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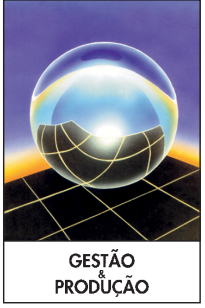

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ISO 14001:2015 and ISO 9001:2015: analyse the relationship between these management systems standards and corporate sustainability

ISO 14001:2015 e ISO 9001:2015: análise da relação entre as normas de sistema de gestão e a sustentabilidade empresarial

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Abstract: Two of the main standards of management systems known worldwide have undergone revision recently, namely: the ISO 9001 (Quality Management System) and the ISO 14001 (Environmental Management System). The new versions were published in September, 2015. In view of the changes which have taken place, the aim of this study is to analyse the relationship between these management systems standards with corporate sustainability. To achieve this objective, first the corporate sustainability requirements were identified based on the Corporate Sustainability Index, Ethos Indicators and the Global Reporting Initiative. The dimensions of corporate sustainability were divided into the following: social, environmental, economic, socio-environmental, socio-economic, economic-environmental and economic-social-environmental. Afterwards, two matrices were constructed for each standard in order to relate their requirements with the corporate sustainability ones. In the first round of analysis, matrices were sent to two specialists in the areas studied and then the results were compared. Relationships were classified as strong, weak or null. They identified some divergences among the answers from the experts. In order to solve the doubts, the second round of consultation was held with three experts. After receiving the experts´ responses, their responses was calculated through mode the Consolidated Relationship Matrices were built based on the consolidated responses from the experts. The ISO 14001:2015 showed a strong relationship with the environmental, social, socio-environmental, socio-economic, economic-environmental and economic-environmental-social dimensions and null with the economic dimension. Regarding the ISO 9001:2015, it can be observed that most of the sustainability requirements grouped into socio-economic and economic-environmental-social dimensions showed a strong relationship with the standard. The social and economic-environmental dimensions presented a weak relationship and in the environmental and economic dimensions there was a null relationship. The socio-environmental dimension presented weak and null relationships. It can be concluded that the ISO 9001 and ISO 14001 standards contribute to corporate sustainability, however, they alone do not ensure that all the requirements of the sustainability recommended by the Corporate Sustainability Index, Ethos Indicators and Global Reporting Initiative will be achieved.

Keywords: ISO 9001; ISO 14001; Sustainability; Indicators; Update.

Resumo: *Duas das principais normas de sistemas de gestão conhecidos mundialmente passaram por revisão sendo elas: a ISO 9001 (Sistema de Gestão da Qualidade) e a ISO 14001 (Sistema de Gestão Ambiental). As novas versões foram publicadas em setembro de 2015. Tendo em vista as mudanças ocorridas, o objetivo deste estudo é analisar a relação entre estas normas de sistemas de gestão e a sustentabilidade corporativa. Para atingir esse objetivo, primeiro os requisitos de sustentabilidade corporativa foram identificados com base no Índice de Sustentabilidade*

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Corporativa, nos Indicadores Ethos e na Global Reporting Initiative. As dimensões da sustentabilidade corporativa foram divididas em: social, ambiental, econômico, socioambiental, socioeconômico, econômico-ambiental e econômico-social-ambiental. Posteriormente, foram construídas duas matrizes para cada padrão, a fim de relacionar seus requisitos com os de sustentabilidade corporativa. Na primeira rodada de análise, as matrizes foram enviadas para dois especialistas das áreas estudadas e, em seguida, os resultados foram comparados. As relações foram classificadas como fortes, fracas ou nulas. Os pesquisadores identificaram algumas divergências entre as respostas dos especialistas. Para esclarecer as dúvidas, foi realizada a segunda rodada de consultas com três especialistas. Após o recebimento das respostas dos especialistas, suas respostas foram analisadas e as Matrizes de Relacionamento foram consolidadas. A ISO 14001:2015 mostrou uma forte relação com as dimensões ambiental, social, socioambiental, socioeconômica, econômico-ambiental e econômico-ambiental-social e nula com a dimensão econômica. Com relação à ISO 9001: 2015, pode-se observar que a maioria dos requisitos de sustentabilidade agrupados nas dimensões socioeconômica e econômico-ambiental-social apresentaram forte relação com a norma. As dimensões social e econômico-ambiental apresentaram uma relação fraca e nas dimensões ambiental e econômica houve uma relação nula. A dimensão socioambiental apresentou relações fracas e nulas. Pode-se concluir que as normas ISO 9001 e ISO 14001 contribuem para a sustentabilidade corporativa, no entanto, elas sozinhas não garantem que todos os requisitos de sustentabilidade recomendados pelo Índice de Sustentabilidade Corporativa, Indicadores Ethos e Iniciativa Global Reporting sejam alcançados.

Palavras-chave: *ISO 9001; ISO 14001; Sustentabilidade; Indicadores; Atualização.*

1 Introduction

According to the definition from the Lowell Center for Sustainable Production, production from the point of view of sustainability can be defined as the creation of goods and services by non-polluting systems that conserve energy and natural resources, to ensure the health and safety of employees, communities and consumers, and that is economically viable and rewarding for all workers (Veleva et al., 2001).

To achieve sustainability, one of the ways identified has been to use management systems. Mežinska et al. (2015) state that the ISO 9001 requirements (Quality Management System), the ISO 14001 (Environmental Management System) and the OHSAS 18001 (Occupational Health and Safety Management System) can be used jointly focusing on building sustainable organizations. Fresner & Engelhardt (2004) define that the basis for sustainable development can be established in small steps, and integrating management systems can be considered as one of these steps. Jørgensen (2008) also refers to using management systems to achieve sustainability.

Two of the main standards of management systems known worldwide have undergone revision recently, namely: the ISO 9001 (Quality Management System) and the ISO 14001 (Environmental Management System). The new versions were published in September 2015. Among the main changes to the ISO 9001 are: adopting the new structure proposed by the ISO in order to facilitate integration between the different management systems and focusing on risk-based thinking. Moreover, it gives greater emphasis to the involvement of leadership, as it is easier to be used by service companies and organizations based on knowledge (ISO, 2015a). The new version of the ISO 14001 heightened the need to take into account both internal and external elements that influence the environmental impact, for example, changes to the climate and the competitive environment in which the company operates. Another perceived change is that the new standard focuses on life-cycle thinking (ISO, 2015b).

Another way of achieving sustainability is by using indicators such as Ethos Indicators, the Corporate Sustainability Index and the Global Reporting Initiative. The first two are Brazilian indicators and the latter is North American, which is recognized worldwide and used. These indicators are the basis for setting sustainability requirements used in this research.

Given the changes made to the standards, this study evaluates the new versions of the standards which establish requirements to implement quality management and environmental systems, seeking to verify that the ISO 9001 and ISO 14001 requirements support the sustainability requirements.

2 Literature review

The number of standards related to management systems has grown in recent years, among them the following can be mentioned: the ISO 9001 (Quality Management System), the ISO 14001 (Environmental Management System), the OHSAS 18001 (Occupational Health and Safety Management System), the NBR 16001 (Social Responsibility Management System), the ISO 22000 (Food Safety Management System), the ISO 27001 (Information Security Management System), among others. Some authors have claimed that using the ISO 9001, ISO 14001 and OHSAS 18001 jointly contribute to sustainability.

One of these authors is Jørgensen (2008), who emphasizes that sustainable management should include quality, occupational health and safety, as well as the environment, considering the perspective of integrating these management systems. Mežinska et al. (2015) refer also to ISO9001, ISO14001 and OHSAS18001

such a contributor for social responsibility and sustainability. Fresner & Engelhardt (2004) mention that the integration of management systems supported sustainable development. According Karapetrovic & Willborn (1998), the integration of two or more management systems occurs when they join and lose the independence of one or all systems. Then comes what is called Integrated Management Systems (IMS). The research of Bernardo et al. (2017) revealed that difficulties, benefits and methodology of integration keep similarities independent of the country where the company is located, but the auditing process often changes. The main difficulties detected in the implementation of the IMS are: lack of human resources, inadequate training, non-integrated audit, lack of senior management commitment and lack of integration in IMS performance evaluation (Gianni & Gotzamani, 2015).

More information follows about the ISO 9001 (Quality Management System) and the ISO 14001 (Environmental Management System) standards, as well as sustainability. We decided to analyse these two management system standards, as both underwent a review process in 2015, seeking through this research to identify whether these changes contribute to integrating corporate sustainability into organizations.

2.1 Management system standards

The ISO (International Organization for Standardization) is a non-governmental organization that emerged in Switzerland. It is responsible for developing a large amount of standards. One of the standards best known worldwide is the ISO 9001 (Quality Management System), developed by the ISO in 1987, which underwent various revisions in 1994, 2000, 2008 and 2015. Another widespread standard also developed by the ISO is the ISO 14001 (Environmental Management System), whose first version was drawn up in 1996, and was revised in 2004 and 2015.

The implementation of an environmental management system based on ISO 14001 can bring benefits to the organization. The organization can improve its environmental performance behind the emission reduction of greenhouse gases, water and light savings, solid waste management, among others (Poksinska et al., 2003). Parallel to ISO 9001 can bring benefits such as customer satisfaction, increased production speed and delivery to the customer, greater return on investments, among others (Casadesús & Karapetrovic, 2005)

According to Tarí et al. (2012), the main benefits of adopting the ISO 9001 and the ISO 14001 are similar for both standards, highlighting the improvement of efficiency and performance, improved image, greater customer satisfaction and improvements in relations with people.

In research conducted by Boiral (2011), with companies certified to the ISO 9001 and/or ISO 14001, it was revealed that among the main pitfalls when implementing these management systems are: lack of feedback and monitoring system; inappropriate or excessive documentation; search for certification focused on the commercial area; insufficient resources and outsourcing the deployment process.

The importance of both the ISO 9001 and ISO 14001 can be observed by the growth of certified companies. From 1999 to 2015, the number of certified companies worldwide to the ISO 9001 increased from 343,641 to 1,033,936. In the same period, the number of certifications to the ISO 14001 went from 13,994 to 319,324 (ISO, 2017).

In order to facilitate integration and a greater consistency of the different management system standards, the ISO established the Annex SL. The proposal of the Annex SL is to provide a similar structure, with texts and terms in common, which serves as a basis for preparing and reviewing the next management systems developed by the ISO or any other body who wants to follow this structure (Tangen & Warris, 2012).

Due to the revised ISO 9001 and ISO 14001 in 2015, the number of clauses increased from five to seven. According to Qi et al. (2013) ISO 9001 and ISO 14001 standards are seen as a fundamental foundation for the economic and environmental development of a company.

The ISO 9001 and ISO 14001 clauses follow the Annex SL and are: the organization's context, leadership, planning, support, operation, performance evaluation and improvement. According to Carpinetti & Gerolamo (2016), although the number of clauses has increased, there was no major change regarding the requirements, but only adaptation. The same authors add that the main changes are related to some terminology, adopting the concept of risk, the exclusion of the requirement of having a Management Representative (MR) and no requirement for documented procedures. The 2015 revision of the ISO 14001 also follows the Annex SL structure, and therefore, the ISO 14001 and ISO 9001 clauses are the same.

2.2 Sustainability

In order to address the problems related to environmental issues, in 1983 the World Commission on Environment and Development (WCED) was created. In 1987, the commission published the Brundtland Report, also known as "Our Common Future", formalizing the concept of sustainable development. According to the report, sustainable development is the ability of meeting the needs of the present, but

without causing damage to future generations. In the report, three fundamental components of sustainable development are presented: environmental protection, economic growth and social equity (ONU, 2014).

From these three components comes the concept called *triple bottom line* developed by Elkington (1997) which considers social, environmental and economic issues. The social pillar involves issues related to the surrounding community, training and education, job creation for minorities and philanthropy, workplace safety and products. The economic pillar is related to income and, in the case of sustainability, includes environmental and social issues. The environmental pillar is related to natural resources such as wood, soil, water, flora, fauna, biodiversity, greenhouse gas emissions, use of renewable resources and additional wealth that sustains an ecosystem.

In research carried out by Kiron et al. (2013), when considering sustainability within the organization, companies pointed out that it was fundamental to have first the commitment of senior management, followed by clear communication regarding the responsibility of sustainability in the organization and the establishment of sustainability-related indicators. When asked about the main obstacles to assess the sustainability strategies, it was mentioned first the difficulty of quantifying intangible effects, followed by competing priorities and the difficulty of capturing comprehensive metrics. The research also addressed the factors that led to the change in the business model, and the following was mentioned: consumer preference for products/sustainable services; a lack of resources; competitors being more concerned about the issue of sustainability and political and legal pressures, among others.

There are tools that have helped to include sustainability in organizations such as Ethos Indicators, the Corporate Sustainability Index and the Global Reporting Initiative (GRI).

The Ethos Institute, which is the creator of the indicators, started in 1998 by a group of Brazilian executives and entrepreneurs concerned with social responsibility and sustainable development (Ethos, 2016). The Ethos indicators have a questionnaire to help companies perform a management self-diagnosis, identifying which level the company operates in relation to sustainability (Ethos, 2014). According to Lohn (2011) the Ethos indicators can be used as a tool for evaluating and managing the social practices of an organization.

Among the issues addressed by the indicators are: the internal public, transparency and governance, values, suppliers, consumers and customers, the environment, community, government and society (Ethos, 2007). Therefore, the authors selected these indicators because they point out the main social issues represented by the social tripod of sustainability.

The BM& FBovespa is a Brazilian stock exchange which has headquarters in the United States, China and the UK, as well as two headquarters in São Paulo and Rio de Janeiro in Brazil (Bovespa, 2016). The Corporate Sustainability Index (CSE) is a tool developed by BM&FBovespa, which allows for a comparative analysis among companies listed in this stock exchange considering environmental equilibrium, economic efficiency, social justice and corporate governance.

The purpose of this tool is to help investors in decision-making related to socially responsible investments, as well as being a driving force for companies to adopt sustainable practices. This index was a pioneering initiative in Latin America that began in 2005 and was initially funded by the International Finance Corporation (IFC), which is a financial arm of the World Bank (ISE, 2016).

The study carried out by Santis et al. (2016) aimed at analyzing the financial performance of companies that are on the CSE list compared to companies that are not part of it. The result shows that the difference in financial performance between these companies was not significant. However, the study by Reale, et al. (2016) points out that the use of the Corporate Sustainability Index brings benefits especially in the use of natural resources.

The GRI (Global Reporting Initiative) is an independent international organization that helps companies develop sustainability reports. It appeared in 1997 in Boston and can be found in over 90 countries. It provides one of the world's most widely used standards for the preparation and disclosure of sustainability reports, helping businesses, the government, civil society and citizens to make the best decisions when taking into account the sustainability issue (GRI, 2015). According to Fernandez-Feijoo et al. (2014) the GRI is a tool used in communicating the environmental, social and economic aspects of an organization. The authors used GRI performance indicators because it is a tool used worldwide and points out the main points that should be measured by the organizations to achieve business sustainability.

3 Methodology

The research aims at the creation and development of knowledge, and the contribution to this knowledge is its main output. Universities are being charged for activities and research that involve economic growth and are applicable in business (Karlsson, 2009). In the case of this research, it sought to bring this contribution both to the organizations that use these norms and to the academic area. However, as Karlsson (2009) points out, it is not all the research questions that can be answered by the existing research methods.

This methodology was based on the study carried out by Ferreira & Gerolamo (2016). This section illustrates the steps taken to achieve the objective of this study (Figure 1).

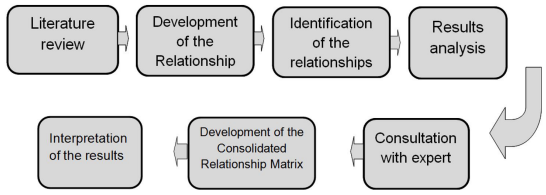

Figure 1. Methodological steps. Source: Developed by the authors.

Step 1 - Literature review: the aim of this step is to identify the corporate sustainability requirements. Eighty seven requirements were taken from the Corporate Sustainability Index (ISE, 2013), the Global Reporting Initiative (GRI, 2013) and Ethos (2007), and were divided into seven corporate sustainability dimensions which are: social, environmental, economic, socio-environmental, socio-economic, economic- environmental and economic-environmental-social. The GRI, ISE and Ethos were chosen for their completeness in addressing issues related to corporate sustainability.

Table 1 shows the corporate sustainability requirements that can be understood as: "[…] the need or expectation that is stated, generally implied or obligatory" (ABNT, 2015, p. 21). Afterwards, the ISO 14001 management system standards: 2015 (ISO, 2015c) and the ISO 9001:2015 (ISO, 2015d) were read and interpreted. The outputs of this step were the corporate sustainability requirements (as shown in Table 1) and the management system standard requirements addressed in this study.

Step 2 - Relationship Matrix Preparation: the aim was to develop a methodology that could relate the corporate sustainability requirements (shown in the rows) identified in Step 1 with the requirements of the ISO 14001 and ISO 9001 standards (shown in the columns) as illustrated in Table 2. The outputs of this step were: relationship matrix between corporate sustainability and the ISO 14001 and the relationship matrix between corporate sustainability and the ISO 9001.

Step 3 - Identifying relationships (first round): the aim was to identify the relationship between the corporate sustainability requirements and the management system standard requirements. In this step, the two first experts completed the relationship matrices considering the following scales:

- Strong relationship (9) = when the corporate sustainability requirements are **directly** related to the management system standard requirements;
- Weak relationship (3) = when the corporate sustainability requirements are **indirectly** related to the management system standard requirements;
- Null relationship (0) = when the corporate sustainability requirements **have no relation** to the management system standard requirements.

Twenty-three experts were invited to fill out the matrices. However, only two responded. The two experts who took part in this step hold a Master´s degree and their dissertations address the two standards analysed.

The outputs of this step were: relationship matrix between corporate sustainability and the completed ISO 14001 and the relationship matrix between corporate sustainability and the completed ISO 9001.

Step 4 - Results analysis: the aim was to analyse and interpret the results obtained by completing the matrices. After completing the matrices, the average rows were calculated (general average) and the results were compared between the responses of the two experts. The divergences were separated and sent to experts as shown in Step 5. As the results used in this analysis stage are averages, the scale shown in Table 3 was used. This scale was used only at this stage.

To understand the results, it is important to consider how the following averages were calculated:

- Average value = is the individual value of each relationship according to the answers given by the experts (value of each cell);
- Overall average = is the average of the relationship between each sustainability requirement and each management system standard requirement (averages of rows or columns).

The research method enables users to interpret the results in the following ways:

1. Considering the mean values (value of each cell). This enables the user to identify the relationship between each corporate sustainability requirement and each management system standard requirement used;
2. Analysing and interpreting the global average values (average of rows and columns). This enables

Table 1. Corporate sustainability requirements.

Social	Environmental	Economic	Socio-environ	Socio-economic	Econ-environ
1. Develop engagement policies and dialogue with stakeholders (Ethos, 2007) and (ISE, 2013).	18. Develop environmental policy (Ethos, 2007) and (ISE, 2013).	32. Adopt policies for intangible assets (ISE, 2013).	45. Incorporate socio-environmental criteria into the organization's strategy (Ethos, 2007).	52. Support educational projects (Ethos, 2007).	64. Develop internal environmental improvement programs (Ethos, 2007).
2. Value diversity, equity and non-discrimination (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	19. Maintain an area or committee responsible for the environment (Ethos, 2007).	33. Develop implemented processes and procedures for managing intangible assets (ISE, 2013).	46. Communicate the socio-environmental aspects to stakeholders (Ethos, 2007).	53. Develop a complaint system concerning environmental impacts (ISE, 2013).	65. Have waste management programs (Ethos, 2007).
3. Consider social responsibility in the supply chain (Ethos, 2007) and (ISE, 2013).	20. Maintain permanent preservation areas (PPA) (ISE, 2013).	34. Consider antitrust values in your corporative policies (ISE, 2013).	47. Be responsible for socio-environmental issues in the supply chain (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	54. Develop occupational health and safety policy (Ethos, 2007) and (ISE, 2013).	66. Have programs to verify the origin of timber and forest inputs (Ethos, 2007).
4. Engage stakeholders (Ethos, 2007) and (ISE, 2013).	21. Maintain conservation areas legal (ISE, 2013).	35. Develop processes and procedures for corporative risk management (ISE, 2013).	48. Evaluate suppliers considering socio-environmental issues (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	55. Formulate labour, compensation, benefits and career policies (Ethos, 2007), (ISE, 2013) and (GRI, 2013, 211).	67. Prioritize preventive policies (Ethos, 2007).
5. Participate in developing public policies (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	22. Carry out environmental licensing (ISE, 2013).	36. Restrict the use of financial instruments for the sole purpose of protection (ISE, 2013).	49. Train suppliers concerning socio-environmental issues (Ethos, 2007) and (ISE, 2013).	56. Formulate policies related to customers (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	68. Have environmental quality monitoring policies (Ethos, 2007).
6. Sponsor programmes and campaigns (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	23. Develop environmental impact study (Ethos, 2007).	37. Implement processes and procedures to monitor indirect economic impacts of the company's activities (ISE, 2013).	50. Draw up socio-environmental report (Ethos, 2007).	57. Ensure work conditions (Ethos, 2007) and (ISE, 2013).	69. Participate in the disposal of products and post-consumer processes (Ethos, 2007).
7. Consider vulnerable groups (Ethos, 2007).	24. Advertise environmental aspects and impacts (ISE, 2013).	38. Have a performance management system based on indicators related to strategic planning (ISE, 2013).	51. Participate in committees/local and or regional advisory boards (Ethos, 2007).	58. Maintain dialogue with stakeholders (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	70. Attempt to reduce the consumption of renewable and non-renewable resources (Ethos, 2007).
8. Ensure ethical principles are met (Ethos, 2007).	25. Consider issues concerning climate change (ISE, 2013).	39. Implement antitrust measures (ISE, 2013).		59. Include local suppliers (Ethos, 2007) (ISE, 2013) and (GRI, 2013).	71. Consider environmental liabilities (ISE, 2013).

Source: Developed by the authors.

Table 1. Continued...

Social	Environmental	Economic	Socio-environ	Socio-economic	Econ-environ
9. Ensure human rights are met (GRI, 2013).	26. Monitor greenhouse gases (Ethos, 2007).	40. Prepare and publish financial statements in constant currencies (ISE, 2013).		60. Map employees´ skills (Ethos, 2007).	72. Have insurance for environmental degradation (ISE, 2013).
10. Plan employees´ career (Ethos, 2007).	27. Monitor risks and environmental aspects (Ethos, 2007).	41. Calculate the economic profit or other measures to generate economic value (ISE, 2013).		61. Identify employees with high incidence or high risk of illnesses related to their occupation (GRI, 2013)	73. Consider an approach based on product life cycle (ISE, 2013).
11. Internal preparation of employees (Ethos, 2007).	28. Develop and maintain emergency plans (Ethos, 2007).	42. Report the direct economic value (revenue) generated and distributed based on the accrual basis of accounting (GRI, 2013).		62. Antitrust law (ISE, 2013).	74. Have a process to measure, monitor and audit significant environmental aspects regularly (Ethos, 2007), (ISE, 2013).
12. Contract local residents (Ethos, 2007) and (ISE, 2013).	29. Develop and maintain action plans (Ethos, 2007).	43. Prepare a benefit plan for the organisation (GRI, 2013).		63. Ensure no gender distinction (GRI, 2013).	75. Monitor the consumption of natural resources in the production chain (ISE, 2013).
13. Contract disabled people (Ethos, 2007).	30. Preserve biodiversity (Ethos, 2007) and (ISE, 2013).	44. Top management must be committed to social and environmental issues (Ethos, 2007).			76. Consider initiatives such as “ecodesign” or DfE (Design for Environment) (ISE, 2013).
14. Monitor and prevent occupational diseases and work accidents (GRI, 2013).	31. Use renewable resources (ISE, 2013).				77. Plan the product considering environmental issues (ISE, 2013).
15. Maintain agreements between companies and trade unions (GRI, 2013).					
16. Ensure technical support (ISE, 2013).					
17. Provide information (Ethos, 2007).					

Source: Developed by the authors.

Table 2. Extract from Theoretical Matrix for exemplification.

Corporate sustainability requirements	ISO 14001 requirements			
	4.1 Understanding the organisation and its context	4.2 Understanding stakeholders´ needs and expectations	4.3 Determining the scope of the quality management system	(...)
1. Develop engagement policies and dialogue with stakeholders (Ethos, 2007) and (ISE, 2013).				
2. Value diversity, equity and non-discrimination (Ethos, 2007), (ISE, 2013) and (GRI, 2013).				
3. Consider social responsibility in the supply chain (Ethos, 2007) and (ISE, 2013).				
(...)				

Source: Developed by the authors.

Table 3. Data analysis scale.

0 = Null relationship
0 > and ≤ 1.5 = Weak relationship
1.5 > and ≤ 3 = Moderate relationship
3 > and ≤ 9 = Strong relationship

Source: Developed by the authors.

the user to interpret the general relationship of each sustainability requirement with the various management system requirements (row) or each requirement of a specific management system with various sustainability requirements (column).

In this study, the researchers chose the number 1 analysis option as they wanted to identify in detail the relationships between the management system standards and corporate sustainability.

Table 4 shows an exemplification of how the Relationship Matrix was completed and analysed by the experts.

Step 5 - Identifying relationships (second round): After this analysis, it was observed that in some points identified by the experts there were differing opinions. In total, there were 42 sustainability requirements which had differing opinions concerning the ISO 14001 matrix and 3 matrix requirements in the ISO 9001. Due to this, each of the different sustainability requirements was analysed and the average values which showed divergence were identified. The average divergent values were analysed by three experts (two doctors and one Master).

Step 6 - Consolidated Relationship Matrix Development: the aim was to insert the consolidated opinion into Step 5 (above). Considering this, the convergent responses of the experts in the first round were maintained and concerning the divergences, the value calculated was inserted based on the statistic mode of the responses from the five experts (first and second rounds) resulting in new general average values. The output of this step was the Consolidated Matrix Relationship.

Step 7 - Interpretation of the results: after consolidating the results, the Consolidated Relationship Matrix was interpreted and shown according to the following section.

4 Results and discussion

In Table 5, it can be observed that the social dimension of sustainability had a strong relationship with the ISO 14001 and weak one with the ISO 9001. Although six ISO 9001 requirements were considered strong, ten requirements were considered weak.

The environmental dimension showed a strong relationship with the ISO 14001, and all the sustainability requirements had at least a strong relationship with the standard´s requirements. In contrast, the ISO 9001 standard had a null relationship with the environmental dimension, although two sustainability requirements had a weak relationship.

Regarding the economic dimension, most sustainability requirements had a null relationship with the ISO 14001 and the ISO 9001.

The socio-environmental dimension showed a strong relationship with the ISO 14001 as most of the sustainability requirements had a strong relationship with the standard. Most of the socio-environmental dimension requirements presented weak and null relationships with the ISO 9001, although the relative

Table 4. Extract from completed Theoretical Matrix.

Corporate sustainability requirements	ISO 14001 requirements				Global average
	4.1 Understanding the organisation and its context	4.2 Understanding the stakeholders´ needs and expectations	4.3 Determining the scope of the quality management system	(...)	
1. Develop engagement policies and dialogue with stakeholders (Ethos, 2007) and (ISE, 2013).	9 *	9 *	3 Δ		2. 16
2. Value diversity, equity and non-discrimination (Ethos, 2007), (ISE, 2013) and (GRI, 2013).	9 *	0 □	9 *		1. 41
3. Consider social responsibility in the supply chain (Ethos, 2007) and (ISE, 2013).	0 □	0 □	0 □		0
(...)					

Key: * = strong relationship; Δ = weak relationship; □ = null relationship. Source: Developed by the authors.

Table 5. Map of relationships between the management system standards and the eighty seven corporate sustainability requirements.

		Relationships		
	Dimensions	**Strong**	**Weak**	**Null**
ISO 14001:2015	Social	1, 2, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17	3, 5, 6	
	Environmental	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31		
	Economic	33, 35, 38, 44	32	34, 36, 37, 39, 40, 41, 42, 43
	Socio-environmental	46, 48, 49, 51	45, 50	47
	Socio-economic	52, 53, 56, 57, 58, 59, 60		54, 55, 61, 62, 63
	Economic - environmental	64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76	67, 77	
	Economic-environmental-social	78, 79, 80, 81, 84, 85, 86, 87		82, 83, 86
ISO 9001:2015	Social	2, 3, 10, 11, 16, 17	1, 4, 5, 7, 8, 9, 12, 13, 14, 15	6
	Environmental		28, 29	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 30, 31
	Economic	35, 38	37	32, 33, 34, 36, 39, 40, 41, 42, 43, 44
	Socio-environmental	48	45, 46, 47	49, 50, 51
	Socio-economic	54, 56, 57, 58, 60, 61	53, 55, 59, 63	52, 62
	Economic - environmental	67	64, 65, 66, 68, 69, 70, 71, 73, 77	72, 74, 75, 76
	Economic-environmental-social	78, 80, 84, 86, 87	79, 81, 82, 83	85

Source: Developed by the authors.

requirement to assess the suppliers presented a strong relationship.

The socio-economic dimension showed a strong relationship with the ISO 14001 and the ISO 9001.

The environmental-economic dimension showed a strong relationship in twelve out of the fourteen sustainability requirements when considering the ISO 14001 standard and a weak relationship in nine out of the fourteen requirements with the ISO 9001.

The economic-environmental-socio dimension showed a strong relationship with the ISO 14001 standard and a weak relationship with the ISO 9001.

Table 6 (below) shows the requirements of the ISO 9001 and the ISO 14001 standards that have a

Table 6. Requirements of the ISO 9001 and ISO 14001 standards that have a strong relationship with the corporate sustainability requirement.

	Requirement				Requirement		
	Sustainability	ISO 14001:2015	ISO 9001:2015		Sustainability	ISO 14001:2015	ISO 9001:2015
Social	1	4.1, 4.2, 4.4, 7.4.1; 7.4.2; 7.4.3		Socio-environmental	45		
	2	4.1; 4.3; 5.2; 6.1.3; 9.1.2	7.1.4		46	7.4.1; 7.4.2; 7.4.3	
	3		8.5.3		47		
	4	4.2			48	9.1.1; 9.1.2	8.4.2; 8.4.3
	5				49	4.2; 7.1; 7.2; 7.3; 7.4.3	
	6				50		
	7	4.2			51	4.2	
	8	4.3; 4.4; 5.1; 5.2; 6.1.3; 7.3; 9.1.2		Socio-economic	52	4.2	
	9	5.1; 5.2; 6.1.3; 7.3; 9.1.2			53	7.4.1; 7.4.2; 7.4.3	
	10	7.2	7.1.2; 7.2; 7.3		54		7.1.4
	11	7.1; 7.2; 7.3	7.1.2; 7.1.6; 7.2; 7.3		55		
	12	4.2			56	4.2; 7.4.3	5.1.2
	13	9.1.2			57	6.1.3; 9.1.2	7.1.4
	14	7.2; 7.3			58	7.4.1; 7.4.2; 7.4.3	5.1.2
	15	4.2			59	4.2	
	16	7.1	5.1.2		60	7.2	4.1; 4.2; 4.3; 7.2
	17	5.2; 7.4.1; 7.4.2; 7.4.3	6.2		61		7.1.4
Environmental	18	5.2			62		
	19	5.1; 5.3			63		
	20	4.3; 5.2; 6.1.3; 9.1.2		Environmental-economic	64	8.1; 10.3	
	21	4.3; 5.2; 6.1.3; 9.1.2			65	6.1.3	
	22	4.3; 5.2; 6.1.1; 6.1.3; 9.1.2			66	8.1	
	23	4.3; 5.2; 6.1.3; 9.1.2			67		6.1
	24	7.4.1; 7.4.2; 7.4.3			68	4.4; 9.1.2	
	25	4.3; 5.2; 6.1.3; 9.1.2			69	8.1	
	26	4.3; 5.2; 6.1.3; 9.1.2			70	6.1.2; 8.1	
	27	6.1.1; 6.1.2; 6.1.3; 6.1.4; 6.2.1; 6.2.2; 7.2; 7.3; 9.1.1; 9.1.2; 9.3			71	4.3; 5.2; 6.1.1; 6.1.2; 6.1.3; 6.1.4; 8.2; 9.1.2; 9.2.2; 9.3; 10.2	
	28	8.2			72	9.1.2	
	29	6.1.4			73	8.1	
	30	4.3; 5.2; 6.1.3; 9.1.2			74	9.1.1; 9.1.2; 9.2.1; 9.2.2	
	31	4.3; 5.2; 6.1.3; 9.1.2			75	9.1.1; 9.1.2	
Economic	32				76	10.3	
	33	8.1			77		
	34			Economic-environmental-social	78	7.4.1; 7.4.2; 7.4.3	7.4; 8.2.1; 8.4.3
	35	6.1.1; 6.1.3; 6.1.4; 9.1.2	6.1		79	5.1; 6.1.2; 6.1.3; 7.3; 7.4.2; 7.4.3	
	36				80	4.2	4.1; 4.3
	37				81	4.2	
	38	6.2.2; 9.1.1; 9.1.3	6.2		82		
	39				83		
	40				84	6.1.3; 9.1.2	8.2.2
	41				85	7.4.1; 7.4.2; 7.4.3	
	42				86	5.3	5.3
	43				87	4.1; 6.1.1	6.1
	44	5.1; 5.2; 5.3; 9.3					

Source: Developed by the authors.

strong relationship with the sustainability requirement. It can be observed that the ISO 14001 has for each sustainability requirement various requirements that have a strong relationship. For example, requirement 1 of the sustainability that is inserted into the social dimension consisting of "develop engagement policies and dialogue with stakeholders" has a strong relationship with the 4.1, 4.2, 4.4, 7.4.1, 7.4.2 and 7.4.3 requirements of the ISO 14001, although it has a weak relationship with the ISO 9001. These relationships occurred because the standard was inserted into the need that organizations have to identify the needs and expectations of stakeholders.

Requirement 8 of the sustainability, i.e. "ensure ethical principles are met" showed the highest number of strong requirements in relation to the ISO 14001 in the social dimension.

Corporate sustainability requirement 27, i.e. "monitor risks and environmental aspects" was the requirement of the environmental dimension that most showed a strong relationship with the requirements of the ISO 14001 standard.

In the economic dimension, the sustainability requirement that most showed a strong relationship with the requirements of the ISO 14001 standard was number 35 which is "develop processes and procedures for corporative risk management."

In the environmental dimension, sustainability requirement number 49 which is "train suppliers concerning socio-environmental issues" was the one that showed the strongest relationship with the requirements of the ISO 14001.

Sustainability requirement number 53 which shows the need for organizations to "develop a complaint system concerning environmental impacts" inserted into the socio-economic dimension had the highest amount of strong relationships with the ISO 14001 in this dimension.

Sustainability requirement number 71 which is "consider environmental liabilities" had the highest number of relationships in the environmental-economic dimension with the ISO 14001.

In the economic-environmental-social dimension, requirement number 79 which is "assume an ethical posture" was the requirement that most had a strong relationship with the ISO 14001.

According to the analysis, it was identified that the ISO 14001 had a null relationship with topics such as social responsibility in the supply chain, participation in public policy organizations, sponsorship of advertisements and campaigns, using financial instruments for the sole purpose of protection, processes and procedures to monitor indirect economic impacts of the company's activities, financial statements in constant currencies, generating measures of economic value, direct economic value, benefit plan of the organizations, socio-environmental issues in the production chain, occupational health and safety policy, labour policies, compensation, benefits and career, identify employees with high incidence or high risk of diseases related to their occupation, continuous policy of clarifying antitrust to the employees, maintaining the values of collaborators´ salaries regardless of gender, advisory board or formal person in charge for internal and external ethical issues and ensuring effective management and not practicing unfair competition.

Sustainability requirement number 11 which is "Internal preparation of employees" inserted into the social dimension was the one that most showed strong relationships with the ISO 9001.

The ISO 9001 standard showed no strong relationship with the environmental dimension of corporate sustainability.

In the economic dimension, as shown in Table 6, only the sustainability requirements of number 35 which is "develop processes and procedures for corporate risk management" showed a strong relation with requirement 6.1 of the ISO 9001 standard and the sustainability requirement of number 38 which is "have a performance management system based on indicators related to strategic planning" showed a strong relationship with the requirement 6.2 of the ISO 9001 standard.

The socio-environmental dimension showed a strong relationship with the ISO 9001 only with the sustainability requirement number 48 which is "evaluate suppliers considering socio-environmental issues."

The sustainability requirement number 60 which is "map emloyees´ skills " inserted in the socio-economic dimension was the one that most showed strong relationships with the ISO 9001 standard.

The environmental-economic dimension showed a strong relationship with the ISO 9001 only with the sustainability requirement number 67 which is "prioritize preventive policies".

Sustainability requirement number 78 which is "devise a communication policy" inserted into the economic-environmental-social dimension was the one that most showed strong relationships with the ISO 9001 standard.

According to the analysis, it was identified that the ISO 9001 had a null relation with topics such as: sponsorship of programs and campaigns, developing an environmental policy, maintaining an area or committee responsible for the environment, maintaining Permanent Preservation Areas (PPAs), maintaining reservation areas legal, carrying out environmental licensing, developing an environmental impact study, advertising environmental impacts and aspects, considering issues concerning climate change, monitoring greenhouse gases, monitoring risks and environmental aspects, preserving biodiversity, using renewable resources, adopting policies for intangible assets, developing

implemented processes and procedures for managing intangible assets, considering antitrust values in corporate policies, restricting the use of financial instruments for the sole purpose of protection, implementing antitrust measures, preparing and publishing financial statements in constant currencies, calculating the economic profit or other measures to generate economic value, reporting the direct economic value (revenue) generated and distributed based on the accrual basis of accounting, drawing up a benefit plan of the organization, top management must be committed to social and environmental issues, training suppliers concerning environmental issues, drawing up a socio-environmental report, participating in committees/local and or regional advisory boards, supporting educational projects, adopting a continuous policy of clarifying antitrust to the employees, having insurance for environmental degradation resulting from accidents in their operations, having processes to measure, monitor and audit the significant environmental aspects, monitoring the consumption of natural resources in the production chain, considering initiatives such as "ecodesign" or DfE (Design for Environment) and communicating the commitment to sustainable development.

5 Conclusion

The objective of this research is to analyse the relationship between ISO 9001 and ISO 14001 with corporate sustainability, seeking to verify if requirements of management systems standard support the sustainability requirements based in GRI, ISE and Ethos indicators.

As expected, this study concludes that the ISO 14001 standard showed a strong relationship with the environmental dimension where all the corporate sustainability requirements inserted into this dimension showed a strong relationship with the standard. This affirms the efficiency of the standard in terms of considering the main points related to the environment and corporate sustainability.

The social, socio-environmental, socio-economic, economic-environmental and economic-environmental-social dimensions showed a strong relationship with the standard as most of the grouped sustainability requirements in each dimension fitted in the strong relationship scale. However, this result was not expected because the ISO 14001 standard focuses on environmental issues.

Different to what was said in the previous paragraph, most sustainability requirements inserted into the economic dimension had a null relationship with the standard. This result was expected, as the focus of the ISO 14001 standard is environmental.

Therefore, it can be concluded that companies that wish to introduce sustainability into their contexts can use the ISO 14001 standard as a practice. However, this standard is not related to purely economic issues and topics such as social responsibility in the supply chain, participation of organizations in public policies, among others.

Regarding the ISO 9001, it can be observed that most of the sustainability requirements grouped into the socio-economic and economic-environmental-social dimensions showed a strong relationship with the standard. It was not expected that the standard would present a strong relationship with these dimensions as the focus is on quality.

In the social and environmental-economic dimensions, most of the requirements showed a weak relationship and the environmental and economic dimensions had a null relationship. The socio-environmental dimension presented weak and null relationships with the ISO 9001 standard as among the seven corporate sustainability requirements, three showed a weak relationship and three a null relationship. Therefore, it can be observed that the social, environmental, economic, socio-environmental and environmental-economic dimensions did not have a strong relationship with the ISO 9001 standard as was expected, given that the focus of the standard is quality. However, it is worth mentioning that all improvements regarding quality end up resulting in reduced costs and having a certain impact on the financial part of the organization.

Considering this, it can be concluded that the ISO 9001 standard is prone to low and null relationships with corporate sustainability, considering that two dimensions of sustainability were considered null, two weak, one tied between weak and null, and two were considered strong. Therefore, for companies that wish to introduce sustainability into their corporate environment can use the ISO 9001 standard associated to other practices such as the ISO 14001 because the ISO 9001 tends to have a weak and null relationship with corporate sustainability.

It can be concluded that the ISO 9001 and ISO 14001 standards contribute to corporate sustainability, however, they alone do not ensure that all the sustainability requirements recommended by ETHOS, ISE and GRI will be reached. In the practice, ISO 9001 and ISO 14001 can help companies that seek to improve the management of the operations and to be more sustainable, since by the research results reinforce that the norms of management systems contribute for sustainability.

Companies that do not have sustainable practices, management systems standards can make a important contribution, helping to implement sustainable actions and increasing environmental awareness. However, sustainability mature companies, specific models will be needed such as circular economy, ecodesign, life cycle assessment, cleaner production, among others.

Among the limitations, we can mention the fact that few experts accepted to participate in the study,

consider the Brazilian context because it used ISE and Ethos, and the method was applied in only one previous study. As a suggestion of future work, it would be advisable to seek experts from other countries to evaluate the relationships.

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