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DEVELOPMENT OF A THEORETICAL MODEL FOR MEASURING THE PERCEIVED VALUE OF SOCIAL RESPONSIBILITY OF IPEN

Rita de Cássia Mutarelli, Ana Cecília de Souza Lima and Gaianê Sabundjian

Instituto de Pesquisas Energéticas e Nucleares (IPEN / CNEN - SP)
Av. Professor Lineu Prestes 2242
05508-000 São Paulo, SP
rmutarelli@gmail.com, aclima@ipen.br, gdjian@ipen.br,

ABSTRACT

Social responsibility has been one of the great discussions in institutional management, and that is an important variable in the strategy and performance of the institutions. The Instituto de Pesquisas Energéticas e Nucleares (IPEN) has worked for the development of environmental and social issues, converging mainly to the benefit of the population. The theory that guides the social responsibility practices is always difficult to measure for several reasons. One reason for this difficulty is that social responsibility involves a variety of issues that are converted in rights, obligations and expectations of different audiences that could be internal and external to the organization. In addition, the different understanding of the institutions about social and environmental issues is another source of complexity. Based on the study context including: the topic being researched, the chosen institute and the questions resulting from the research, the aim of this paper is to propose a theoretical model to describe and analyze the social responsibility of IPEN. The main contribution of this study is to develop a model that integrates the dimensions of social responsibility. These dimensions – also called constructs – are composed of indexes and indicators that were previously used in various contexts of empirical research, combined with the theoretical and conceptual review of social responsibility. The construction of the proposed theoretical model was based on the research of various methodologies and various indicators for measuring social responsibility. This model was statistically tested, analyzed, adjusted, and the end result is a consistent model to measure the perceived value of social responsibility of IPEN. This work could also be applied to other institutions. Moreover, it may be improved and become a tool that will serve as a thermometer to measure social and environmental issues, and will support decision making in various management processes.

1. INTRODUCTION

The Corporate Social Responsibility (CSR) is a current issue and it is increasingly present in the strategic planning of the companies. The institutions are under pressure to observe the impact of their operations on society and the environment. They also have to carefully check the impact of its policies and actions in their employees, customers, suppliers, shareholders, competitors, communities and society as a whole [1].

According to Carroll [2], the formal studies on the concept and definition of CSR began in the 1960s. The view that corporate responsibility should go beyond profit maximization and

resources should be used to broader social purposes and private interests are not prevalent anymore. During this period, relations of companies with external agents and the effects of their decisions and actions on the entire social system began to be recognized. According to Grajew [3], CEO of Ethos Institute, the concept of social responsibility is expanding, moving from philanthropy, which is the socially committed relationship of the company with the community, to cover all the company's relationship with its internal and external public.

According to Melo Neto and Froes [1], many institutions have initiated a new position for this purpose, which resulted in important decisions and practical strategies. This attitude was based on the following parameters:

- good relationship with the community;
- good relationship with environmental agencies;
- establishing an environmental policy;
- efficient environmental management system;
- guarantee of safety of employees and neighboring communities;
- use of clean technology;
- substantial investments in environmental protection;
- definition of an environmental commitment;
- associating the environmental actions with the principles for sustainable development;
- environmental actions based on international agreements;
- contribution to sustainable development of the surrounding communities.

Managers of public or private organizations have turned their attention to social and environmental issues in their strategic actions. IPEN, whose mission is the commitment to society with regard to: "improve the quality of life of the population, producing scientific knowledge, developing technologies, creating products and services and forming human resources in nuclear and related fields" [4] has also invested in this area. IPEN has always sought the improvement on environmental and social issues, especially concerning nuclear energy, the proper functioning of its facilities and social welfare.

Measuring the social responsibility of a company is not an easy task. Therefore, the main aim of this work is to propose a theoretical model to describe and analyze the social responsibility of IPEN.

2. METHODOLOGY

The construction of the proposed theoretical model was based on the research of various methodologies and various indicators for measuring social responsibility. Once having the theoretical model defined, an empirical research will be performed for validation.

2.1. Comparative study of methodologies and indicators of social responsibility

A significant number of methodologies and indicators to measure social responsibility at national and international levels have been developed. On the other side, in the organizational context, there were a smaller number of initiatives, building up more guides or guidelines for disclosure of corporate actions related to sustainability and social responsibility than measurement systems for decision making [5].

Ten measurement initiatives of sustainability and social responsibility were used in the development of this work. These initiatives have a significant number of dimensions and indicators and are widely used and referenced in the measurement theory of social responsibility.

These initiatives and their descriptions are shown below in a summary form.

2.1.1. Sustainable Development Indicators of the United Nations (SDI)

A set of indicators was developed by the Commission for the United Nations Sustainable Development in 1995. Its main objective was to make the indicators of sustainable development accessible to decision makers, through its definition and explanation of methodologies, as well as training for its use [6].

2.1.2. Dashboard of Sustainability

This indicator was developed in 1998 by the Consultative Group for Sustainable Development Indicators and was considered one of the top three initiatives for measuring sustainability, according to research conducted by international experts [7].

2.1.3. Barometer of Sustainability

This is an index developed by the World Conservation Institute, which measures sustainability in local, regional and national levels through a performance scale given in two dimensions: human well-being and ecosystem well-being. Similar to the Dashboard, the Barometer of Sustainability was also considered one of the top three initiatives for measuring sustainability [7].

2.1.4. Global Reporting Initiative (GRI)

This is a guide for the preparation of sustainability reports released in 1997 by the American nongovernmental organization Coalition for Environmentally Responsible Economies (CERES) and the United Nations Environment Programmer (UNEP). It aims to help companies and their stakeholders to understand and communicate the organization's contributions to achieve sustainable development by improving the quality and utility of sustainability reports. It focuses on establishing a balance among economic, environmental and social needs that will not compromise the outcome future [8].

2.1.5. Index Triple Bottom Line (TBL)

The Triple Bottom Line uses three dimensions of sustainability: the economic, social and environmental. These dimensions often overlap, for example, the selection of suppliers of materials and services, typically an economic activity, can also be a component of the social and environmental dimensions when the company is awarded due to its sustainable practices [9].

2.1.6. Metrics for sustainability of the Institution of Chemical Engineers of England (IChemE)

It is an emphasis set of indicators to measure the sustainability of industries, developed by the chemical engineers of England. It uses the TBL concept previously discussed and balances environmental responsibility, economic return (wealth creation) and social development [10].

2.1.7. Dow Jones Sustainability Index (DJSI)

The DJSI was established in 1999 and evaluates the performance of the world leaders in sustainability selected from the 2.500 largest global companies. It results from a questionnaire with 33 different criteria and from the documents and information provided by companies to analysts, to the media and to the stakeholders. This index defines sustainability and creates long-term value for shareholder through the exploitation of the opportunities and risk management deriving from economic, social and environmental developments [11].

2.1.8. Tear Methodology

Tear was created in partnership with the consultancy Business Sustainability Development (BSD) considering the experience of six large companies already working with the implementation of CSR in their supply chain. The companies are: ABN Amro Real, ArcelorMittal Brasil, O Boticário, Companhia Paulista de Força e Luz (CPFL), Federação das Industrias do Estado da Bahia (FIEB) and Natura. The design of the methodology considered the lessons learned from each of these experiences, compiling the positive results for effective implementation of the theme [12].

2.1.9. Global Compact

Global Compact is an international business community engaged in the promotion of core values in the areas of human rights, labor relations and the environment. It establishes that companies should contribute to the creation of a consistent environmental structure, in free and open markets, ensuring that everyone enjoys the benefits of the new global economy [12].

2.1.10. Ethos Indicators of Corporate Social Responsibility

The Ethos Indicators were developed in order to provide companies with a management tool for diagnosing and planning their social responsibility practices. This is an essentially internal tool that provides self-assessment of management to incorporate social responsibility practices, to assist planning strategies and monitor the general performance of the company [12].

2.1.11. Comparative analysis of the methodologies and indicators

First the scope was analyzed. It evaluated the relevance of each dimension for each tool. Scores (zero to three) for each were assigned, depending on the emphasis of each initiative, where three indicates that the size is significant for the tool and zero means that the size is not significant to the tool [15]. Table 2.1 demonstrates this analysis.

Table 2.1: Analysis of the scope of the measurement tools of Social Responsibility

	Environmental	Economic	Social	Institutional
Sustainable Development Indicators of the United Nations (SDI)	3	1	2	0
Dashboard of Sustainability	3	3	2	2
Barometer of Sustainability	3	0	3	0
Global Reporting Initiative (GRI)	3	3	3	1
Index Triple Bottom Line (TBL)	3	3	3	0
Metrics for sustainability of the Institution of Chemical Engineers of England (IChemE)	2	3	2	1
Dow Jones Sustainability Index (DJSI)	3	3	2	2
Tear Methodology	3	2	2	2
Global Compact	3	2	3	0
Ethos Indicators of Corporate Social Responsibility	3	3	3	3

Ethos indicators are more complete and understandable, being an effective tool in the institutional dimension [15].

The second analysis evaluates the application of indicators in companies. For this analysis, three items were evaluated: quantity indicators, ease of understanding of the indicators and adaptability of indicators to institutional reality. Scores (zero to three) for each were assigned depending on the indicators of each initiative, where three indicates that the initiative is quite adequate and zero means that the initiative is not adequate [15]. Table 2.2 demonstrates this analysis.

Table 2.2: Analysis of the applicability of the measurement tools of Social Responsibility

	Indicators amount	Ease of understanding	Adaptability of indicators to institutional reality
Sustainable Development Indicators of the United Nations (SDI)	2	1	0
Dashboard of Sustainability	2	3	2
Barometer of Sustainability	2	3	0
Global Reporting Initiative (GRI)	2	2	1
Index Triple Bottom Line (TBL)	2	3	0
Metrics for sustainability of the Institution of Chemical Engineers of England (IChemE)	2	1	1
Dow Jones Sustainability Index (DJSI)	3	2	2
Tear Methodology	3	2	2
Global Compact	2	2	0
Ethos Indicators of Corporate Social Responsibility	3	3	3

Ethos indicators are more feasible, with adequate amount of indicators, clarity in content, and apparently quite adaptable to the context and realities of different companies [15].

2.2. Proposal of the theoretical model

The starting point for the development of the theoretical model was the definition of the concept of social responsibility and the study of the main methodologies and indicators. The aim is to define the model, supported by the conceptual elements with a higher level of consensus, plus some elements that, in the view of the author of this work could contribute to a more consistent definition. At the beginning of the empirical research, the concept of social responsibility used as the foundation of multidimensional modeling consisted of the following elements: ethics, internal public, environment, customer, supplier, community, and government / society.

The dimensions that are not measured directly are called constructs or latent variables. Each construct could be measured in an approximate manner by means of indicators. These indicators used to measure a construct are also called observed variables [16].

The theoretical model proposed for empirical research is a reflective-type model, in which the social responsibility construct is considered an abstraction or second-order latent variable. The formative components of the first order or latent variables are: ethics, workforce, environment, customer, supplier, community and government /society. These components are manifested by multiple reflective indicators, which are the variables observed through empirical survey [17].

Based on the concepts reported in the literature and discussions with subject matter experts, a conceptual model and its respective hypotheses were designed (Fig. 2.1).

According to Fig. 2.1, the following reflective indicators measure the constructs:

An (n = 1 to 4): Ethics;

Bn (n = 5-12): Workforce;

Cn (n = 13-15): Environment;

Dn (n = 16-19): Supplier;

En (n = 20-24): Customer Service;

Fn (n = 25-31): Community;

Gn (n = 32-35): Government and Society.

Hn (n=1 -7): Hypotheses

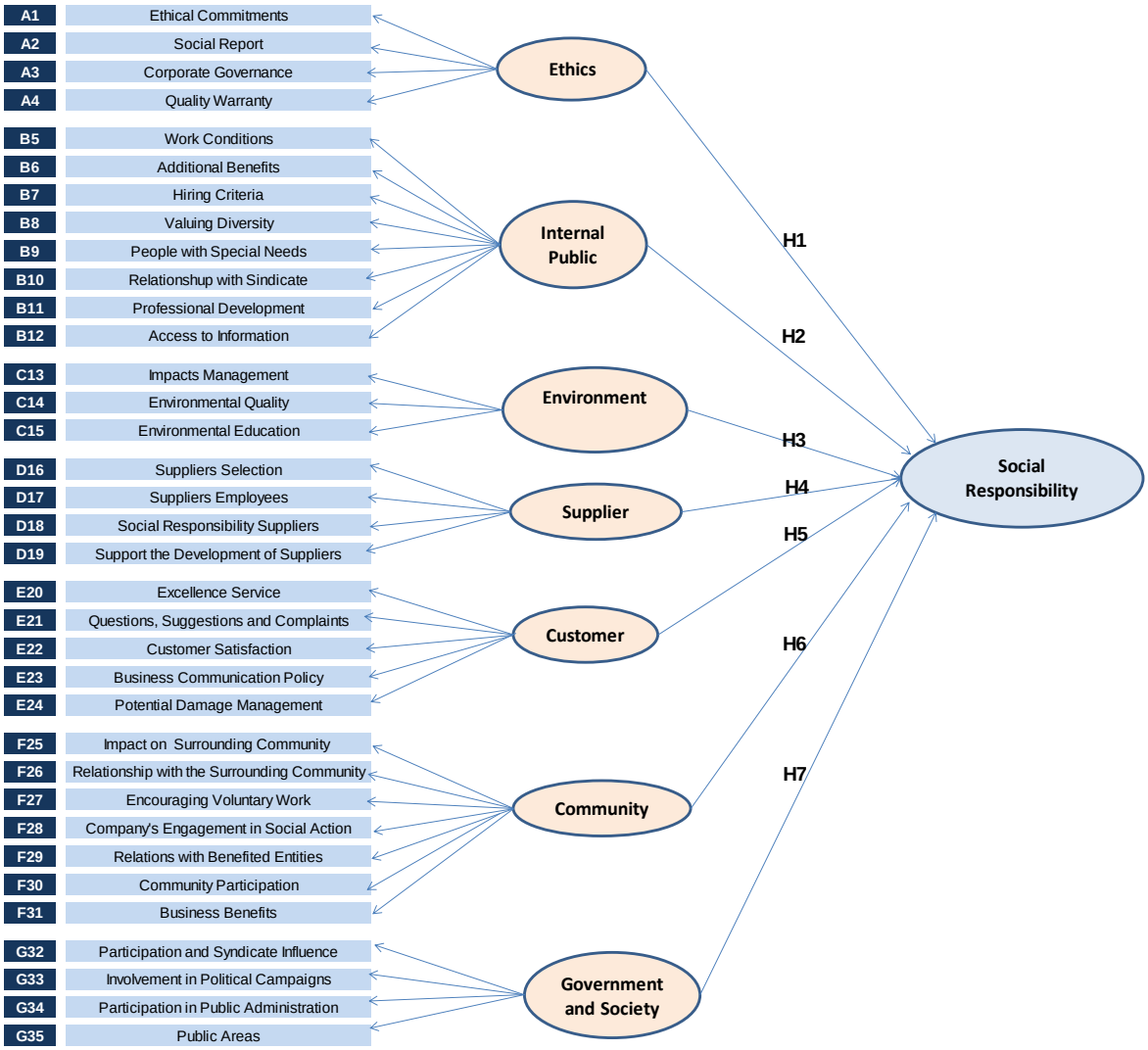

Figure 2.1: Proposed theoretical model.

2.3. Empirical research methodology

According to Marconi and Lakatos [18] defining the research model as a set of systematic and rational activities will help achieve the goal set for the investigation, tracing the path to be followed by detecting errors and aiding decisions of the researcher.

The empirical research provides data from direct sources (people) who know, experienced or have knowledge on the subject, fact or situation that may cause differentiation in approach and understanding of them, leading to a change, addition or alteration deep, relevant, that does not distort or change the main content; on the contrary, it enriches and transforms knowledge into easy understanding [19].

Given the complexity of the theme of this study, the methodological approach chosen was a quantitative descriptive research, which was applied to the employees of IPEN.

To conduct the empirical research a questionnaire based on the theory studied and on expert opinions was used. This questionnaire was validated through a pretest conducted with some professionals of the Nuclear Engineering Center (IPEN department).

The final version of the questionnaire resulted in 35 observable indicators, setting at least three items for each latent variable dimensions of social responsibility, in agreement with the recommendations of Hair [20], who indicates that constructs with less than 3 variables should be avoided.

After designing the questionnaire, the next step was to define the sample for the research and determine the methodology for collecting and analyzing data.

The determination of the sample consists of the determination of the number of elements that will be included in the study. The execution of the sampling process consists of a detailed specification of how the decisions about the population will be implemented, the sample composition, the sampling unit, the sampling technique, and the sample size [21]. The research was administered to all 951 employees of IPEN with voluntary participation. Data were collected via internet through an online questionnaire, which was designed by using the tool available in Google Drive, and e-mailed to Corporate IPEN.

At the end of the data collection, 179 questionnaires were answered and analyzed. The quantitative analysis of the collected data was performed in two main steps: (1) univariate analysis and (2) the multivariate analysis.

The processing and analysis of data collected was performed with the assistance of the following softwares: MS-Excel, the Statistical Package for Social Sciences - Analysis of Moment Structures (AMOS SPSS) version 20.0 and the Statistical Package for Social Sciences (SPSS) version 20.0. For multivariate analysis SmartPLS version 2.0 was used.

3. RESULTS

3.1. Preparation of the database

Before starting the statistical analysis, the data were checked following the principles established by Hair [20]: a) questionnaires with more than 15% blank should not be considered; b) questionnaires with frequent repeated answers should not be considered and c) questionnaires answered in an excessively short time should also be excluded because it indicates that the respondent did not carry out the task with due seriousness and attention. In this analysis questionnaires with blank answers were not found; however, 8 cases that showed a lot of repeated responses were not considered. The final database had a total of 171 valid questionnaires, which were considered for univariate and multivariate analyses.

3.2. Univariate analysis

Univariate and descriptive analysis includes the characterization of the profile of respondents. The dimensions were measured by using a scale 1 to 6. Each variable was related to its respective meaning, standard deviation, coefficient of variation, asymmetry measurement and kurtosis. The percentage of responses for each level was calculated based on the scale of six points [22].

According to Hair [20] the normality of all variables should be analyzed by the Kolmogorov-Smirnov test. In this test, if a variable has normal distribution, the significance level should be above 0.05. Concerning the research conducted in IPEN, all variables were significant zero; therefore, they do not have a normal distribution.

The skewness and kurtosis of all the variables involved in the research were calculated. According to Hair [20] all variables should have values significantly distant from zero; therefore, according to this analysis, all variables do not have normal distribution.

3.3. Multivariate analysis

Multivariate analysis of collected data include: (1) the scale reliability analysis; (2) Test Outer Model (Measurement Model); (3) Test Inner Model (Structural Model). Statistical tests were also applied to the bootstrapping procedures and to identification of the number of segments of the respondents.

The scale reliability analysis was performed by using the Cronbach's alpha. The interpretation of Cronbach's alpha coefficient is almost intuitive because the values range generally between zero and one. One represents the greatest statistical reliability [21]. The total Cronbach's Alpha analysis model was 0.923, which shows a very high degree of reliability.

The structural equation modeling is a statistical technique used to estimate and test causal relationships between variables based on statistical data and qualitative causal hypotheses. It can be considered as the second generation of multivariate analysis, as it allows the researcher to consider both relationships between multiple independent and dependent constructs. The structural equation modeling uses the inner and outer models [23].

For statistical analysis of the proposed theoretical model the technique of structural equation modeling was used. The evaluation of the outer model considers the reliability, convergent and discriminant validity of each individual indicator and composite measures of each construct. This assessment verifies whether the constructs are well represented by its indicator variables [25]. The second stage using the structural equation modeling technique involves testing the validity of the inner model and the corresponding hypothetical theoretical relationships. The estimated parameters for the structural relationships provide direct empirical evidence about the relationship raised by the assumptions (which constructs are inter- related and the nature of each relationship) represented in the structural model [24].

The profile of respondents demonstrated that they are mature people, highly educated, who have worked at PEN research centers for a long time, occupying technical and research positions. The theoretical model showed robustness concerning the reliability and validity tests. The measurement found in the outer model and in inner model presents a good level of

general adjustment or variance explanation ($R^2 = 0{,}878$). All hypothetical relationships in the model were confirmed by empirical results.

3. CONCLUSIONS

The aim of the study was to propose and test a multidimensional theoretical model to analyze the social responsibility of IPEN. For this, the starting point was a critical literature review on the subject followed by the designing of a proposal of a conceptual model. This model has been tested and validated based on univariate and multivariate statistical analysis of data collected from the 171 employees of IPEN. The results demonstrated the efficiency of the proposed research.

Several theoretical models were found in the literature to measure and explain the social responsibility of an organization. The presented theoretical model was based on a literature review, associated with some own thoughts, with a strong foundation in the work performed by the Ethos Institute for Social Responsibility and the United Nations Department of Economic and Social Affairs.

In addition to proposing a simplified and complete theoretical model, another important academic contribution of the study was to build a reflective-formative model type in which the social responsibility construct is considered a second-order latent variable. The first-order constructs are: internal public, environment, suppliers, customers, community and government / society. These constructs are measured by reflective items, developed from scales reported and tested in the literature with adaptations based on the pre-test.

All results of the tests demonstrated the importance of considering all the dimensions of social responsibility together; otherwise, very important points of social responsibility can be neglected.

The proposed and validated model can be used by IPEN as a tool to manage the social responsibility. This work provided a deep understanding of the concept of social responsibility and the factors that influence the perception of the people involved in the research. This knowledge added to a robust model that allowed measuring different dimensions of social responsibility are important tools for the management of IPEN practice. Based on the elements that most influence the way employees understand and define the social responsibility of IPEN, it is possible to find options to act in a more relevant way and establish sustainable plans for this action to be effective.

Research on the social responsibility of IPEN is not limited in this study. Foundations and Institutions around the world have studied ways to show the world that they do not just perform isolated social actions, but integrate them into planning systems, assessment, monitoring and management processes [26].

Since the study focused exclusively on employees of IPEN, it would be interesting to replicate it with its partners, such as outsourced employees, students, suppliers, customers and members of the surrounding community to investigate whether the results are consistent with the obtained here . This would demonstrate whether the results of this study are connected only to the employees of IPEN or they can be interpreted in a general way. It

would be of great value to the IPEN understand its position concerning the dimensions of social responsibility from the perspective of different audiences and compare the results.

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