ENVIRONMENTAL STRATEGY OF UNIVERSITIES OF SOUTHERN BRAZIL

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ABSTRACT
The incorporation of environmental issues to strategic planning, called environmental strategy, has been presented as an opportunity for organizations to effectively manage the various pressures and challenges that contemporaneity has been requiring in terms of sustainability. The number of high education institutions that highlight sustainability in their strategy have been increasing during the last few years. Some reasons for this are the increase of competition in the sector, the imposed pressure for their stakeholders and their responsibility in teaching and promoting the principles of environmental ethics and sustainable development. Based on that, this study has the goal of evaluating the environmental strategy of three community institutions of higher education in southern Brazil, based on their employees' perception. To achieve the goal, a research-diagnosis study was conducted through a structured questionnaire in a digital format, in which the measurement of respondents' opinions was performed using a Likert Scale of five points. The results were evaluated based on descriptive statistics and categorized according to the environmental strategies presented on the natural resource-based view framework. It was possible to identify that each community institution of higher education that participated in the study presented a different environmental strategy, based on natural resource-based view framework. The results also indicate that even the University that presents the most developed environmental strategy has problems in disseminating environmental information through its organizational structure, based on employees' perception.
Keywords: environmental strategy, higher education institutions, pollution prevention, product stewardship, sustainable development.

1 INTRODUCTION
The variety of challenges and the quickness with which they are imposed to organizations, by the market, require differentiated responses from institutions in order to ensure their sustainability [1]. Countless are the agents that influence the variability and celerity of these challenges: globalization; more demanding customers; more restrictive legal instruments; technological advancements; market fluctuations; etc. [2]–[4]. These agents, acting joint or separately, send signals to companies that it is necessary to adapt their strategies, in order to leading them to more dynamic, competitive and innovative position.

The indication that part of the current environmental scenario is a consequence of the human activities [5], [6] has been increasing the political and social pressure on companies, in order them to adopt environmental actions that decrease the negative externalities and increase the positive ones [1], [7]–[10]. Thereby, the incorporation of environmental issues to strategic planning, called environmental strategy, has been presented as an opportunity for organizations to effectively manage the various pressures and challenges that contemporaneity has been requiring in terms of sustainability.

Although the design of a clear and concise environmental strategy – which is able to connect itself with other corporative goals – is commonly associated with the sector of transformation and production of consumer goods, it has been increasingly present in other areas such services sector. In this sense, it stands out the increasing number of higher education institutions that has been emphasizing the sustainability in their strategic orientation [11].

There are many reasons why environmental issues are each day more present into the agenda of Brazilian High Education Managers. Some of them are: Imposed pressure by their stakeholders [12], [13]; Responsibility to teach and promote the principles of environmental ethics and sustainable development [14]; Globalization process that stimulates information exchanges; Increasing number of new institutions accredited by Brazilian Education Ministry in the last decade, influencing the competition in the sector [15].

Considering the exposed arguments, this study has the aim to evaluate the environmental strategy of three community institutions of higher education (ICES, in Portuguese), based on their employees' perception (teacher and administrative staff). The method consisted on the application of an online questionnaire and the evaluation of the answers based on descriptive statistic. The results were categorized according the environmental strategies presented on the framework natural resource-based view (NRBW) [16].

2 ENVIRONMENTAL STRATEGY

The pressure on organizations to incorporate environmental practices into their daily activities has gradually increased over the last few years [10]. For this reason, the ability with which companies manage their environmental performance has emerged as a strategic issue [17], so that the subject has getting space on companies' planning agenda.

The environmental strategy of a company is defined as the set of deliberations that integrate environmental and corporate goals. It reflects the degree with which environmental issues are connected to organization strategic planning [18]. In this context, the perception of managers regarding environmental variables must evolve to a full business context of threatening and opportunities that, at last, may dictates which competitive position a company must adopt to survive into the market [19].

For some many authors, those organizations that are capable to incorporate environmental issues into their corporate strategies own a valuable resource that positively affect their performance [8], [9], [20]–[26]. On the other hand, some studies are not able to find a positive impact on financial performance considering the same condition [27]–[31]. These results depend on variables which correlations are not well known yet, so that new studies in this fieldwork are needed.

Table 1: NRBW summary [35].

	Pollution prevention	Product stewardship	Sustainable development
Goal	Minimize costs; Maximize profit; Focus on operational actions.	Minimize costs; Maximize profit; Focus on product life cycle.	Minimize costs; Maximize profit; Focus on technological and/or processual innovation.
Method	Organize and replace materials; Recycling; Innovation on production process.	Integrate stakeholders' views into the design and product stewardship.	Integrate stakeholders' views into the organizational structure.
Focus	Production process; Logistic operations.	Production process; Logistic operations; Product engineering.	Brand and image.
Result	Decrease of operational costs due to implementation of continuous improvement programs.	Decrease of operational costs and increase of profitability due to anticipation in occupying market niches.	Decrease of operational costs and increase of profitability due to anticipation in occupying market niches and brand and image valorisation.

Considering this gap, the framework called natural resource-based view (NRBW) [16] was developed based on resource based-view (RBW) framework [32], aiming to evaluate the environmental strategy adopted by companies to create sustainable competitive advantages [33]. This framework was also developed to connect the environmental challenges to the resources' operationalization, since in several models there is a disconnection between the natural environment and that where organizations are inserted [34].

The NRBW model defines three kinds of exclusive strategic capabilities: pollution prevention, product stewardship and sustainable development. They have different leadership forces, which are built upon different resources and capabilities and generate different sources of competitive advantages [33]. Table 1 summaries the main information regarding to NRBW framework and its three exclusive strategic capabilities.

3 MATERIAL AND METHOD

The current study is characterized as a survey diagnostic [36] and its goal has a descriptive nature [37], since tend to present trends for the interest group instead of definitive answers. Has quantitative nature, since it uses quantification techniques for data collect and treatment [38].

3.1 Community Institutions of Higher Education

The Community Institutions of Higher Education (ICES, in Portuguese) from Brazil are non-profit organizations with a strong social vocation, which develop activities essentially linked to teaching and researching [39]. The emergence of these institutions is connected to social mobilization. In the absence of the State, some social groups identified the need for well-educated human resource to enable economic development of the region. The ICES were born from the organization and articulation of these societal groups in meeting such demand [40]. The ICES must have, minimally, the following characteristics [41], [42]:

- Maintainer established as a private association or foundation.
- Patrimony belonging to civil society and local public authority.
- Board formed by representatives from society, public authorities and academic community.
- Non-profit.
- Democratic process to elect teachers that will work on strategic level.

The ICES were chosen as a study case due the initial hypothesis that considering the social orientation they would suffer higher pressure from their stakeholders to be a sustainability model. Table 2 synthesises the main relevant information regarding to the ICES that participated in the current study.

3.2 Sample unit

The research population was delimited based on convenience criteria [39]. Three community institutions of higher education (ICES, in Portuguese) from southern Brazil compose it. The sample unit from each Institution – that represents the number of employees that should answer the questionnaire based on a reliability level and sample error – was defined using eqn (1) [43].

$$n = \frac{z_g^2 \cdot \hat{p} \cdot \hat{q} \cdot N_n}{e^2 \cdot (N-1) + z_g^2 \cdot \hat{p} \cdot \hat{q}}. \tag{1}$$

Table 2: Characterization of Community Universities [35].

Characteristics	Universities		
	1	2	3
Students (graduate and postgraduate)	4,080	9,415	26,374
Teachers	662	518	1,153
Administrative staff	209	591	1,086
Graduate courses	31	47	81
Postgraduate courses	2	7	15
Continuing education courses	24	20	52
Location	Santa Catarina (SC)	Rio Grande do Sul (RS)	
Origin of the Maintainer	Society		
Strategic planning	Formal, but unstructured	Formal and structured	Formal, but has structural problems

Table 3: Information to sample unit estimation.

	Universities		
	1	2	3
Population size (N)	871	1,109	2,239
Sample error (e)	0.05		
Estimative of proportion pˆ(pˊ)	0.50		
Inverse probability of pˆ(qˊ)	0.50		
Abscissa of normal distribution referring to the reliability level (z)	1.96		
Reliability level (g)	0.95		
Sample size (n)	146	136	164

3.3 Data collection instrument

Relevant information for the study were obtained through a data collection instrument (questionnaire), which was reviewed by specialists and pre-tested, in order to validate it in terms of legibility, clarity, reliability and suitability.

Study participants are employees (teacher and administrative staff) from ICES, which received the instrument by email and filled it using Google docs®. They have had two months to fulfil and sent the questionnaire back.

Research participants evaluated seven affirmations that represented each exclusive strategic capability from NRBW framework (pollution prevention, product stewardship and sustainable development): ESAM3, ESAM4, ESAM5, ESAM6, ESAM7, ESAM8 and ESAM9. Their opinion/knowledge were measured through a five points Likert scale, ranging from totally disagree (point 1 in the scale) to totally agree (point 5 in the scale).

3.4 Results analysis

The data were treated through descriptive statistic techniques, in special frequency distribution. The result analysis point which environmental strategy ICES are applying, according to the perception of their employees.

4 RESULTS

The main results obtained for the present study are presented as follows.

4.1 Adherence of study participants

It has been verified, based on data collected, that the sample sizes for all three ICES were not hit. That happened because the answers level was lower than necessary, considering a reliability level of 95%. In this sense, the information presented on Table 2 were reviewed based on obtained sample sizes and considering a new reliability level (Table 4).

Data presented in Table 4 show that the new reliability level were lower than originally estimated (95%). Although the new results do not disqualify the present study, since all reliability levels are higher than 70%, reaching 87% at University 3, the inferences made during the subsequent items must take into account the statistic issue and the reliability of obtained data.

4.2 Environmental strategy according NRBW

Table 5 shows the data frequency distribution that represent the perception of ICES' employees related to different environmental situations. To facilitate data analysis and interpretation, Table 5 was converted into a heat map that visually points data concentration. Points with darker colours represent higher data concentration while points with lighter colour represent lower data concentration. The evaluation of heat map indicates which environmental strategy the ICES are using according their employees.

Data from University 1 show that the lowest data concentration is allocated at the highest point on the scale (totally agree), while data with medium and large concentrations are randomly distributed at the other points of the scale.

Based on that data collected from University 1 are not capable to explain, just by itself, which environmental strategy the institution is applying, since they do not appear to show significant trends according frequency distribution. In this sense, the evaluation of environmental strategy from University 1 should be realized using additional information, such as characteristics related to strategic planning [35].

Table 2 shows strategic planning on University 1 is incipient and informal, once does not involve neither include significant portion of its employees. In this sense and assuming that environmental strategy should be strictly linked to the institutional process of strategic planning [35], it is understood that if strategic planning has characteristics of informality the environmental strategy will also present them.

The answers from questions ESAM3 and ESAM6, which represent the strategic orientation towards pollution prevention, may support this statement. Although the solid waste management is visibly an institutional challenge – based on ESAM3 answers – it is

Table 4: New information to reliability level estimation.

	Universities		
	1	2	3
Population size (N)	871	1,109	2,239
Sample error (e)	0.05		
Estimative of proportion p^(p ̂)	0.50		
Inverse probability of p^(q ̂)	0.50		
Abscissa of normal distribution referring to the reliability level (z)	0.603	0.753	1.164
Reliability level (g)	72.57%	77.34%	87.70%
Sample size (n)	35	54	128
Level of responses	4.00%	4.90%	5.70%

Table 5: Environmental strategy evaluation.

University 1 (%)							
[16]	ESAM	Mean	Likert scale				
			1	2	3	4	5
PP	3	2.7391	22.72	22.72	27.27	22.72	4.57
	6	2.2500	19.04	19.04	19.04	33.33	9.55
PS	4	2.9000	23.07	15.39	19.23	26.92	15.39
	5	1.6667	28.57	19.04	19.04	28.57	4.78
	7	1.4167	30.76	30.76	7.72	30.76	0.00
SD	8	1.6667	34.62	26.92	19.23	19.23	0.00
	9	2.3333	19.23	26.92	19.23	30.76	3.86
University 2 (%)							
[16]	ESAM	Mean	Likert scale				
			1	2	3	4	5
PP	3	3.9787	0.00	4.28	12.76	63.82	19.14
	6	2.2500	0.00	2.64	26.31	50.00	21.05
PS	4	3.9787	0.00	2.15	19.14	57.44	21.27
	5	1.6667	0.00	9.10	18.18	50.00	22.72
	7	1.4167	0.00	12.50	33.33	37.50	16.67
SD	8	1.6667	0.00	11.77	17.65	49.01	21.57
	9	2.3330	0.00	5.78	15.38	53.84	25.00
University 3 (%)							
[16]	ESAM	Mean	Likert scale				
			1	2	3	4	5
PP	3	2.7882	17.64	27.05	18.82	31.76	4.73
	6	2.9296	11.42	25.71	25.71	28.57	8.59
PS	4	3.1136	15.90	12.50	25.00	37.50	9.10
	5	3.1184	9.21	17.10	32.89	34.21	6.59
	7	2.6721	21.31	35.57	18.26	18.26	6.76
SD	8	2.5385	21.15	35.57	18.26	18.26	6.76
	9	2.9787	13.84	21.27	28.71	25.53	10.65

PP – Pollution prevention; *PS* – Product Stewardship; *SD* – Sustainable Development.

also possible to identify that the minimization of raw material use, solid waste generation and improvement of equipment efficiency are aspects present in its orientation (based on ESAM6 answers).

This demonstrates that the environmental strategy adopted by University 1 is towards oriented to pollution prevention. This orientation is usually verified in organizations that are taking the first steps in search of a strategic identity focused on the environmental issue. This result is corroborated by the evaluation of the means, which also is presented on Table 5. The averages related to pollution prevention questions are higher than others, indicating that employees tend to agree more with this approach in comparison with the others.

The collected information for University 2 shows results that are more homogeneous. The lower data concentration is located in the lowest values of measurement scale (totally disagree and disagree), while the larger volume of data is present at the same point of the scale (agree). Mean data concentration is located both in intermediate scale value (I do not disagree, nor agree) and highest scale value (totally agree).

In this sense, it is possible to analyse that employees from University 2 agree with all environmental initiatives presented in the questionnaire, which indicates that the

environmental strategy applied is broad and comprehensive, not only aimed at pollution prevention, but mainly at management level, with concerns on organizational brand and image. Thus, it is clear that University has an orientation towards sustainable development.

This result is corroborated by information presented on Table 2. According to that, University 2 has a formal process of strategic planning, with high degree of maturity and wide employees' participation.

Finally, the data from University 3 show an intermediary behaviour between both institutions whose results have already been presented. The lower data concentration is allocated at the highest point of the measurement scale (totally agree), the same situation pointed by University 1. However, University 3 presents equally low concentrations in point 1 (totally disagree) for ESAM5, ESAM6 and ESAM9 and in point 2 (disagree) for ESAM4.

The higher data concentrations occur at the central points of the scale (disagree, I do not disagree, nor agree and agree), showing a lack of unanimity regarding the results, especially in comparison with data from University 2.

The identification of environmental strategy applied by University 3 will depends on the evaluation of its strategic planning process, like to University 1. Table 2 shows that University 3 has a formal strategic planning, although the employees' participation since to be inefficient. Since environmental strategy is related to strategic planning [35], the presented information indicates its orientation is more mature than University 1, although not sufficiently to be equated to University 3. In this sense, and corroborated by data presented on Table 5, it is possible to identify that environmental strategy applied by University 3 is towards product stewardship, since its institutional focus is on offered services.

5 CONCLUSIONS AND RECOMMENDATIONS

The environmental issue is everyday more present into the managers' agenda all over the world. It is not a surprise that such subject is an issue even at Higher Education Institutions, whose environmental impacts from their daily activities may be compared to small urban centres [44]. Besides that, there is a view that Universities have the duty to apply what they teach and, in this context, the environmental issue gains even more significance to Brazilian Educational Institutions. The National Policy of Environmental Education requires the subject must be transversally addressed across all educational levels in the country [45]. Globalization process, exchange of teachers and students and the seek for resources to promote researches also influence the pressure undergone by Higher Education Institutions, in order to greening their activities.

Institutions must know their current environmental policy and environmental management system – whether formal or informal – and how the environmental strategy is connected, or not, to the corporate goals. However, it is important to have methods to support this evaluation, so that organizations can adapt them to their needs or even directly apply them, in order to obtain results to subsidy the managers' decision-making.

Many methods have been developed to evaluate environmental strategy at industrial sector [1], [46]–[49], nevertheless just few studies aim to evaluate how environmental issues are connected to organizational strategy in other sectors. It is on this gap that the goal of the present study is based on. The questionnaire, as a method to collect data, has been showed efficient and met the study goal. However, since a different number of questions represented each environmental strategy, the results analysis through frequency distribution was impaired. Consequently, it was necessary to evaluate the results based on complementary information (strategic planning process). Based on that, it is suggested the review of the data collection instrument, in order to guarantee equal number of questions for each environmental strategy.

The results demonstrate that each ICES presented a different environmental strategy, based on their employees' perception and previous information about their strategic planning. The results also indicate that even the University that presents the most developed environmental strategy shows to have problems in the articulation of environmental information among its employees. If the outlined strategy is not capable of being disseminated throughout the organizational structure, it will certainly fail. In this sense, it is essential to managers to scale out new communication channels for environmental information, as well as to understand and rescale the existing ones.

Although the reliability levels for obtained samples are representative (ranging between 70 to 90%, approximately), it is suggested to review data collection approach for future studies, in order to maximize the number of participants. Chen et al. [9] and Fraj, Matute & Melero [50] show some examples of different approaches to obtain better results on data collection. Nevertheless, cultural and geographical differences as well as legal aspects must be take into account when applying different kinds of strategies.

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