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Relations between importance and use of environmental performance indicators and firms characteristics

Relações entre a importância e utilidade dos indicadores de desempenho ambiental e características organizacionais

Relaciones entre la importancia y la utilidad de los indicadores de comportamiento medioambiental y las características de la organización

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Organizational Performance. Environmental Performance. Performance Indicators

Abstract: Based on the literature that highlights the importance of environmental performance indicators in supporting organizational management, the present study aimed to identify the relationships between organizational characteristics and managers' characteristics in the attribution of levels of importance and usefulness regarding environmental performance indicators, considering their conceptions of sustainable issues. To achieve this objective, data collection was carried out through a structured questionnaire, with a response rate of approximately 42 companies. We analyzed the characteristics of the company, ISO 14000 certification, environmental strategies, organizational structure and size, and the characteristics of the manager, professional experience, education and training. As analysis techniques, descriptive statistics were used to identify the managers' conception of the importance and usefulness of the indicators, as well as a mean test between groups of organizational and manager characteristics and their relationships with the importance attributed to the indicators. It is concluded that the companies attach great importance to the purpose of the environmental indicators, with an emphasis on the control of

wastewater discharges and solid waste discharges. In terms of the organizational characteristics, strategy, structure, market and size were significant regarding the importance attributed to the purpose of legal compliance indicators. As for the characteristics of the managers, only experience and training have an influence on the indicators of atmospheric emissions and financial impact, which allows us to conclude that, regardless of experience, education and training, environmental issues are considered important within management.

PALAVRAS-CHAVE
Desempenho Organizacional.
Desempenho Ambiental.
Indicadores de Desempenho.

Resumo: *Baseado na literatura que destaca a importância dos indicadores de desempenho ambiental em apoio ao gerenciamento organizacional, o presente estudo objetivou identificar as relações entre as características da organização e as características dos gestores na atribuição de níveis de importância e utilidade dos indicadores de desempenho ambiental, tendo em vista suas concepções quanto às questões sustentáveis. Para atingir tal objetivo, utilizou-se a coleta de dados por meio de um questionário estruturado, sendo obtida uma taxa de retorno de aproximadamente 42 empresas. Foram analisadas as características da empresa, Certificação ISO 14000, estratégias ambientais, estrutura organizacional e tamanho e características do gestor, experiência profissional, escolaridade e formação. Como técnicas de análise, foi considerada a estatística descritiva para identificar a concepção dos gestores quanto à importância e utilidade dos indicadores e um teste de média entre os grupos das características da organização e dos gestores e suas relações com a importância atribuída aos indicadores. Conclui-se que as empresas atribuem grande importância à finalidade dos indicadores ambientais, com ênfase no controle da saída de lixo nas águas e saídas de resíduos sólidos. Com base nas características organizacionais, a estratégia, estrutura, mercado e tamanho foram significativos quanto à importância atribuída à finalidade dos indicadores de conformidade legal. Já em relação às características dos gestores, há influência apenas da experiência e formação em indicadores de saídas atmosféricas e impacto financeiro, o que permite inferir que, independente da experiência, escolaridade e formação, as questões ambientais são consideradas importantes dentro da gestão.*

PALABRAS CLAVE
Desempeño Organizacional.
Desempeño Ambiental.
Indicadores de Desempeño.

Resumen: *Basado en la literatura que destaca la importancia de los indicadores de desempeño ambiental en apoyo a la gestión organizacional, el estudio tuvo como objetivo identificar las relaciones entre las características de la organización y las características de los gestores en la asignación de niveles de importancia y utilidad de los indicadores de desempeño ambiental, teniendo en cuenta sus concepciones sobre cuestiones sostenibles. Para lograr este objetivo, se utilizó la recopilación de datos a través de un cuestionario estructurado, obteniendo una tasa de respuesta de aproximadamente 42 empresas. Se analizaron las características de la empresa, certificación ISO 14000, estrategias ambientales, estructura organizativa y tamaño, así como las características del gestor, experiencia profesional, educación y formación. Como técnicas de análisis, se consideró la estadística descriptiva para identificar la concepción de los gestores sobre la importancia y utilidad de los indicadores, y una prueba de media entre los grupos de características de la organización y los gestores y sus relaciones con la importancia atribuida a los indicadores. Se concluye que las empresas atribuyen gran importancia a la finalidad de los indicadores ambientales, con énfasis en el control de la salida de desechos en el agua y en la salida de residuos sólidos. En base a las características organizativas, la estrategia, estructura, mercado y tamaño fueron significativos en cuanto a la importancia atribuida a la finalidad de los indicadores de cumplimiento legal. En cuanto a las características de los gestores, solo la experiencia y la formación en indicadores de emisiones atmosféricas y impacto financiero influyen, lo que permite inferir que independientemente de la experiencia, educación y formación, las*

cuestiones ambientales son consideradas importantes en la gestión.

Introduction

The need for sustainable development, built up over the years, imposes continuous changes in the way organizations manage and operate their activities in order to adapt them to the new reality. In this context, organizations incorporate the environmental variable in their operations and management through environmental management systems (EMSs) that manage their actions in relation to the environment.

Implementing an EMS applied to management and control allows the production process to be continuously re-evaluated. According to ISO 14001, an organization can define procedures, mechanisms, and standards with less damage to the environment (Campos et al., 2015). The standardization proposed by the ISO 14000 series certifies organizations that wish to follow more significant environmental criteria (ISO 14001, 2004). It can be applied to any organization that aims to evaluate its performance and is increasingly adopted in defining goals, strengthening environmental concerns and continuous improvement (Oliveira & Serra, 2010).

Other reasons for seeking environmental certification are highlighted in the literature, including ease of product entry into certain markets, improvement of internal processes, environmental control, and anticipation of solutions to environmental degradation (Campos & Melo, 2008; Nascimento et al., 2019; Oliveira & Serra, 2010).

Although the EMS, together with the ISO standard, provides this support, implementation does not guarantee the success of organizational performance. In view of this, the literature suggests monitoring through indicators as a tool to support the environmental management of organizations (Guimarães et al., 2017; Henri & Journeault, 2008; Ingaramo et al., 2009; Lourenço & Branco, 2013; Silva et al., 2011). In addition, the main standard-setting bodies also direct the adoption of performance indicators for environmental issues, for example: the Global Reporting Initiative (GRI); the Environmental Protection Agency (EPA); the European Chemical Industry Council (CEFIC); the European Eco-Management and Audit Scheme (EMAS); the International Standards Organization (ISO); and the Investor Responsibility Research Center (IRRC).

The ISO, through Standard 14031, proposes a set of environmental performance indicators as an internal management tool. The purpose of the indicators is to provide management with reliable and verifiable information to evaluate the company's environmental performance and to determine compliance with the criteria established by the organization's management (ISO 14031, 2004).

The importance of indicators – and their usefulness – in influencing the environmental performance of organizations is highlighted in the literature. Being able to direct specific improvements by highlighting critical points in the organization, in addition to assessing competitive advantages in terms of mechanisms implemented, they also provide communication, make the information about a complex issue public and identify trends; these are advantages of indicators to assess performance (Nadruz et al., 2017; Fagundes et al., 2009; Guimarães et al., 2017).

Considering the importance highlighted by the regulations and literature, defining what to evaluate is a complex task given organizational and managerial characteristics. Henri and Journeault (2008) point out that the importance given to indicators and their use are related to organizational characteristics, especially in terms of sector, size and the environmental strategies adopted. Therefore, these characteristics must be taken into account when evaluating environmental performance.

Balasubramanian et al. (2021) agree on the influence of the company's characteristics, among which the availability of resources, the propensity to innovate, bureaucracy and organizational inertia are factors that explain the barriers to and the implications of environmental performance. From this perspective, we also consider that the benefits of indicators, as a management tool, are different when analyzing the manager's characteristics.

To this end, the following research question is formulated: What is the effect of organizational and manager characteristics in attributing levels of importance and usefulness to environmental performance indicators? The research objective is to identify the effect of organizational and manager characteristics in attributing levels of importance and usefulness to environmental performance indicators.

The study contributes to the exploration of specific characteristics of the organization related to the monitoring of environmental performance. Identifying them enables an advancement of the knowledge of the indicators for evaluating organizational performance based on the company's and managers' characteristics.

Theoretical elements of the research

In the international context, environmental performance is characterized by the emergence of companies with a socially responsible profile. Interested in integrating socio-environmental aspects into their operations, they include in their strategic planning issues that go beyond the traditional economic-financial goals. There is also recognition that the environmental variable affects continuity, the achievement of economic benefits and the attainment of competitive advantages (Araújo et al., 2014; Dubey et al., 2017).

The traditional vision of companies is debated in conferences and environmental forums. The potential for technological innovation, cost reductions, and better streamlining of production processes in terms of the use of inputs and waste is reinforced. The discussion also puts pressure on organizations to develop management tools and adapt existing management systems (Schneider, 2004; Severo, 2015).

The adoption of certifications and EMSs, as well as the use of indicators in internal and external communications, reflect an interest in holistically assessing organizational environmental performance (Rodrigues et al., 2015).

Nadruz (2017) shows that an environmental performance assessment tool can provide support for more effective management in terms of compliance, a pre-emptive action plan, and better delineation of environmental practices. In support of this, Mangueira et al. (2015) emphasize that continuous assessment in environmental management positively influences organizational performance. It is possible to create a "win-win" situation, in which the environment and the organization are favored.

Several studies highlight the usefulness of indicators to support the environmental management of organizations, highlighting that through them it is possible to compare environmental performance between periods and identify possible trends in their processes (Bovea et al., 2010; Henri & Journeault, 2008; Ingaramo et al., 2009; Silva et al., 2011). However, indicators as a management support tool is not a view shared by all organizations and may be influenced by organizational characteristics (Campos & Melo, 2008).

Campos and Melo (2008) identify indicators as a management tool that monitors certain processes and contributes to planning and decision making. In this sense, organizational objectives, goals and strategies should be related to the set of indicators used.

Pacheco (2001) supports the inclusion of indicators to measure performance in the EMS and connect them to strategic objectives that are relevant to competitive success. Through indicators, management will be able to observe the critical factors of its processes and, as a result, will support environmental quality and increased competitiveness. Therefore, it is assumed that companies voluntarily implementing an EMS need to evaluate their practices through indicators, which will help to prevent risks, environmental accidents and/or non-compliance with legislation.

In this sense, it is assumed that, in addition to implementing the EMS, companies must strive to meet the requirements for environmental certification and use indicators for continuous monitoring of their practices. Gavronski et al. (2008) identify the motivations for organizations to pursue environmental certification, including responding to external pressures, future commercial expectations, legal concerns, and internal influences. Operational changes, financial impacts, and improved stakeholder relations were identified as beneficial factors for companies following environmental certification.

The context of companies with environmental certification was studied by Melnyk et al. (2003). Companies that have an EMS and environmental certification perceived impacts beyond pollution reduction, with better selection and use of environmental options compared to companies that do not have certification. The authors further suggest that industry impacts on the EMS relationship and on performance may promote a better understanding of the effects of visibility of environmental problems and opportunities for environmental improvements.

The importance of EMSs and certifications for organizational performance is maximized by continuous monitoring through indicators, as noted by Henri and Journeault (2008). In an analysis of their use, the authors point to the influence of the organization's characteristics, such as the environmental strategy of its processes, the implementation of ISO 14001, the size of the organization, and whether it is public or private.

Tannuri (2013) suggests observing the relevance of performance indicators according to the context and sector of the organization, since in an analysis of the GRI indicators it was found that the core indicators were considered relevant for all organizations, while the additional indicators were considered relevant only in some segments. In this sense, the context in which the organization operates will influence the selection of indicators.

According to Fagundes et al. (2009), the size of the organization influences the importance given to the indicators, as better management of environmental costs was considered important only for small and medium-sized companies.

The context of the organization also influences the definition of the list of indicators, according to Callado et al. (2008), because they allow for visualization of the amplitude of the incorporated practices and relate them to the dynamism of the competitive environment. Nascimento et al. (2011) confirm that the use of environmental indicators is related to the social, economic-financial, human resources and quality focus of the organization.

In analyzing indicators that measure managerial and operational aspects, Campos and Melo (2008) state that it is the organizational context that defines specific environmental performance criteria that indicators must meet. In support of this, Beuren et al. (2013) identify the industry as influencing greater control, that is, the greater the exposure to environmental issues, the greater the control mechanisms used.

In addition to organizational characteristics, the influence of managers who commonly measure what is more urgent and easier to control has been observed in the literature, leading in many cases to a practice aimed at meeting targets rather than improvement, as highlighted by Silva et al. (2016).

Henri and Journeault (2008) point out that indicators provide convincing and consistent evidence for the efficient allocation of limited resources. They support the commitment to measure and control environmental performance in compliance with laws, regulations, or even proactively. They also suggest that the indicators need to be strategic and aligned with the organization's policies, objectives, and goals. Thus, when building the list of indicators, the company must have a clear mission, strategies, and critical success factors.

Guimarães et al. (2017) reveal that at various points in the organization, environmental performance can be observed through indicators. And as for the application of technologies that promise to improve sustainability in production, these can be great tools for the manager to evaluate the possible competitive advantages of these mechanisms.

In this sense, it is concluded that there is no influence of organizational characteristics on the use and usefulness of performance indicators. Thus, the fact of answering the question of which indicators to use – and how to use them so that they allow for the evaluation of managerial and operational criteria – enables the improvement of environmental performance, both in the context of the organization and in relation to the characteristics of the manager responsible for directing and implementing such mechanisms.

Methodological elements of the research

According to the perspectives addressed, the research is descriptive in nature and uses a quantitative approach and a survey. The research population was defined intentionally and based on convenience, consisting of the businesses registered with the Federation of Industries of the State of Paraíba (FIEPB), that of Pernambuco (FIEPE) and that of Rio Grande do Norte (FIERN). A total of 600 email addresses were collected from the register, which is considered as the research universe.

All businesses were contacted by email to confirm their willingness to participate in the survey within 60 days. A reminder was sent every 15 days to obtain greater representativeness. At the end of the period, the sample composition was determined by the receipt of the questionnaires, comprising a total of 42 companies, representing 7% of the universe.

Given the proposed objective, which is to identify the relationships between the characteristics of the organization and managers in the attribution of levels of importance and usefulness of environmental performance indicators, the following variables were outlined according to Table 1:

Table 1
Categorization of variables

VARIÁBLES	KIND
Environmental performance indicators	Ordinal
Company characteristic	
ISO 14001 implemeted	Binary
Environmental strategies	Binary
Company structure	Ordinal
Size	Ordinal
Mananger characteristic	
Experience	Nominal
Education	Nominal
Formation	Nominal

Fonte: Dados da Pesquisa

The variables related to the environmental performance indicators are

consistent with those proposed by ISO 14031 and are measured using a 7-point Likert scale, where 1 is not very important and 7 is very important.

The variable that refers to the company characteristic "environmental strategies" was defined according to the environmental strategies available in the research tool that can be used in organizations. The companies that ranked the importance higher than the average of the respondents were classified as active, and the companies that ranked it lower were classified as passive, following the same judgment of Henri and Journeault (2008).

For the data collection procedure, a survey with closed-ended questions structured in three stages was used. According to Chizzotti (2018), the questionnaire consists of a set of pre-designed questions, systematically and sequentially arranged in items to elicit written answers from the respondents on the subject on which they are able to give an opinion. As a decisive aspect in choosing this instrument, Richardson (1999) presents the ease of coding answers and closed questions, as well as the ease of filling out the questionnaire in full.

The structure of the questionnaire followed the premises of Henri and Journeault (2008), justified by the researchers' interest in continuing the study in the Brazilian context. Ittner and Larcker (2001) emphasize the importance of promoting the continuation of studies, since the lack of continuity in research allows for only superficial discussions, minimizing the chances of conceptual advances. The first part consists of an explanation about the survey and the respondent's consent to participate in the survey. The second part consists of 13 statements about the importance of environmental performance indicators, based on the indicators proposed by ISO 14031. The third part contains four statements about the usefulness of indicators in the organization and 14 environmental strategies that can be adopted by companies. Finally, questions on company and manager characteristics are asked to profile the responding companies and managers.

Once the sample size and the data collection instrument had been defined, a pre-test was conducted with academics and managers to detect possible flaws in the instrument. Gil (2002) states that this step should be carried out as soon as the questionnaire is written. After the pre-test and restructuring, the questionnaire was applied.

The methodology used for the application followed the following steps: i) random selection of businesses in the states of Paraíba, Pernambuco and Rio Grande do Norte, in the year 2017; ii) initial contact by email explaining the research objective; and iii) application of the online questionnaire sent through the Google Docs platform requesting that it be sent to the manager responsible for environmental management issues in the organization.

Finally, data analysis techniques were used to examine the relationship between the indicators in the context of the organizations. First, descriptive statistics using frequency distributions were used to determine the importance given by managers to environmental indicators and their usefulness. Next, two types of analyses were used to examine the relationship between importance, usefulness, and company and management characteristics. First, correlation provides preliminary evidence of the relationship between the factors. And then, analysis of variance (ANOVA) allows for testing for statistically significant differences in the characteristics of the organizations and managers.

Analysis and discussion of the results

In order to profile the respondents, the frequency distribution was observed regarding

the characteristics of the organization and the manager. The structure of the tables was approached according to Callado and Jack (2017). Table 2 comprises the organizational characteristics explored in the survey.

Table 2
Organizational characteristics

ITEM	(%)
ISO 14001	
Implemented	21,4
No Implemeted	78,6
Environmental strategies	
Ative	61,9
Passive	38,1
Organizational structure	
1 à 3 levels	52,4
4 à 5 levels	31,0
More than 5 levels	16,7
Markets	
Only national	66,6
Nacional and International	33,3
Organizations size	
Micro	23,8
Smal	28,6
Medium	28,6
Big	19,0

Note. [a] Characteristic size was defined according to the number of employees.

It can be observed that most of the respondents have not implemented ISO 14001, indicated having active environmental strategies, and had an organizational structure of one to three hierarchical levels, being predominantly small and medium-sized companies. So, we see that even without ISO 14001 fully implemented, companies can develop some degree of environmental strategy:

Table 3
Managers characteristics

ITEM	(%)
Experience	
Up to 10 years	21,4
11 a 20 years	33,4
More than 20 years	45,2
Education	
Incomplete higher	2,4
Graduated	40,5
Postgraduate	57,1
Formation area	
Engineering	21,95
Finance	43,90
Natural Sciences	34,15

The responding managers are characterized by their experience of more than 20 years, with most of them having a post-graduate degree in finance. After profiling the sample, the importance of the environmental indicators suggested by ISO 14031 was determined, as shown in Table 4.

It can be observed that, in general, the environmental indicators are recognized as important in the managers' conception. The importance given to the indicators "waste discharge in the waters" and "solid waste discharge," which are indicators that monitor the outputs generated in the organization's operations, is highlighted. The degree of importance given to the indicators confirms the literature on the maturation of organizations' views on environmental issues (Schneider, 2004; Severo, 2015), which, according to Chen et al. (2006), focus on issues that are more related to operations, due to the pressures exerted by society and regulators.

Table 4
Environmental indicators – importance of measurement

ITEM	IMPORTANCE LEVEL							STD DEV.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Conformity with requirements or expectations	-	-	-	7,1	14,3	26,4	52,2	0,958
Inputs of energy	-	-	2,4	2,4	9,5	38,1	47,6	0,912
Community relations	-	-	-	9,5	9,5	16,7	64,3	1,008
Outputs of solid waste	-	-	-	-	9,5	19,0	71,5	0,661
Outputs of air emissions	-	-	-	4,8	4,8	23,8	66,6	0,804
Financial impact	-	-	-	7,1	14,3	19,0	59,6	0,975
Installation, operation, and maintenance of the physical facilities and equipment	-	-	-	-	19,0	28,6	52,4	0,786
Outputs of waste water	-	-	-	-	2,4	11,9	85,7	0,437
Inputs of raw materials	-	-	4,8	7,1	11,9	26,2	50,0	1,165
Inputs of water	-	-	2,4	2,4	11,9	21,4	61,9	0,962
Implementation of environmental policies and programs	-	-	-	4,8	7,1	21,4	66,7	0,834
Inputs of auxiliary materials	-	-	-	9,5	19,0	21,5	50,0	1,041
Indicators providing information on the local, regional, or national condition of the environments	-	-	2,4	4,8	26,2	21,4	45,2	1,070

The usefulness of the indicators relates to their purpose in the organization. The objectives were highlighted as developed by Bennett and James (1998) and addressed by Henri and Journeault (2008) in their study, as indicated in Table 5.

The recognition of the purpose of the indicators among managers stands out, confirming the literature considered. The usefulness "to motivate continuous improvement" obtained more importance, which is confirmed when it is stated that the indicators should be used to monitor processes, goal achievement, performance, and corrections of possible deviations.

Table 5
Use of environmental performance indicators

ITEM	IMPORTANCE LEVEL							STD. DEV.
	1	2	3	4	5	6	7	
Monitor internal compliance with environmental policies and regulations	-	-	-	4,8	11,9	23,8	59,5	0,882
Motivate continuous improvement	-	-	-	4,8	9,5	19,0	66,7	0,862
Provide data for internal decision-making	-	-	2,4	7,1	9,5	38,1	42,9	1,017
Provide data for external reporting	-	-	9,5	7,1	16,7	35,7	31,0	1,255

The usefulness "to provide data for external reporting" received a greater divergence in the level of importance assigned by managers. The findings allow us to conclude that the easy communication proposed by the indicators, as well as transforming and informing in a simplified way regarding complex data, highlighted by Beuren et al. (2013), are not in convergence as usefulness valued by managers.

Characteristics of the organization

Given the importance assigned to the indicators and their purposes, it was examined how organizational characteristics influence the assignment of importance levels, as shown in Table 6.

Table 6
Environmental indicators - organizational characteristics

ITEM	ISO	*STRATEGY*	*STRUCTURE*	*MARKETS*	*SIZE*
	p	***p***	***p***	***p***	***p***
Conformity with requirements or expectations	**0,025**	***0,000***	***0,11***	***0,082***	***0,019***
Inputs of energy	*0,744*	*0,383*	*0,953*	*0,448*	***0,049***
Community relations	***0,093***	*0,761*	*0,565*	*0,599*	*0,597*
Outputs of solid waste	*0,515*	*0,160*	*0,407*	*0,407*	*0,368*
Outputs of air emissions	*0,089*	*1,000*	*1,000*	***0,077***	*0,769*
Financial impact	***0,076***	*0,378*	*0,858*	*0,608*	*0,160*
Installation, operation, and maintenance of the physical facilities and equipment	*0,362*	*0,701*	*0,505*	*0,196*	*0,276*
Outputs of waste water	*0,486*	*0,576*	*0,926*	*1,000*	*0,413*
Inputs of raw materials	*0,878*	*0,231*	*0,882*	*0,596*	*0,617*
Inputs of water	*0,988*	*0,749*	*0,989*	*1,000*	*0,842*
Implementation of environmental policies and programs	*0,609*	*0,190*	*0,925*	*0,561*	*0,564*
Inputs of auxiliary materials	*0,181*	*0,106*	*0,639*	*1,000*	*0,527*
Indicators providing information on the local, regional, or national condition of the environments	*0,425*	*1,000*	*1,000*	*0,632*	*0,930*

Note. Test ANOVA

Regarding the characteristics of the organization, it can be observed that compliance with the standards imposed by the legislation is still the indicator that is considered the most important in terms of the ISO implemented, the environmental strategy, the structure, the markets, and the size of the organization. Therefore, it can be concluded that large companies, operating in international markets, with larger defined structures and active environmental strategies, consider it more important to monitor the extent to which their environmental practices comply with aspects of the legislation, which is the main driver for the importance of monitoring through indicators.

Other indicators that promote legitimacy were also important for companies that implement ISO 14001: "relationship with the community" and "financial impact," confirming the proposal of a green marketing that organizations pursue when monitoring environmental performance. Indicators related to atmospheric emissions are considered more important by companies that also operate in the international market, which implies a concern with international legislation.

The findings confirm the literature indicating that organizational characteristics influence the importance given to indicators (Henri & Journeault, 2008) and add specificity to what these concerns are, given the importance of modifying indicators related to legal formalities.

The usefulness of the indicators was also observed in relation to the organizational characteristics to identify their influence, as shown in Table 7.

Table 7
Use of environmental performance indicators - organizational characteristics

ITEM	**ISO**	***STRATEGY***	***STRUCTURE***	***MARKETS***	***SIZE***
	p	*p*	*p*	*p*	*p*
Monitor internal compliance with environmental policies and regulations	*0,759*	***0,019***	***0,054***	*0,525*	*0,284*
Motivate continuous improvement	*0,454*	*0,487*	*0,948*	***0,026***	*0,889*
Provide data for internal decision-making	*0,625*	***0,061***	*0,899*	*0,154*	*0,592*
Provide data for external reporting	*0,567*	***0,004***	*0,928*	*0,1003*	*0,137*

Fonte: Dados da Pesquisa

The usefulness of the indicators is influenced by strategy, structure and markets. The usefulness in terms of policy and regulatory compliance is statistically significant for companies with active environmental strategies and with larger organizational level structures. It can also be concluded that the type of environmental strategy of the organization has an influence on the usefulness of the indicators, such that companies that are more active in their strategies to improve environmental performance use indicators for management. Such findings diverge from the proposal of ISO 14031 and the authors (Oliveira & Serra, 2010; Nascimento Nadruz et al., 2017), regarding the greater usefulness of indicators for ISO certified companies to identify critical points for continuous improvement of their performance.

Managers' characteristics

The characteristics of managers as drivers of environmental performance improvements were identified according to experience, education, and training. See Table 8:

Table 8
Environmental indicators - Managers characteristics

ITEM	EXPERIENCE	EDUCATION	FORMATION
	p	*p*	*p*
Conformity with requirements or expectations	*0,526*	0,205	*0,994*
Inputs of energy	*0,167*	0,312	*0,472*
Community relations	*0,561*	0,128	*0,284*
Outputs of solid waste	*0,568*	0,829	*0,764*
Outputs of air emissions	*0,164*	0,634	***0,070***
Financial impact	***0,018***	0,208	*0,591*
Installation, operation, and maintenance of the physical facilities and equipment	*0,537*	0,100	*0,442*
Outputs of waste water	*0,435*	0,806	*0,906*
Inputs of raw materials	*0,165*	0,672	*0,577*
Inputs of water	*0,526*	0,205	*0,994*
Implementation of environmental policies and programs	***0,041***	0,396	*0,137*
Inputs of auxiliary materials	*0,720*	0,555	*0,842*
Indicators providing information on the local, regional, or national condition of the environments	*0,382*	0,330	*0,636*

Note. Test ANOVA

It can be seen that the professional's experience was significant only regarding the importance given to the financial impact indicator (0.018), which is responsible for assessing how environmental practices affect the organization's financial performance; more experienced managers gave greater importance to this indicator. The education characteristic had a significant influence on the output of atmospheric emissions indicator (0.007), revealing that managers with a degree in natural sciences give greater importance to the output indicators than to the impact on the environment. The findings elucidate the ideas of Silva, Callado, and Callado (2016) regarding the manager's vision to prioritize what is most urgent and to develop a management focused only on meeting targets, as observed in the influence of experience on the importance of financial impact indicators.

The characteristics of the managers were also identified in relation to the usefulness of the indicators, as indicated in Table 9.

As for the purpose, the "education" characteristic influences the usefulness in motivating continuous improvement, which is the view of engineers. As for the other indicators, it seems that regardless of experience, education and training, environmental issues are considered important in the management of organizations, revealing that the person responsible for this management recognizes the importance of environmental indicators as tools to support decisions.

Table 9
Use of environmental performance indicators - managers characteristics

ITEM	EXPERIENCE	EDUCATION	FORMATION
	p	*p*	*p*
Monitor internal compliance with environmental policies and regulations	0,775	0,728	0,728
Motivate continuous improvement	0,249	0,143	**0,053**
Provide data for internal decision-making	0,810	0,620	0,307
Provide data for external reporting	0,387	0,508	0,705

Nota. Teste ANOVA

Final Considerations

The objective of the research was to identify the effect of the characteristics of the organization and of the managers on the attribution of levels of importance and usefulness of environmental performance indicators, in view of the managers' conception of sustainable issues.

The descriptive statistics showed that, in general, the businesses consider environmental performance indicators to be important, both in terms of their use and in relation to their purpose. Greater importance was attributed to the indicators that control the outputs of the company's operations, which can be explained by the increase in coercive pressure on organizations to direct discharges to appropriate locations, as highlighted by Law No. 12.305/10, which establishes the National Solid Waste Policy (PNRS), and this is considered one of the biggest problems: the inadequate management of solid waste.

The purpose of the indicators studied confirms the recognition of this tool and the interest of organizations in evaluating environmental performance in order to identify critical points and possible improvements. As for the organizational context, a pro forma motivation is concluded for compliance with legislation, which is the main driver for organizations to monitor operations and management efforts. There is a reflection and motivation in these findings regarding the need for empirical research that highlights other benefits beyond legal compliance. Improving environmental performance is considered a costly path, and in this sense, organizations need to identify financial, competitive, and market advantages to change the paradigm of environmental compliance.

There is also manager adjustment regarding the attributes of environmental management through these support tools, regardless of their experience and training, with only continuous improvement being an indicator that is considered important according to the area of training. In this sense, it is concluded that, in practice, there is a predominance of the common view of organizations regarding the definition of indicators and their usefulness, defended by all members of the organization, regardless of experience, training or education.

It is concluded that there is theoretical-empirical evidence regarding the study of the characteristics of organizations and the levels that they attribute to the usefulness of indicators in their processes. There is also an environmental awareness and knowledge of this tool among managers. The importance of this tool is recognized in support of the different contexts of organizations, with greater influence on some characteristics.

The study is limited to the analysis of the reality of the respondents that make up the sample, as well as to exploring some indicators. In future research, we suggest also analyzing the sectors of organizations in order

to identify the usefulness of environmental indicators in the context of this characteristic, as well as analyzing the use of indicators in organizations in order to compare the level of importance they give and the level of use of these indicators in internal processes.

Referências

Araújo, G., Cohen, M., & Silva, J. (2014). Avaliação do Efeito das Estratégias de Gestão Ambiental Sobre o Desempenho Financeiro de Empresas Brasileiras. *Revista de Gestão Ambiental e Sustentabilidade*, *3*(2), 16–38.

Balasubramanian, S., Shukla, V., Mangla, S., & Chanchaichujit, J. (2021). Do firm characteristics affect environmental sustainability? A literature review-based assessment. *Business Strategy and the Environment*, *30*(2), 1389–1416. DOI: https://doi.org/10.1002/bse.2692

Bennett, M., & James, P. (1998). Environment under the spotlight: current practice and future trends in environment-related performance measurement for business. *(No Title)*.

Beuren, I. M., Theiss, V., & Carli, S. B. (2013). Influência do eco-controle no desempenho ambiental e econômico de empresas. *Contaduría y Administración*, *58*(4), 9–37. DOI: https://doi.org/10.1016/s0186-1042(13)71232-4

Bovea, M. D., Díaz-Albo, E., Gallardo, A., Colomer, F. J., & Serrano, J. (2010). Environmental performance of ceramic tiles: Improvement proposals. *Materials & Design*, *31*(1), 35-41. DOI: https://doi.org/10.1016/j.matdes.2009.07.021

Callado, A. L. C., Callado, A. A. C., & Almeida, M. A. (2008). A utilização de indicadores de desempenho não-financeiros em organizações agroindustriais: um estudo exploratório. *Organizações Rurais & Agroindustriais*, *10*(1), 35–48.

Callado, A. A., & Jack, L. (2017). Relations between usage patterns of performance indicators and the role of individual firms in fresh fruit agri-food supply chains. *Journal of Applied Accounting Research*, *18*(3), 375–398. DOI: https://doi.org/10.1108%2FJAAR-04-2016-0037

Campos, L. M. de S., & Melo, D. A. de. (2008). Indicadores de desempenho dos Sistemas de Gestão Ambiental (SGA): uma pesquisa teórica. *Production*, *18*, 540–555.

Campos, L. M. S., de Melo Heizen, D. A., Verdinelli, M. A., & Miguel, P. A. C. (2015). Environmental performance indicators: a study on ISO 14001 certified companies. *Journal of Cleaner Production*, *99*, 286–296.

Chizzotti, A. (2018). *Pesquisa em ciências humanas e sociais*. Cortez editora.

Dubey, R., Gunasekaran, A., Helo, P., Papadopoulos, T., Childe, S. J., & Sahay, B. S. (2017). Explaining the impact of reconfigurable manufacturing systems on environmental performance: The role of top management and organizational culture. *Journal of Cleaner Production*, *141*, 56–66. DOI: https://doi.org/10.1016/j.jclepro.2016.09.035

Fagundes, A. B., Vaz, C. R., & Hatakeyama, K. (2009). A relação entre os custos e receitas ambientais como principal indicador do desempenho econômico-ambiental das organizações. *Revista Produção Online*, *9*(3). DOI: https://doi.org/10.14488/1676-1901.v9i3.177

Gavronski, I., Ferrer, G., & Paiva, E. L. (2008). ISO 14001 certification in Brazil: motivations and benefits. *Journal of Cleaner Production*, *16*(1), 87–94. DOI: https://doi.org/10.1016/j.jclepro.2006.11.002

Gil, A. C. (2002). *Como elaborar projetos de pesquisa* (Vol. 4). Atlas São Paulo.

Guimarães, C. E., Teixeira, C. E., Cirani, C. B. S., & dos Santos, M. R. (2017). Avaliação do Desempenho Ambiental do Aproveitamento do

Biogás em Fecularias de Mandioca no Estado do Paraná. *Desenvolvimento Em Questão*, *15*(39), 171–202. DOI: https://doi.org/10.21527/2237-6453.2017.39.171-202

Henri, J.-F., & Journeault, M. (2008). Environmental performance indicators: An empirical study of Canadian manufacturing firms. *Journal of Environmental Management*, *87*(1), 165–176. DOI: https://doi.org/10.1016/j.jenvman.2007.01.009

Ingaramo, A., Heluane, H., Colombo, M., & Cesca, M. (2009). Water and wastewater eco-efficiency indicators for the sugar cane industry. *Journal of Cleaner Production*, *17*(4), 487–495. DOI: https://doi.org/10.1016/j.jclepro.2008.08.018

Ittner, C. D., & Larcker, D. F. (2001). Assessing empirical research in managerial accounting: a value-based management perspective. *Journal of Accounting and Economics*, *32*(1–3), 349–410. DOI: https://doi.org/10.1016/S0165-4101(01)00026-X

Lourenço, I. C., & Branco, M. C. (2013). Determinants of corporate sustainability performance in emerging markets: the Brazilian case. *Journal of Cleaner Production*, *57*, 134–141. DOI: https://doi.org/10.1016/j.jclepro.2013.06.013

Mangueira, F. O., Gallardo, A. L. C. F., & da Silva Gabriel, M. L. D. (2015). Análise dos efeitos da gestão ambiental no desempenho organizacional de oficinas de reparação automotiva no município de São Paulo. *Exacta*, *13*(2), 263. DOI: https://doi.org/10.5585/exactaep.v13n2.5746

Melnyk, S. A., Sroufe, R. P., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, *21*(3), 329–351. DOI: https://doi.org/10.1016/S0272-6963(02)00109-2

Nascimento N., V., Gallardo, A. L. C. F., Ruiz, M. S., & Ramos, H. R. (2017). Avaliação de desempenho ambiental a partir das práticas de gestão ambiental para qualificação da contratação de obras de linhas de transmissão. *Exacta*, *15*(2), 187–202. DOI: https://doi.org/10.5585/exactaep.v15n2.6381

Nascimento, D. L. M., Alencastro, V., Quelhas, O. L. G., Caiado, R. G. G., Garza-Reyes, J. A., Rocha-Lona, L., & Tortorella, G. (2019). Exploring Industry 4.0 technologies to enable circular economy practices in a manufacturing context. *Journal of Manufacturing Technology Management*, *30*(3), 607–627. DOI: https://doi.org/10.1108/JMTM-03-2018-0071

Nascimento, S. do, Bortoluzzi, S. C., Dutra, A., & Ensslin, S. R. (2011). Mapeamento dos indicadores de desempenho organizacional em pesquisas da área de Administração, Ciências Contábeis e Turismo no período de 2000 a 2008. *Revista de Administração (São Paulo)*, *46*, 373–391. DOI: https://doi.org/10.5700/rausp1018

NBR ISO 14001. (2004). *NBR ISO 14001: sistemas da gestão ambiental-Requisitos com orientações para uso*. ABNT Rio de Janeiro.

Oliveira, O. J. de, & Serra, J. R. (2010). Benefícios e dificuldades da gestão ambiental com base na ISO 14001 em empresas industriais de São Paulo. *Production*, *20*, 429–438. DOI: https://doi.org/10.1590/S0103-65132010005000013

Pacheco, J. M. J. (2001). *A inserção de Indicadores de Medição do Desempenho para o Sistema de Gestão Ambiental*. Dissertação (Engenharia da Produção) - UFSC. Santa Catarina, 2011.

Richardson, R. J. (1999). *Pesquisa Social: Métodos e técnicas, 3ª Edição Editora Atlas SA São Paulo*.

Rodrigues, A. M., Zeviani, C. H., Rebelato, M. G., & Borges, L. (2015). Avaliação de desempenho ambiental industrial: elaboração de um referencial metodológico. *Revista Produção Online*, *15*(1), 101–134. DOI: https://doi.org/10.14488/1676-1901.v15i1.1719

Schneider, V. E. (2004). *Sistemas de gerenciamento de resíduos sólidos de serviços de saúde: contribuição ao estudo das variáveis que interferem no processo de implantação, monitoramento e custos decorrentes*. Tese (Engenharia) UFRGS, 2004.

Severo, E. A. (2015). *Análise do gerenciamento ambiental nos hospitais de Caxias do Sul-RS*. Dissertação (Administração). UCS. 2015.

Silva, A. R., Callado, A. A. C., & Callado, A. L. C. (2020). Análise das relações entre o uso de indicadores de desempenho e fatores contingenciais de empresas do setor da construção civil. *Organizações em contexto*, 16 (32).

Tannuri, G. (2013). *Indicadores de desempenho ambiental evidenciados nos relatórios de sustentabilidade: uma análise à luz de atributos de qualidade*. Dissertação (Ciências Contábeis). UFSC. 2013.