent variable (Factor) and its indicators as independent variables, namely the observed variables. The model was subjected to factor analysis using the SPSS ® software and analyzed some outputs explained below.

Communality is the amount of variance a variable shares with all the others, ie, the variance of an item is being used in the factor solution. We seek a high communality, ie, above 0.50 [17].

Tables 8-14 explain the communalities of the dependent variables. We can observe that the 35 independent variables, only four were left with value below 0.50 (B7, B9, E20 and E24 presented in table 1).

Table 8 - Ethics

Communalities		
	Initial	Extraction
A1	1,000	,720
A2	1,000	,451
A3	1,000	,540
A4	1,000	,697

Table 10 - Consumer

Communalities		
	Initial	Extraction
E20	1,000	,338
E21	1,000	,644
E22	1,000	,540
E23	1,000	,525
E24	1,000	,431

table 12 - Environment

Communalities		
	Initial	Extraction
C13	1,000	,828
C14	1,000	,891
C15	1,000	,458

Table 9 - Internal Public

Communalities		
	Initial	Extraction
B5	1,000	,658
B6	1,000	,604
B7	1,000	,413
B8	1,000	,752
B9	1,000	,371
B10	1,000	,591
B11	1,000	,737
B12	1,000	,639

Table 11 - Community

Communalities		
	Initial	Extraction
F25	1,000	,695
F26	1,000	,841
F27	1,000	,705
F28	1,000	,795
F29	1,000	,847
F30	1,000	,625
F31	1,000	,633

Table 13 - Suppliers

Communalities		
	Initial	Extraction
D16	1,000	,773
D17	1,000	,754
D18	1,000	,730
D19	1,000	,667

Table 14 - Government and Society

Communalities		
	Initial	Extraction
G32	1,000	,730
G33	1,000	,959
G34	1,000	,771
G35	1,000	,679

Another report analyzed was the Total Variance Explained, where the column initial eigenvalues are shown the eigenvalues, percentage of variance, the percentage of variance that the factors are able to explain this variance and cumulative percentage. In the following three columns, the values are retained after extraction, ie, only those with eigenvalues greater than 1. In the analyzes of all the independent variables was obtained an average of 70%.

2.7.3. Analysis of results obtained

The end result of this work shows the positioning of the CEN regarding the dimensions of social responsibility.

In general, on a scale 1-6 points, where 1 means the lowest level of social responsibility and 6 the highest degree of social responsibility, CEN averaged 2.9 points, ie, has a degree of average liability.

A more specific dimension wood for the **internal public** was more punctuated, it scores a 4 points, this means that the actions taken by IPEN in targeting their employees are actually perceived. Among all indicators of workforce size, the INDICATORS regarding valuing diversity and promoting equity, was the highest scoring 70% of respondederam grade 5 and 6 for this item.

The dimensions of the indicators showed lower average were those for the **supplier** and the **community** with an average below 2. Their indicators showed a constant, ie, among them did not have much variation. The indicator was rated the worst for the institute's involvement with social action, where 63% of respondents scored with 1.

Already dimensions concerning **ethics**, governance and transparency as well as **customer** relationship showed an average performance between 3 and 4 points, but had a good variation between the average of its indicators.

The dimensions relating to the **environment** and **government** and society also obtained a result with average scores ranging from 2 to 3 points and with enough variation in the average of its indicators.

The Fig. 3 and 4 represent the average score, and average score size indicators respectively. Table 1 illustrates the dimensions and their indicators, as well as their coding used in this work.

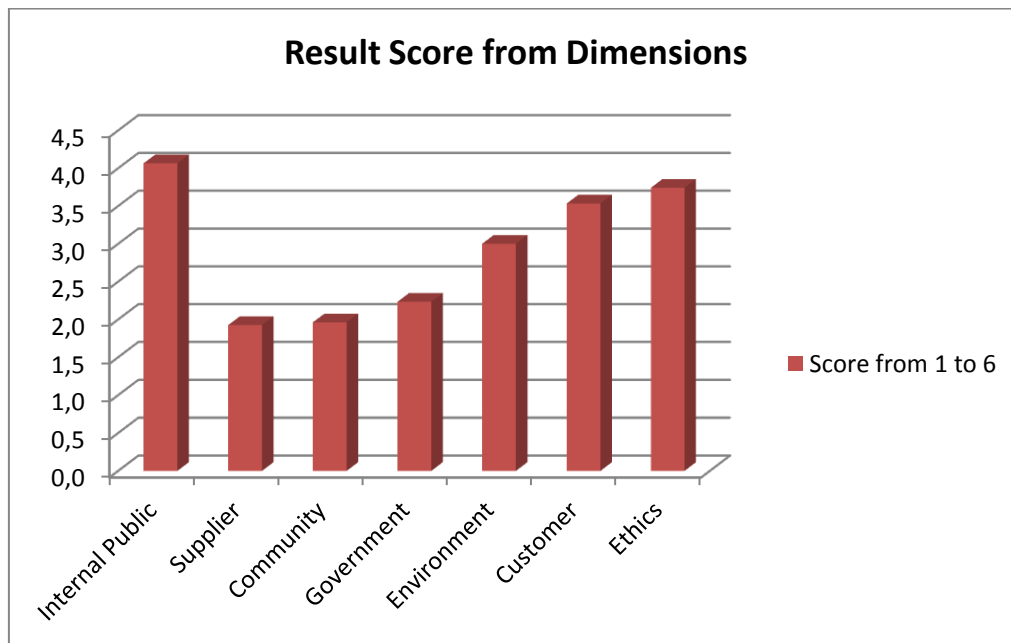


Figure 3 - Average dimensions - scale 1-6

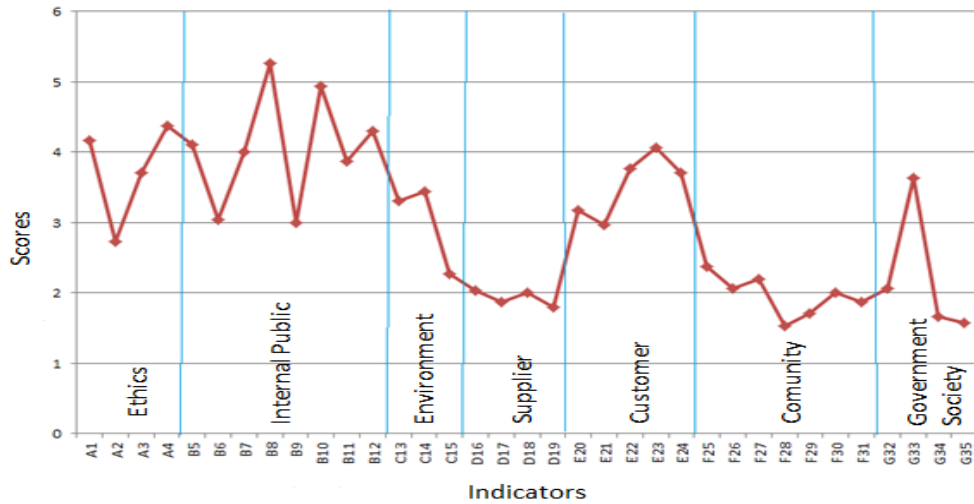


Figure 4: Average indicators within each dimension - scale from 1 to 6

According Hair [14] construct is a latent variable theoretical or hypothetical can not be measured directly but can be roughly measured by multiple indicators. The seven dimensions studied in this model are grouped to make the model more robust and yet more simplified. Indicators of Workforce and Community dimensions were grouped construct in Human Capital, indicators of dimensions Supplier, Customer and Environment were grouped in the construct Corporate Citizenship dimensions and indicators of Ethics and Government and Society in the construct were grouped transparency. These three constructs shown in Fig. 5 shows an average score very similar between them, spinning around 3 points each.

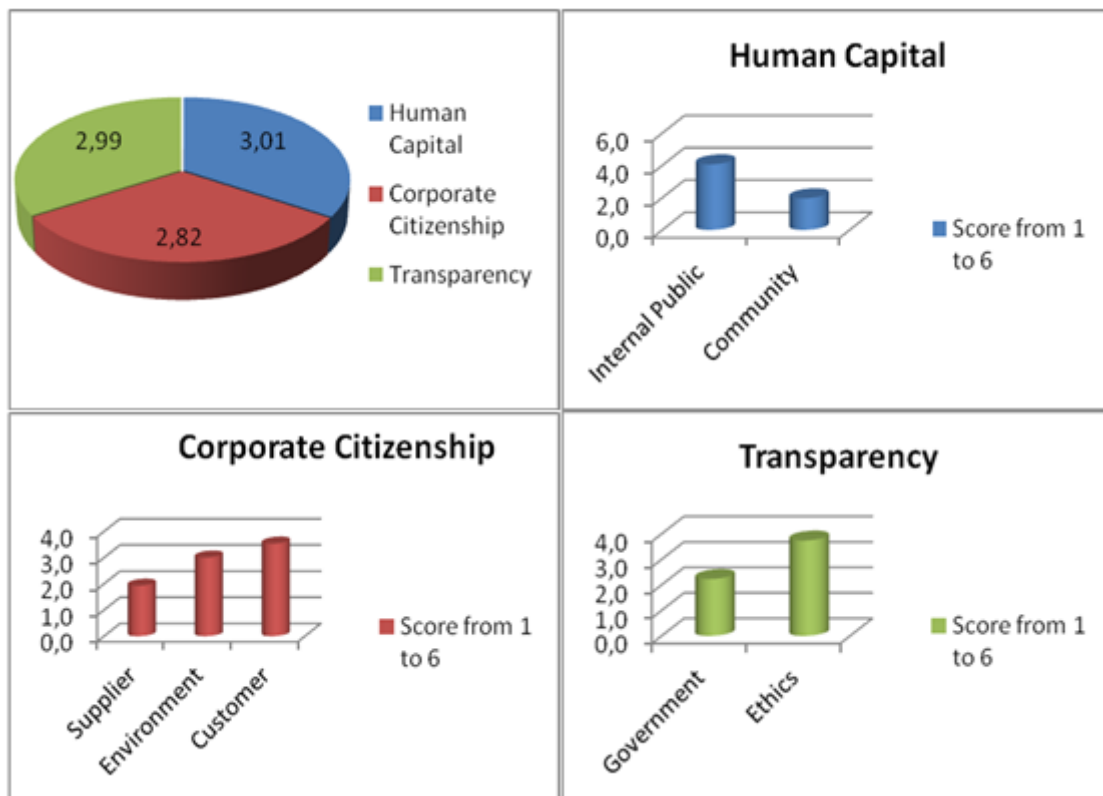


Figure 5: Average dimensions of the constructs and their scale from 1 to 6

3. CONCLUSIONS

Through the assessment tool proposed in this paper, which is based on constructs, dimensions and indicators, it was evaluated the performance of the CEN due to their practice of social responsibility. With the results of this assessment, it was found that, in general, CEN has a satisfactory level of social responsibility. It has outstanding performance with its workforce, but has poor performance with its suppliers and its surrounding community. Regarding the other dimensions (customer, environment, ethics, government and society) has an average performance.

Although this sample is considered statistically acceptable, this work will be extended to other centers of IPEN, because they differ in their activities and relations with the public.

Based on the results apply only to CEN, it is concluded that it is necessary to encourage what is already going well, that is its strong social activities with their employees and employees represented in the workforce size, but more than encouraging, it is necessary develop policies and strategies to establish actions that can contribute to the continuous improvement of other dimensions, especially those that are effectively with very low rates.

Therefore, the results obtained in this paper met the proposed objectives satisfactorily.

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