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Corporate sustainability reporting is currently perceived by company directors and senior staff as a process with a great strategic relevance. However, although sustainability is recognized as an integrating phenomenon and part of corporate life, it is in practice often treated in a one-dimensional manner. There is also a paucity of research specifically aimed at assessing sustainability report in the broad sense. The objectives of this article are therefore to analyse and evaluate reported information (indicators) based on the Global Reporting Initiative guidelines and to select and examine the most promising two-dimensional hybrid relations to enable the evaluation of company performance and its position towards practiced sustainability. The 2011 sustainability reports of 85 companies of different sizes and economic sectors from 36 countries were analysed. On the one hand, it became clear that companies focus their attention on 'anchor' indicators and, consequently, there is a low level of representability in the number of integrations. Performance evaluation, on the other hand, has proved to be a useful process with the potential to trigger the implementation of prospective change. It is, therefore, important that decision-makers may consider including hybrid indicators in the preparation of regulations and guidelines.

Keywords: Global Reporting Initiative; corporate social responsibility; sustainability strategy; sustainability performance; Hybrid Bottom Line

1. Introduction

For a long time, companies have been recognized as the drivers and agents of transformation of habits and lifestyles. However, the processes associated with these changes have not always evolved in a balanced and inclusive way. In recent years, there has been growing efforts by the companies to mitigate the imbalances caused by their activities. This path towards the necessary transition to a better and more sustainable world is the core aspect at the heart of sustainability management studies.

The recognition of corporate sustainability as an act of voluntary activity by companies (Montiel 2008; Lo 2010) which seek to promote the transition from 'business as usual' procedures and behaviours to the implementation of a responsible approach to business has clearly been showing consistent growth, but is still far from being a widespread behaviour among companies. In part, this is due to the difficulty in operationalizing and implementing

effects on the short, medium and long terms. This issue has been dealt with in the work carried out by Lozano (2008) and Baumgartner and Ebner (2010). Moreover, as Figge and Hahn (2005) refer, the creation of sustainable value is more consistent when it is based on the various forms of capital associated with the TBL.

According to Porter and Kramer (2006), the lack of success that some companies have in their efforts towards sustainability on the social and environmental dimensions has to do with their inability to understand the capitals associated with these dimensions, how they relate to each other and the way they are bound to their business strategies and their processes.

The work developed by Linnenluecke and Griffiths (2010), Michelon et al. (2013) and Angelo and Brunstein (2014) offers new proposals in line with the benefits of linking the capitals of TBL with business strategy in the efforts directed to organizational sustainability.

what is meant by sustainability (Moneva et al. 2006; Fischer et al. 2007; Bansal et al. 2012). In this regard, Filho (2000, p. 9) argues that sustainability 'depending on the ways it is looked at, may have many meanings.'

Many authors point out that companies, even when working with short-term strategies, cannot dissociate economic sustainability from environmental and social sustainability (Elkington 1997, 2004). Thus, there are several interrelationships between the dimensions of the triple bottom line (TBL) which interfere and affect them in various ways (Gibson et al. 2005; Fischer et al. 2013).

There has been an effort to try to understand how these interrelationships are produced, their profiles and their

Additionally, they refer to the importance of publicizing the results achieved by the company to make known their commitment to sustainability. In this regard, Porter and Kramer (2006) argue that companies should manage their social responsibility and their relationship with the economic, social and environmental dimensions not from a damage control perspective but bearing in mind the construction of shared value.

The analysis performed by Porter and Kramer (2006, 2011) introduces a new element in the corporate sustainability discussion which has to do with the difficulty that organizations have in understanding how they relate to and balance the TBL dimensions, as well as making efforts to implement sustainability in their business processes.

This idea is also found in Wood (2010), and Carroll and Shabana (2010).

The motivations for organizations to opt for sustainable initiatives and processes should be seen from the perception that the companies have of sustainable development (Heikkurinen & Bonnedahl 2013). On the other hand, in many cases, the corporate sustainability initiatives are the result of external pressures undertaken by stakeholders which lead to the adoption of sustainable practices by the company and its supply chain (Heikkurinen & Bonnedahl 2013).

By analysing the different models and supports used for communicating and publicizing corporate sustainability, we realize that they operationalize sustainability in a segmented way. Examples are the Wood model (Wood 2010), Sustainability Balanced Scorecard (Figge et al. 2002), Impact Assessment (Tajima & Fischer 2013) and Global Reporting Initiative (GRI) (Perrini & Tencati 2006; Lozano & Huisinigh 2011).

This operational view of the segmentation of TBL dimensions does not show clearly the gains or losses between them and their contribution to the creation of sustainable value. This framework and the ongoing academic discussion about the need for new approaches when analysing and understanding the either partial or total integration of TBL dimensions has led us to develop a proposal that contributes to this purpose.

Thus, our approach will use the Hybrid Bottom Line (HBL) model proposed by Jerónimo Silvestre et al. (2014). The goal is to perform a systematic exploratory analysis of the data submitted by companies in their sustainability reports in order to categorize the potential nexus of intersection relations between the TBL dimensional pairs. The hybrid relationships to be analysed are those likely to exist between the economic aspects, regarded as pivot factors. Considering economic aspects as a pivot factor has to do with the need to provide the conditions for business financial viability (Székely & Knirsch 2005; Gupta & Kumar 2013), and the social and environmental aspects, as recombinant factors of functional materiality. Our work will be based on the reporting structure presented by the GRI indicators (GRI 2012). Subsequently, we will exemplify the application of some of the hybrid recombinant factors by performing a longitudinal analysis of one of the companies in the sample, positioning and typifying their contribution in the frame of hybrid sustainability.

2. What is Hybrid Bottom Line?

The sustainability of a company is dependent on the short, medium and long terms of the reach of its strategy and planning. The effects created in one of the TBL dimensions will have consequences in it as well as in the intersection relationships and may maximize or minimize impacts on

desirable or undesirable results of trade-off, synergy or complementarity.

Thus, the hybrid relationship is part of a coherent unit, the system, which through induction of its elements, the subsystem, with a different coherent unit, may potentiate positive, negative, zero or neutral performance results, affecting systems in degree and intensity (Jerónimo Silvestre et al. 2014).

Examples of potential hybrid relationships:

- (1) The adoption of a new production process that reduces pollution, thus cutting or even eliminating the costs associated with the treatment of effluents producing a positive impact on the social dimension and benefiting quality of life (Elkington 1994) enables obtaining a good hybrid relation between economy and the environment with social impact.
- (2) Investments in improving the working conditions may lead to improvements in costs by reducing absenteeism and decreasing the number of occupational accidents (Pullman et al. 2009), hence obtaining a hybrid relation between the economic and social dimensions.
- (3) Supplier evaluation programmes will reduce or eliminate opportunist behaviours (Carter & Rogers 2008) allowing economic improvements and reducing environmental and/or social impact, thus obtaining a hybrid relation between the economy and social dimensions, with impact on the environment and vice versa.

3. Sustainability report: sustainable performance primary source

It is through sustainability reports that companies communicate social responsibility actions by disclosing their performance for TBL dimensions to the different stakeholders (Branco & Rodrigues 2008; Burrit & Schaltegger 2010; Mahadeo et al. 2011). According to the legitimacy theory, disclosure of sustainability information is voluntary.

There has been a consistent growth in the adoption and number of reports published by companies. However, it remains insignificant when compared with the total number of global-scale companies. This leads some researchers to question them, specifically the objectivity of its purpose and the reliability of the information reported by the companies (Moneva et al. 2006; Adams & McNicholas 2007).

Nevertheless, corporate sustainability reports have become an important element as a primary source of information. Among the options available for reporting, GRI guidelines should be highlighted as the option chosen by many authors (Levy et al. 2010; Roca & Searcy 2012).

The present work will be based on the information submitted by the companies in their sustainability reports using as reference the GRI guidelines. This choice is justified by the following aspects:

- (1) Internationally accepted reporting structure;
- (2) Adaptable to any business type, dimension and sector;
- (3) Its indicators represent the TBL dimensions;
- (4) The reporting structure is based on transparency, responsibility and ethics principles;
- (5) Easy access to company reports;
- (6) Allows stakeholders and experts to present proposals to improve reporting.

4. Method

The research methodology here used laid emphasis on the work of quantitative and semi-quantitative processes to analyse the results of the indicators presented and we chose a research methodology bases of qualitative analysis to assess the consistency of the sustainability reports content. With reference to the first method, one has to lay emphasis on the work of Gallego (2006) and Branco and Rodrigues (2008). With regard to the latter, the studies of Beattie and Thomson (2007) and Joshi et al. (2010) should be pointed out.

4.1. Criteria for sample selection: business and sustainability reports

The criteria for the selection of companies and their reports were as follows:

- (1) Report type: based on the GRI criteria, versions G3 and G3.1;
- (2) Reporting year: 2011;
- (3) Dimension of the company: small medium enterprise (SME), large (L) and multinationals (MN);
- (4) Activity sector: one company by country and activity sector;
- (5) Language used on the report: English, Spanish and Portuguese;
- (6) Report format: digital format available on the

Internet;

- (7) Management systems: preferably companies which use a formal management system: e.g. ISO, OHSAS, AA1000 and SA8000.

4.2. Criteria for evaluating and ranking the indicators

In order to evaluate the commitment and attainment of responses to each of the GRI indicators, a scale was created to assess their level of divulgation in the report.

Table 1. Scale for assessing the use of indicators by companies.

Scale	Rating
0	No reference or information about the indicator
1	Refers the indicator as non-applicable to their activity
2	Mentions the indicator but does not present information or does not accomplish it in full. Due to non-fulfillment; because it is relevant for their business; presents a null value but expresses intention to correct this fact; it is being implemented for future evaluation
3	Fully meets the parameters of the indicator (displays additional information)

The score for each indicator varies between zero and three [0, 3] according to the classification presented in Table 1 (using as guideline the proposal presented by Daub 2007). This approach will allow us to find an association between the degrees of accomplishment of each indicator by the company and give an idea whether there are or not sustainable practices on the information given by the report.

A classification of content was defined for the indicator. It will vary between one and four [1, 4] and evaluate the information communicated by the company. The descriptive of the scale is presented in Table 2. In order to maintain the linearity of the weighting to be given to the indicators, the orientation of scope of some of them was transformed.

4.3. Standardization and stability of the information

Taking into account the multiplicity and the different types of information provided by the indicators, there was the need to build standardized scales, both for qualitative and for quantitative information, in order to harmonize measures for each selected indicator. Each indicator was observed according to its purpose, that is, according to the intended meaning of potentiation of its impact: maximization (higher is better) or minimization (smaller is better). Classification of the indicator information content.

Weighting	Descriptive of the valorization action
1	Explanatory: describes the actions undertaken, their importance and impact. It depends on the sensitivity of the economic sector, the type and characteristics of the organization
2	Acceptable: mentions events or actions from its past performance or that may take place in the future
3	Complementary: information that helps to interpret and position the activities of the organization in a broader context of costs (risk) versus profits (revenue) with the available resources

better). For the qualitative or interpretative information indicators, the evaluation scale criteria are very high (5); high (4); medium (3); low (2) and very low (1).

The variability in the quality of information in sustainability reports is naturally acknowledged. This fact is dependent on the geographic location of the company, its size, preventive management of its impacts, the pressure exerted by stakeholders, image and activity sector, among others (Holder-Webb et al. 2009; Costa et al. 2013). The results are, therefore, dependent on the quality of the information reported.

5. Results and discussion

5.1. Characteristics of the sample

The sample consists of 85 companies (GRI 2012) and distributed across 38 sectors of activity. This sample is deemed as a convenience sample, a fact which is justified by two reasons: (1) the amount of data to be dealt with and (2) time/utility ratio. Out of the 85 reports, 38% corresponds to MN companies, 40% are L and 22% are SMEs. The business size is positively related with the level of disclosure (Holder-Webb et al. 2009).

Regarding the geographical distribution, it is in the European and American continents that the highest number of reports is published: 46 and 29%, respectively. They are followed by Asia with 18% and Oceania and Africa with 5% and 2%, respectively. Sample firms are spread across 36 countries and 65% of the companies indicate they subscribe to the commitments of the United Nations Global Pact.

5.2. Use of management systems

Seventy-eight of the 85 companies indicate the use of management systems. Of the 10 systems selected, 4 are chosen by higher number of companies: ISO 14001 with 67%, 66% with ISO 9001, OHSAS 18001 with 45% and AA1000 with 25% of the companies. Thirty-eight percent of companies use three management systems.

The adoption of management systems is generally considered as part of a broader effort by organizations to monitor, control and reduce any impacts caused, representing an important element of corporate sustainability efforts. The results presented prove it.

The application of existing systems varies depending on the sector of activity and its level of operational criticality, the motivation for its implementation (selfinterest, imposition of customers, suppliers and other stakeholders), the economic capacity to make the required improvements and, fundamentally, the commitment level of its governance. However, the use of these tools and management systems per se is no guarantee of performance

improvements legitimacy or that the company is making a genuine effort in that direction (Wiengarten et al. 2013).

5.3. Frequency of use of the indicators

The GRI guidelines (GRI 2011) feature a total of 84 indicators sectioned by three dimensions: 9 economic, 30 environmental and 45 social (15 labour practices, 11 human rights, 10 for society and 9 for product responsibility).

Two moments were considered for the evaluation of the use of indicators: one that specifies that the indicator is 'Reported' and another expressing 'Not reported'. 'Partially reported' and/or 'Not applicable' were accounted for in the category 'Not reported'.

The GRI structure, some of the indicators are imperative, while the importance of others is dependent on their relevance, activity sector, their impact and type of information that the company wants to communicate.

The results show that the most frequently used indicators are EC1 – direct economic value generated and distributed, with 72 references (85% of companies); EN3 – direct energy consumption and EN16 – total direct and indirect emissions of greenhouse gases, with 69 mentions each (81% of companies); LA1 – total work force by type, with 67 references (79% of companies); HR4 – total number of incidents of discrimination and corrective actions at work, with 63 mentions (74% of companies); PR5 – practices related to customer satisfaction, with 60 references (71% of companies) and SO8 – amount of fines and total number of non-monetary sanctions for noncompliance with laws and regulations, with 58 references (68% of companies). Worth mentioning the higher incidence on the main indicators, except the PR5 and SO8 that are considered as complementary indicators by GRI. The indexes with lower use rates are those referred to as complementary.

When considered by sector of activity, it is perceivable, for all the indicators, that in general companies cover the dimensions of TBL, although the use of the spectrum of available indicators varies significantly in different sectors and business sizes. One possible explanation for this could be directly related to the geographic spread of companies. Each country has specific features regarding their political systems, institutional structures, educational systems, cultural organization, work systems and financial systems. These characteristics have direct implications in the procedures and motivations associated with their management and force them to adapt to the circumstances of the local reality (Steurer et al. 2005; Matten & Moon 2008).

Regardless, the results obtained in this sample for the overall spectrum of indicators proposed by the GRI follow the trend observed in other studies (Spain: Gallego 2006; Portugal: Branco & Rodrigues 2008; Canada: Roca & Searcy 2012).

5.4. Selection of indicators for hybridization

To select the most promising indicators for hybrid relations, we have evaluated the report of intentions published by companies by analysing the responses and their frequency of materiality.

Two evaluations were made to determine the importance attributed by the company to the indicators and respective use. The first is an assessment, designated social responsibility of the report (which corresponds to the diversity of indicators reported) and the other evaluation has to do with the importance given to the selected indicators. Only 33% use more than 62 indicators in their reports (and a maximum of 84 indicators) with an average value of 89% report coverage; 28% use more than 40 and less than 63 indicators in their reports, with an average value of 63% report coverage; 32% use more than 20 and less than 41 indicators in their reports, with an average value of 31% report coverage and 7% of the companies use in their reports more than 9 and less than 21 indicators, with an average value of 19% report coverage.

It is observed that 44 companies (52% of the total) are above the average reporting value and can be qualified as very good or good. This can be considered a satisfactory value considering that the sample is not in a comfort zone when compared with other studies that select the best

Table 3. Responses by indicator.
companies, enterprises in the same sector of activity or listed companies.

5.4.1. Economic indicators selected for hybridization

Table 3 presents the economic indicators selected. Fifty-eight percent of companies have responded to two or more indicators. There is complementarity between the EC1-8 and EC8 indicators. However, one cannot thrust aside the hypothesis that companies, as in other identified situations, associate results of indicators which induce complementarity, hence there is a tendency to replicate or link results. However, the scope of application of these indicators is different.

Companies that respond to four indicators are, in the vast majority, MN and L, with a ratio of 14 to 2 SMEs. This scenario is repeated when using three indicators but there is some increase on the presence of SMEs, with a ratio of 27 to 6 SMEs. Comparatively, the combined result when using three and four indicators corresponds to 60% of the total MN and L and 42% of SMEs. It is worth mentioning that one of the companies did not provide records for any of these indicators.

Economic dimension										
Aim for each indicator	a)			a)			a)			a)
Measurement scale	c)			c)			c)			c)
Standard unit of measure	Euro			Euro			Euro			
Dimensions of performance	EC1-1			EC1-7			EC1-8			EC8
Total responses	49			67			52			54
%	57.7			78.8			61.2			63.5
Environmental dimension										
Aim for each indicator	a)	a)	b)	b)	b)	b)	b)	b)	b)	b)
Measurement scale	c)	c)	c)	c)	c)	c)	c)	e)	e)	e)
Standard unit of measure	Tons	Kilowatt hour	Kilowatt hour	Cubic meter	Tons of Carbon Dioxide	Tons	1 – Yes 0 – No	1 – Yes 0 – No	1 – Yes 0 – No	1 – Yes 0 – No
Dimensions of performance	EN1	EN3	EN4	EN8	EN16	EN22	EN23	EN28		
Total responses	53	67	52	73	70	70	54	60		
%	62.3	78.8	61.2	85.8	82.3	82.5	63.5	70.6		
Social dimension										
Aim for each indicator		a)	b)	a)	a)	a)	a)	a)	b)	b)
Measurement scale	c)	c)	c)	d)	c)	d)	e)	e)	e)	e)
Standard unit of measure		%	%	%	%	1 – Yes 0 – No	1 – Yes 0 – No	1 – Yes 0 – No	1 – Yes 0 – No	1 – Yes 0 – No
Dimensions of performance	LA1	LA4	LA7	LA8	LA12	HR2	SO1	SO8	PR4	PR9
Total responses	78	63	71	65	63	45	64	58	45	52
%	92.8	74.1	83.5	76.5	74.1	52.9	75.3	68.24	52.9	61.1

Notes: Aim for each indicator: a) maximize; b) minimize; measurement scale: c) quantitative; d) qualitative; e) binary; dimensions of performance: economic: EC1-1, net sales; EC1-7, employee wages and benefits; EC1-8, investment in the community; EC8, development and impact of investments in infrastructure and essential services for public benefit. Environment: EN1, material input; EN3, direct energy consumption; EN4, indirect energy consumption; EN8, water withdrawal; EN16, total direct and indirect greenhouse gas emissions by weight; EN22, total weight of waste by type and destination; EN23, number and total volume of significant spillages; EN28, fines and total number of sanctions for non-compliance with laws. Social: LA1, workforce; LA4, labour-management relations; LA7, health and safety/accidents; LA8, occupational health and safety; LA12, measuring and rewarding performance; HR2, suppliers subject to evaluation; SO1, business Impact on the community; SO8, significant fines and total number of non-monetary sanctions; PR4, non-compliance with product and service labelling; PR9, fines for non-compliance related to the supply and use of products and services. Source: Companies GRI Reports (GRI 2012); Silvestre and Amaro (2014).

5.4.2. Environmental indicators selected for hybridization

Table 3 presents the environmental indicators selected. Sixty-nine percent of the companies responded to six or more indicators. Companies that meet the 10 indicators are entirely MN and L, totalling 8 companies. For the range 6–9 indicators, there is a total of 51 companies, with 11 SMEs. Comparatively, the combined result when using 6 to 10 indicators corresponds to 74% of the total MN and L and 58% of the total SMEs.

5.4.3. Social indicators selected for hybridization

Table 3 shows the social indicators selected. Seventy-four percent of companies responded to six or more indicators. Companies that respond to 10 indicators are mostly MN and L with a ratio of 15 to 2 SMEs. For the range 6–9 indicators, there is a total of 46 companies of which 13 are SMEs. Compared with the total number of companies for the five most frequent indicators, the results correspond to 71% of MN and L and 79% of SMEs. It is only dimension where SMEs present better results than the MN and L.

5.5. Construction of hybrid relationships matrix

Given the great variability of the companies activity sectors, the range of variation of many of the indicators used and the small size of the sample, the statistical techniques adopted to analyse the data were used as exploratory instruments and not for statistical inference (Statsoft 2013). Within this context, in order to assess the possible existence of relationships or associations between indicators, two by two, contingency and variance analyses were performed. The basic assumptions in the analysis (translated by the null hypothesis) assume the non-existence of association between the indicators:

- (1) Contingency analysis: the two (qualitative) indicators are independent;
- (2) Variance analysis: the average values of the quantitative indicator are the same for all possible categories of the qualitative indicator.

With these analyses, we sought to detect evidence of associations between two indicators of different dimensions. This is why the verification of the assumptions of these two analyses was not a primary concern. The analyses with a p-value well below a level of significance of 0.05 (corresponding to a confidence level of 95%) were considered interesting as a decision criterion. The result led to a subset of indicators which signal evidences of relations between different types of indicators as shown in Tables 4 and 5.

Indicators with evidence of association (indicated with 'YES') were subjected to a multiple correspondence

analysis in order to, combined with each of the binomials Economy–Environment and Economy–Social, detect

Table 4. Evidence of association between indicators (Economy–Environment) resulting from analysis of variance and contingency.

Hybridization (associations)		Economy			
		EC1-1	EC1-7	EC1-8	EC8
Environment	EN1	Yes	No	No	No
	EN3	Yes	Yes	No	No
	EN4	Yes	Yes	No	No
	EN8	No	No	No	No
	EN16	No	No	No	No
	EN22	No	Yes	No	No
	EN23	No	No	No	No
	EN28	Yes	Yes	No	No
Positive associations		Yes: $p < 0.05$			

Note: The bold face used to reinforce the positive associations and for faster reading.

Table 5. Evidence of association between indicators (Economy–Social) resulting from analysis of variance and contingency.

Hybridization (associations)		Economy			
		EC1-1	EC1-7	EC1-8	EC8
Social	LA1	Yes	Yes	Yes	Yes
	LA4	No	Yes	No	No
	LA7	No	Yes	No	No
	LA8	No	No	No	No
	LA12	No	No	No	No
	HR2	No	No	No	No
	SO1	No	No	No	No
	SO8	Yes	Yes	No	No
	PR4	No	Yes	Yes	No
	PR9	No	Yes	No	No
	Positive associations		Yes: $p < 0.05$		

Note: The bold face used to reinforce the positive associations and for faster reading.

associations of interest. The multiple correspondence analysis performed (verified using a Burt table) with the system indicators led to the conclusion that

- (1) Economy–Environment shows that high values of net sales (EC1-1) are associated with large quantities of materials used (EN-1), consumed

energy (EN-3 and EN-4) and environmental sanctions (EN28).

- (2) Economy–Social reveals that high values for remunerations (EC1-7) are associated with a larger proportion of workers with labour contracts (LA4), more labour accidents (LA7), more incidents resulting from non-compliance with regulations (PR4), penalties (PR9) and fines (SO8).

The exploratory analysis proved to be very useful although it, naturally, has some limitations, namely the representativeness of the categories used for the indicators.

The results show us that, although most models and guidelines address corporate sustainability in a compartmentalized way, the hybrid model presented allowed us to identify some of the links established between the TBL dimensions.

Within the chosen reporting framework (GRI), the data structure and the type of information reported by the companies in the sample did not prove itself evident in enhancing intersection relations between the TBL dimensions. There are several factors that may have influenced this as, for example, the size of the sample, the diversity of business sectors, the size of the companies, lack of response to the indicators and/or information replicated between indicators and inconsistency in the reported data.

Depending on the sector of activity and potential impacts where the company is more vulnerable, it will tend to devote more or less attention to the TBL dimension it is more sensible to (Branco & Rodrigues 2008). Thus, its sustainability performance will tend to vary in the extent of its direct or indirect concern, of the activities carried out

and the respective relationships between costs and benefits (Valentinov 2013).

Both the environmental and social dimensions are in permanent conflict with the balance that is required between costs and revenues within the economic dimension (Plambeck 2007).

However, this type of hybrid information enables further analysis in the evaluation of the current state of the companies as well as contributes to a holistic analysis of corporate sustainability and communication with stakeholders.

6. Hybrid longitudinal analysis: application to case study

Using as reference the results obtained in the hybrid combinations shown in Tables 4 and 5, we will exemplify the hybrid recombinant longitudinal process by analysing three years of reports of one of the companies in our sample, determining its position regarding the process of functional materiality and evaluating the hybrid impact.

To exemplify this, we focused on the hybrid economy–environment relationship with a recombinant: EC1-1 for EN1; EN3; EN4 and EN28 and on the hybrid economy–social relationship with the recombinant: EC1-1 for LA1 and SO8. Figure 1 schematically presents the entire cycle of the hybrid recombinant relationships described.

The sample company was selected randomly from a set that presented at least three reports. Table 6 presents the descriptive characteristics of the selected company and the results are shown by indicator.

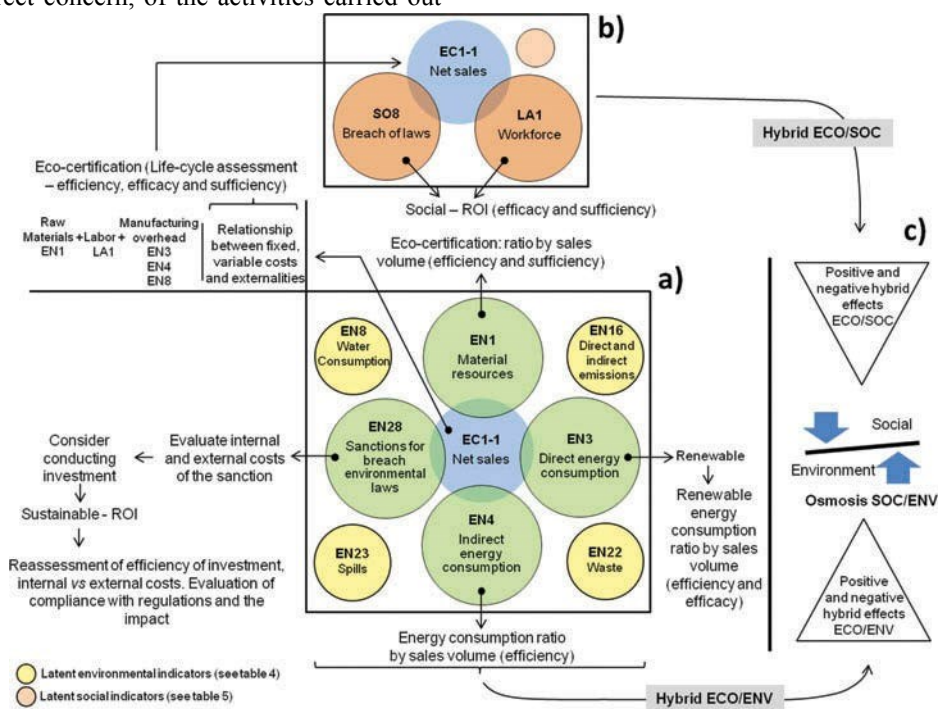


Figure 1. Recombinant hybrid cycle. Relations wherein associations between the economic dimensions EC1 and the environmental dimensions EN1, EN3, EN4 and EN28 were observed. The EN8, EN16, EN22 and EN23 indicators are latent indicators and are shown in (a). Relations wherein associations between the economic dimensions EC1 and the social dimension LA1 and SO8 were perceived.

The LA1, LA4, LA7, LA8, LA12, HR2, SO1, SO8, PR4 and PR9 indicators are presented as latent indicators and are shown in (b). The results of the hybrid relations economy–environment and economy–social contributed positively or negatively to define the balance of social–environment osmosis, which is shown in (c). A relation of proportionality was established for each of the hybridizations, as well as the definition of the two-dimensional combination in the context of the efficiency, effectiveness and adequacy of actions and results to be obtained (see Jerónimo Silvestre et al. 2014).

Table 6. Business information and the evolution of indicators in sustainable reporting.

Company name	Tratolixo				
Country	Portugal				
Shareholders' reference	Municipalities in the District of Lisbon				
Size	SME				
Business sector	Services				
Aim	Management and operation of the municipal solid waste system that includes treatment, final disposal, recovery and recycling of solid waste, the marketing of processed materials and other services in the field of solid waste				
Risk of the activity	Moderate				

Aim for each indicator	Indicator	Standard unit of measure	2010	Year of reporting	
				2011	2012
Maximize	EC1-1: Net sales	€	66650402	41846982	39270383
Minimize	EN1: Material resources	T	52	35	37
Minimize	EN3: Direct energy consumption	GJ	89261	73990	63650
Minimize	EN4: Indirect energy consumption	GJ	70043	40106	34875
Minimize	EN28: Sanctions		0	0	0
	LA1: Total workforce		202	242	267
Minimize	SO8: Breach of laws		0	0	0

Source: Company GRI Reports (Tratolixo 2014).

For each indicator the corresponding hybridization was performed according to the range attributed to each combination. This combination was compared with the theoretical aim defined for each year and it was also verified if this objective had been achieved or not. Additionally, the intentions expressed in the written discourse of the report were analysed in order to find signs that indicate strategic lines of present or future action and complement the results obtained by the indicators and their hybrid relations.

Table 7 shows the results gathered from the 2012 report (the same procedure was adopted for the other years under examination). Effectiveness and efficiency levels of the performance were differently weighted, and additional parameters related to company size and risk of the activity were included (see evaluation method in Supplemental data).

Figure 2 presents the evolution and positioning of the company according to the levels and types of sustainability described (Jerónimo Silvestre et al. 2014). As shown, there is an established trend in regard to the hybrid economy–environment relationship as well as an inverse scenario in the hybrid economy–social relationship.

6.1. Analysis of the hybrid impact: the trade-off, complementarity and synergy established in hybridization

Economy–environment

- (1) Company perspective: it allows the disclosure of the environmental and/or social performance of its products and services along their life cycle. Economically, it presents itself as a distinctive framework for improvement and competitiveness and it also incorporates externalities. Strategically, it enables practices that influence buying options in favour of products with ecological indication.
- (2) Consumer perspective: the information transmitted by the supplier about the eco-certification characteristics and attributes of its products and services constitutes transference of knowledge to the market and can be understood by consumers as an extension and evaluation of their quality.
- (3) Policymaker perspective: developing eco-certificated products can create incentives to stimulate innovation by replacing products with high impacts on the environment and consequential social damages with products with lower impacts (Schubert & Blasch 2010). The main objective is the development of policies and

regulations that enable market mechanisms that lead to efficiency and efficacy criteria.

267 in the year 2012. Out of these, 20% are in a situation of job insecurity and there is an imbalance of proportionality. The European Agency for Safety and Health at Work states that a situation of job insecurity affects negatively the health of workers in various dimensions (EASHW 2014). Studies indicate that this causes chronic insecurity in workers and increases the risks of physical and mental health, causing prolonged absences and promoting imbalance in social relations (Dickerson & Green 2012).

Economy–social

In the case of the economy–social relationship, the example given is the strong variation in the evolution of sales EC1 (decrease of approximately 61% in three years) and a growing staff from 201 human resources in 2010 to

Table 7. Evaluation of hybrid relationships.

Hybrid relationship: economy–environment			Year of reporting: 2012							
Hybrid active Relationship	Scope of hybrid relationship	Aim will achieve	Levels of efficacy of aim				Efficiency = results/resources			
			%							
			20	50	80	100	[0–10]	[11–40]	[41–60]	[61–100]
EC1-1/EN1	Eco-certificated materials: ratio by sales volume	20%	✓							✓
EC1-1/EN3	Rationalization of energy consumption: ratio by sales volume	7%			✓					✓
EC1-1/EN4	Renewable energy consumption: ratio by sales volume	35%			✓					✓
EC1-1/EN28	Assess internal and external costs of sanctions on sales ratio			✓						✓
Total score										47
Hybrid relationship: economy–social										
EC1-1/LA1	Proportionality of the workforce depending on the result of sales			✓				✓		
EC1-1/SO8	Ratio of sales products and services that showed incidents of noncompliance	90%				✓			✓	
Total score										38

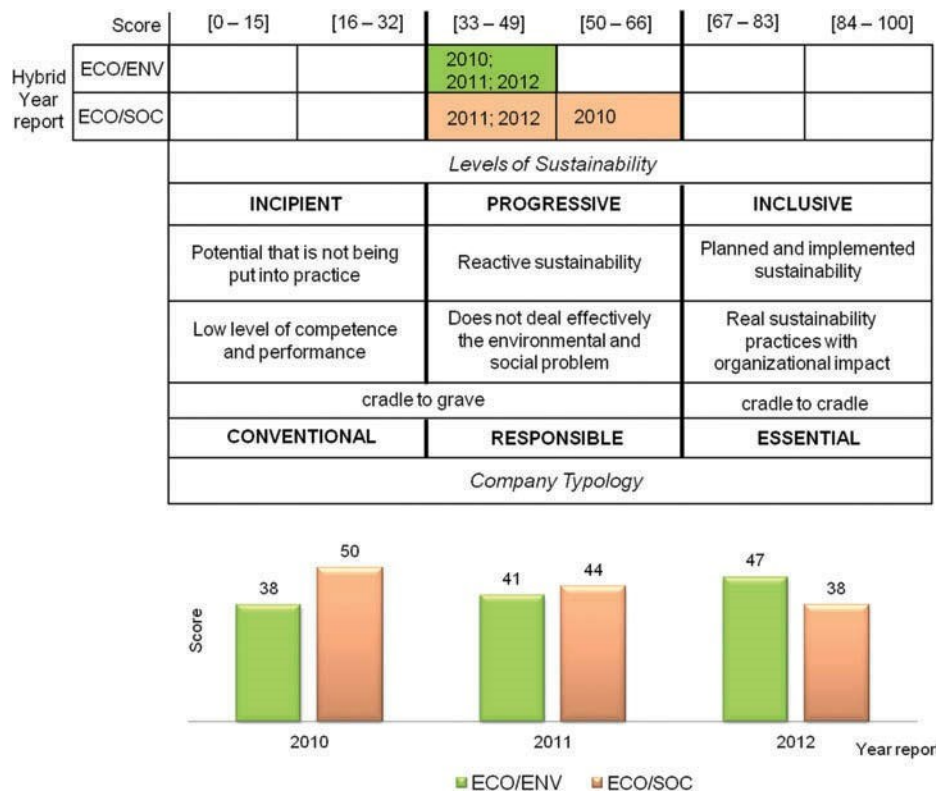


Figure 2. Positioning and evolution of the hybrid performance results.

- (1) Company perspective: it allows the disclosure of the economic and social performance of its products and services through both the efficiency and efficacy of its processes and the quality of its human resources. Strategically, it enables practices that valorize human resources by means of training and improvement of the working conditions.
- (2) Consumer perspective: it is assessed by the guarantee of working conditions as well as by the by relation which is established by the assurance of providing the service.
- (3) Finally, one can also mention a 'policymaker perspective', which creates incentives that value human resources and suitable working conditions.

7. Conclusion

As this article has demonstrated, corporate sustainability reporting is a key issue among modern enterprises and the reported information may play a key role in establishing whether they take sustainability seriously, or not. There is now a new understanding of corporate social responsibility, which no longer refers to it as voluntary action, but which also reflects the need to ensure compliance highlighting the fact that the activities or corporations cause environmental and social impacts, which are responsible for. The impact areas have over the past 10 years been enlarged by ethical, human rights and consumer concerns. The image of an enterprise is partly influenced by quality of the information

they report what they do, and how they strive to cope (and reduce) such impacts.

It is therefore important that decision makers may consider including hybrid indicators in the preparation of corporate regulations and guidelines. This article has outlined some of the ways this can be done, and it is hoped that it will catalyse further action in this rapidly growing field.

References

- Adams CA, McNicholas P. 2007. Making a difference: sustainability reporting, accountability and organisational change. *Accounting, Auditing Account J.* 20:382–402. doi:10.1108/09513570710748553
- Angelo MJ, Brunstein J. 2014. Social learning for sustainability: supporting sustainable business in Brazil regarding multiple social actors, relationships and interests. *Int J Sustainable Dev World Ecol.* 21:273–289. doi:10.1080/13504509.2014.902868
- Bansal P, Bertels S, Ewart T, MacConnachie P, O'Brien J. 2012. Bridging the research-practice gap. *Acad Manag Perspect.* 26:73–92. doi:10.5465/amp.2011.0140
- Baumgartner RJ, Ebner D. 2010. Corporate sustainability strategies: sustainability profiles and maturity levels. *Sustainable Dev.* 18:76–89. doi:10.1002/sd.447
- Beattie V, Thomson SJ. 2007. Lifting the lid on the use of content analysis to investigate intellectual capital disclosures. *Accounting Forum.* 31:129–163. doi:10.1016/j.accfor.2007.02.001

- Branco M, Rodrigues L. 2008. Factors influencing social responsibility disclosure by portuguese companies. *J Bus Ethics*. 83:685–701. doi:10.1007/s10551-007-9658-z
- Burritt RL, Schaltegger S. 2010. Sustainability accounting and reporting: fad or trend? *Accounting, Auditing Account J*. 23:829–846. doi:10.1108/09513571011080144
- Carroll AB, Shabana KM. 2010. The business case for corporate social responsibility: a review of concepts, research and practice. *Int J Manag Rev*. 12:85–105. doi:10.1111/j.14682370.2009.00275.x
- Carter CR, Rogers DS. 2008. A framework of sustainable supply chain management: moving toward new theory. *Int J Phys Distribution Logistics Manag*. 38:360–387. doi:10.1108/09600030810882816
- Costa GA, Oliveira LC, Rodrigues LL, Craig R. 2013. Factors associated with the publication of a CEO letter. *Corporate Communications: Int J*. 18:432–450. doi:10.1108/CCIJ-072012-0045
- Daub C-H. 2007. Assessing the quality of sustainability reporting: an alternative methodological approach. *J Clean Prod*. 15:75–85. doi:10.1016/j.jclepro.2005.08.013
- Dickerson A, Green F. 2012. Fears and realisations of employment insecurity. *Labour Econ*. 19:198–210. doi:10.1016/j.labeco.2011.10.001
- EASHW. 2014. European agency for safety and health at work [Internet]. *Healthy Workplaces Manage Stress*, EU-OSHA, 7. [cited 2014 Nov 12]. Available from: <https://www.healthyworkplaces.eu/en>
- Elkington J. 1994. Towards the sustainable corporation: win-win business strategies for sustainable development. *Calif Manage Rev*. 36:90–100. doi:10.2307/41165746
- Elkington J. 1997. *Cannibals with forks: the Triple Bottom Line of 21st century business*. Stoney Creek: New Society Publishers.
- Elkington J. 2004. Enter the Triple Bottom Line. In: Henriques A, Richardson J, editors. *The Triple Bottom Line: does it all add up?* London: Earthscan; p. 1–16.
- Figge F, Hahn T. 2005. The cost of sustainability capital and the creation of sustainable value by companies. *J Ind Ecol*. 9:47–58. doi:10.1162/108819805775247936
- Figge F, Hahn T, Schaltegger S, Wagner M. 2002. The sustainability balanced scorecard – linking sustainability management to business strategy. *Bus Strat Environ*. 11:269–284. doi:10.1002/bse.339
- Filho WL. 2000. Dealing with misconceptions on the concept of sustainability. *Int J Sustainability Higher Educ*. 1:9–19. doi:10.1108/1467630010307066
- Fischer J, Manning AD, Steffen W, Rose DB, Daniell K, Felton A, Garnett S, Gilna B, Heinsohn R, Lindenmayer DB, et al. 2007. Mind the sustainability gap. *Trends Ecol Evol*. 22:621–624. doi:10.1016/j.tree.2007.08.016
- Fischer TB, Smith M, Sykes O. 2013. Can less sometimes be more? Integrating land use and transport planning on Merseyside (1965–2008). *Urban, Plann Transport Res*. 1:1–27. doi:10.1080/21650020.2013.866876
- Gallego I. 2006. The use of economic, social and environmental indicators as a measure of sustainable development in Spain. *Corporate Soc Responsibility Environ Manag*. 13:78–97. doi:10.1002/csr.94
- Gibson RB, Holtz S, Tansey J, Whitelaw G, Hassan S. 2005. *Sustainability assessment: criteria and processes*. London: Earthscan; p. 180–188.
- GRI. 2011. *Sustainability reporting guidelines Version 3.1*. Amsterdam: Global Reporting Initiative.
- GRI. 2012. *GRI reports list* [Internet]. [cited 2014 Jan 10]. Available from: <http://www.globalreportingorg/GRIReports/GRIReportsList/>
- Gupta S, Kumar V. 2013. Sustainability as corporate culture of a brand for superior performance. *J World Bus*. 48:311–320. doi:10.1016/j.jwb.2012.07.015
- Heikkurinen P, Bonnedahl KJ. 2013. Corporate responsibility for sustainable development: a review and conceptual comparison of market- and stakeholder-oriented strategies. *J Clean Prod*. 43:191–198. doi:10.1016/j.jclepro.2012.12.021
- Holder-Webb L, Cohen J, Nath L, Wood D. 2009. The supply of corporate social responsibility disclosures among U.S. firms. *J Bus Ethics*. 84:497–527. doi:10.1007/s10551-0089721-4
- Jerónimo Silvestre W, Antunes P, Filho WL. 2014. Hybrid Bottom Line: another perspective on the sustainability of organizations. *Int J Sustainable Dev World Ecol*. 21:456–464. doi:10.1080/13504509.2014.959580
- Joshi M, Ubha DS, Sidhu J. 2010. Reporting intellectual capital in annual reports from Australian S/W & I/T companies. 11:1–19.
- Levy DL, Szejnwald Brown H, De Jong M. 2010. The contested politics of corporate governance: the case of the global reporting initiative. *Business Soc*. 49:88–115. doi:10.1177/0007650309345420
- Linnenluecke MK, Griffiths A. 2010. Corporate sustainability and organizational culture. *J World Bus*. 45:357–366. doi:10.1016/j.jwb.2009.08.006
- Lo S-F. 2010. Performance evaluation for sustainable business: a profitability and marketability framework. *Corporate Soc Responsibility Environ Manag*. 17:311–319. doi:10.1002/csr.214
- Lozano R. 2008. Envisioning sustainability three-dimensionally. *J Clean Prod*. 16:1838–1846. doi:10.1016/j.jclepro.2008.02.008
- Lozano R, Huisingh D. 2011. Inter-linking issues and dimensions in sustainability reporting. *J Clean Prod*. 19:99–107. doi:10.1016/j.jclepro.2010.01.004
- Mahadeo JD, Oogarah-Hanuman V, Soobaroyen T. 2011. Changes in social and environmental reporting practices in an emerging economy (2004–2007): exploring the relevance of stakeholder and legitimacy theories. *Accounting Forum*. 35:158–175. doi:10.1016/j.accfor.2011.06.005
- Matten D, Moon J. 2008. “Implicit” and “Explicit” CSR: a conceptual framework for a comparative understanding of corporate social responsibility. *Acad Manag Rev*. 33:404–424. doi:10.5465/amr.2008.31193458
- Michelon G, Boesso G, Kumar K. 2013. Examining the link between strategic corporate social responsibility and company performance: an analysis of the best corporate citizens. *Corporate Soc Responsibility Environ Manag*. 20:81–94. doi:10.1002/csr.1278
- Moneva JM, Archel P, Correa C. 2006. GRI and the camouflaging of corporate unsustainability. *Accounting Forum*. 30:121–137. doi:10.1016/j.accfor.2006.02.001
- Montiel I. 2008. Corporate social responsibility and corporate sustainability: separate pasts, common futures. *Organ Environ*. 21:245–269. doi:10.1177/1086026608321329
- Perrini F, Tencati A. 2006. Sustainability and stakeholder management: the need for new corporate performance

- evaluation and reporting systems. *Bus Strat Environ.* 15:296–308. doi:10.1002/bse.538
- Plambeck EL. 2007. The greening of wal-mart's supply chain. *Supply Chain Manag Rev.* 11:18–25.
- Porter ME, Kramer MR. 2006. Strategy and society: the link between competitive advantage and corporate social responsibility. *Harv Bus Rev.* 84:78–92.
- Porter ME, Kramer MR. 2011. Creating shared value - how to reinvent capitalism and unleash a wave of innovation and growth. *Harv Buss Rev.* January–February: 1–17.
- Pullman ME, Maloni MJ, Carter CR. 2009. Food for thought: social versus environmental sustainability practices and performances and outcomes. *J Supply Chain Manag.* 45:38–54. doi:10.1111/j.1745-493X.2009.03175.x
- Roca LC, Searcy C. 2012. An analysis of indicators disclosed in corporate sustainability reports. *J Clean Prod.* 20:103–118. doi:10.1016/j.jclepro.2011.08.002
- Schubert R, Blasch J. 2010. Sustainability standards for bioenergy—A means to reduce climate change risks? *Energy Policy.* 38:2797–2805. doi:10.1016/j.enpol.2010.01.011
- Silvestre WJ, Amaro A. 2014. Sustentabilidade corporativa: avaliação híbrida do Triple Bottom Line. *Revista Portuguesa E Brasileira De Gestão.* 13:19–29.
- Statsoft. 2013. Statsoft Inc 2013 STATISTICA (data analysis software system), Version 12. www.statsoft.com.
- Steurer R, Langer M, Konrad A, Martinuzzi A. 2005. Corporations, stakeholders and sustainable development I: a theoretical exploration of business–society relations. *J Bus Ethics.* 61:263–281. doi:10.1007/s10551-005-7054-0
- Székely F, Knirsch M. 2005. Responsible leadership and corporate social responsibility: metrics for sustainable performance. *Eur Manag J.* 23:628–647. doi:10.1016/j.emj.2005.10.009
- Tajima R, Fischer TB. 2013. Should different impact assessment instruments be integrated? Evidence from English spatial planning. *Environ Impact Assess Rev.* 41:29–37. doi:10.1016/j.eiar.2013.02.001
- Tratolixo. 2014. Relatórios GRI [Internet]. [cited 2014 Jan 10]. Available from: <http://www.tratolixo.pt/Comunicacao/Paginas/Relatorios.aspx>
- Valentinov V. 2013. Corporate social responsibility and sustainability: insights from Boulding and Luhmann. *Int J Sustainable Dev World Ecol.* 20:317–324. doi:10.1080/13504509.2013.808282
- Wiengarten F, PagellM, Fynes B.2013. ISO14000 certification and investments in environmental supply chain management practices: identifying differences in motivation and adoption levels between Western European and North American companies. *J Clean Prod.* 56:18–28. doi:10.1016/j.jclepro.2012.01.021
- Wood DJ. 2010. Measuring corporate social performance: a review. *Int J Manag Rev.* 12:50–84. doi:10.1111/j.1468-2370.2009.00274.x