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Abstract

Purpose – The purpose of this paper is to propose a minimum set of indicators to be measured by industrial companies to represent the triple bottom line (TBL) approach.

Design/methodology/approach – The research is both descriptive and quantitative. Three hypotheses establish associations among the degrees of use of TBL indicators and their different degrees of use in firms. The authors used confirmatory factor analysis (CFA) to validate the scale and structural equation modelling to represent the final measurement model. The survey gathered 149 industrial companies.

Findings – The results pointed out that there are positive associations among the degree of use of environmental indicators and social indicators, economic, environmental and social indicators have different degrees of use in firms, a positive association between the degree of use of environmental and social indicators and the use of economic indicators was not confirmed. The findings suggest how to measure sustainable performance for industrial companies and highlight the differences in the degree of use for the three dimensions of TBL.

Research limitations/implications – The limitations refer to the non-probabilistic sample, applied in a specific context, industrial companies.

Practical implications – This set of indicators is intended to be used by industrial companies as a reliable instrument to sustainable performance assessment of the current stage of the TBL deployment and provide alternative approaches to address specific issues related to the environmental, social and economic sustainability.

Social implications – The results offer tangible results for measuring and reporting firm's social and environmental performance.

Originality/value – This paper intends to offer an integrated and consistent way of measuring sustainability in industrial companies.

Keywords Structural equation modelling, Performance management, Triple bottom line, Performance measurement, Sustainability indicators

Paper type Research paper

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1. Introduction

Sustainability, despite its inherent difficult to be properly defined (Lélé, 1991; Glavič and Lukman, 2007), has become a major issue when seen from an organisational perspective. As previously pointed out by several authors (e.g. Atkinson *et al.*, 1997; Neely *et al.*, 2002; Epstein and Roy, 2003), since sustainability has had its role increased in several aspects of management, one issue has arisen: how to better understand the way sustainability has been taken into account in terms of performance measurement by the firms? In order to find an answer to this question, numerous studies have dealt with how companies could turn firm's sustainability performance into a systematic and effective way (Veleva and Ellenbecker, 2001; Warhust, 2002; Azapagic, 2004; Singh *et al.*, 2012; Krajnc and Glavič, 2005; Searcy, 2009).

Once it has become clear the need for a paradigm shift towards a sustainable performance measurement, a new way to define organisation's sustainable performance has advanced, the triple bottom line (TBL) approach (Elkington, 1998; Harris *et al.*, 2001; Pava, 2007; Norman and McDonald, 2004; Colbert and Kurucz, 2007). The TBL adds both social and environmental dimensions to the traditional economic results to measure a firm's performance from a sustainable perspective.

Accordingly, many studies that aim to study sustainability and performance in organisations use TBL as their conceptual basis, mentioning Elkington's proposal as their conceptual reference (e.g. Cinelli *et al.*, 2014; Deng, 2015; Ekins and Vanner, 2007; Krajnc and Glavič, 2005; Pádua and Jabbour, 2015).

Given the importance of the theme and the need for differentiation for unequal realities, several scholars have tried to shed some light on how to integrate sustainability measurement in organisations from different sectors. Thus, studies depict sectors such as minerals (Azapagic, 2004); textiles (Zamcopé *et al.*, 2012); agricultural (Guttenstein *et al.*, 2010); oil and gas (Infante *et al.*, 2013; Hourneaux *et al.*, 2017); and steel (Singh *et al.*, 2007).

In this fashion, this paper aims to propose a minimum set of indicators to be measured by industrial companies to represent their performance according to the TBL approach. To do so, the instrument for data collection was threefold: for the economic dimension, we used 20 BSCs typical indicators, according to Henri (2009); 9 and 22 indicators from Global Reporting Initiative (GRI) (2008) for environmental and social dimensions, respectively. The empirical research had a sample that summed up 149 companies in Brazil.

The paper is structured as follows. Section 2 enfolds the main concepts of sustainability, sustainable performance measurement and indicators, followed by the study hypotheses. In the subsequent part, we describe the research methodology. In the sequence, we show the main results and analyses that were carried out and the paper ends with the conclusions and recommendations.

2. Theoretical background

2.1 Sustainability and the triple bottom line approach

Possibly the most known definition related to this theme is the Brundtland Commission's, that states that sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Despite its importance, there have been some difficulty and controversy in defining what sustainability is (Lélé, 1991; Doppelt, 2008), especially on how to translate it into business frameworks and practices.

Possibly, due to its complexity, organisational sustainability is most known as represented by the "TBL". According to Elkington (1998), the TBL approach could lead an organisation to perform economic prosperity, environmental quality and social justice simultaneously. McDonough and Braungart (2002) emphasise that many executives are getting to know these three concepts, including TBL issues as a way to add value to their products or services. Later, Lacy *et al.* (2010) and Berns *et al.* (2009) reinforce the importance of TBL as the main proxy to represent and measure sustainability in organisations.

In the search for a consensus, among countless definitions and terminologies, the three-pillar approach called the TBL has been a widely accepted perspective for sustainability not only by scholars but also by society and organisations (Lacy *et al.*, 2010), although the TBL has not been exempt from criticism and contention (Norman and McDonald, 2004; Macdonald and Norman, 2007).

Despite some researchers' resistance to this concept, to whom the concept is impossible to be put into operation (Norman and McDonald, 2004; MacDonald and Norman, 2007; Hubbard, 2009; Smith and Sharicz, 2011), the TBL has gradually been accepted among organisations (Elkington, 1998). Some studies reinforce this movement (Ho and Taylor, 2007; Hubbard, 2009).

2.2 Sustainability performance through indicators

In some sense, performance measurement has been noticed as a fundamental key to the managerial control process in any business (Olson and Slater, 2002). One point of departure for measuring organisation's – whether sustainability-oriented or not – performance is the use of indicators. As seen before, they can be split into economic, social and environmental, according to the TBL approach.

2.2.1 Economic indicators: the balanced scorecard. The balanced scorecard (BSC) was created by Kaplan and Norton, in the early 1990s. The BSC is defined as a way to integrate strategy and action, through a communication process, including objectives, goals, initiatives and indicators, both financial and non-financial (Kaplan and Norton, 1996). Kaplan and Norton (1996) created the BSC as a new management system that "emphasises that financial and non-financial measures must be part of the information system for employees at all levels of the organisation" (p. 8).

BSC consists of four perspectives, setting the interrelationships among performance indicators that could lead to a complete view of a company's activities (Kaplan and Norton, 1996). As per Kaplan and Norton (1996, p. 150), "[a] good Balanced Scorecard should have a mix of outcome measures and performance drivers. Outcome measures without performance drivers do not communicate how the outcomes are to be achieved". Simons (2000) also stresses that a well-designed BSC should allow a balance between short and long-term objectives and outcome (lagging) and process (leading) measures, besides establishing both objective and subjective measures for firm's performance.

Some authors explored BSC through statistical analysis, assessing the validity and reliability of the model (Bouliane, 2006; Henri, 2009). In one of these studies, Henri (2009), investigating 383 top management teams of Canadian manufacturing firms, establishes a set of 20 indicators that would be representative of a typical BSC composition. Table I presents these indicators, according to Henri's (2009) proposal, used as a proxy for representing economic indicators in this study.

2.2.2 Social and environmental indicators: Global Reporting Initiative. The Global Reporting Initiative (GRI) Reporting Framework is intended to perform as an accepted framework for reporting on an organisation's economic, environmental and social performance (GRI, 2008). The GRI is a network with experts and representatives from various sectors of society present in over 40 countries around the world, and it has been determining the guidelines to sustainability reporting with the participation of several important stakeholders (GRI, 2008).

Table II presents the social and environmental aspects defined by the GRI guidelines. These aspects are "the general types of information that are related to a specific indicator category, e.g., energy use, child labour, customers" (GRI, 2008) and will be used as a proxy for the data gathering in this research.

Perspective	Indicators	Code[a]
Finance	(1) Operational income	OperIncF
	(2) Sales growth	SalesGrowF
	(3) Return-on-investment (ROI)	ROIF
	(4) Return-on-equity (ROE)	ROEF
	(5) Net cash flows	CashFlowF
	(6) Cost per unit produced	CostUnitF
Customer	(1) Market share	MShareC
	(2) Customer response time	RespTimeC
	(3) On-time delivery	OnTimeDelC
	(4) Number of customer complaints	NComplC
	(5) Number of warranty claims	NWaClaimC
	(6) Survey of customer satisfaction	SurveySatC
Internal processes	(1) Materials efficiency variance	MatEffVarP
	(2) Manufacturing lead time	ManTimeP
	(3) Rate of material scrap loss	MatLossP
	(4) Labour efficiency variance	LabEffVarP
Learning and development	(1) Number of new patents	NNewPatL
	(2) Number of new product launches	NNewProdL
	(3) Time-to-market for new products	TimeNewPrL
	(4) Employee satisfaction	EmplSatL

Note: [a]Codes created for the purposes of this research
Source: Based on Henri (2009)

Table I. Economic indicators used in the survey

3. Study hypotheses

This study aims to describe how TBL approach has had been taking into account regarding the firm's performance measurement. Figure 1 presents the research's conceptual model and the hypotheses.

Two hypotheses refer to the relationship among the different types of indicators, commonly presented as the three dimensions of the TBL. These hypotheses are:

H1. There is a positive association between the degree of use of environmental indicators and social indicators in industrial firms.

H2. There is a positive association between the degree of use of environmental and social indicators and the use of economic indicators in industrial firms.

A third hypothesis refer to an overall analysis of the TBL and challenges the common understanding that the three dimensions would be equal. This hypothesis is:

H3. Economic, environmental and social indicators have different degrees of use in industrial firms.

4. Methodological aspects

This sections aims to define and describe the main methodological aspects considered in the empirical research. Besides the content of this section, a detailed explanation on the statistical procedures was given also in Section 5.

4.1 Research definitions

The study is both descriptive and quantitative, using a survey-type research approach, conducted with managers of industrial companies. Despite the non-probabilistic sampling, this can be considered as a homogeneous group, with at least one common characteristic, as belonging to the same industry, as recommended by Flynn *et al.* (1990).

TBL dimension	Indicator	Code[a]
Environmental indicators	Materials	GRI_ENV_A
	Energy	GRI_ENV_B
	Water	GRI_ENV_C
	Biodiversity	GRI_ENV_D
	Emissions, effluents and waste	GRI_ENV_E
	Environmental aspects of products and services	GRI_ENV_F
	Environmental compliance	GRI_ENV_G
	Transporting	GRI_ENV_H
	General environmental issues	GRI_ENV_I
Social indicators	Employment	GRI_SOC_A
	Labour/management relations	GRI_SOC_B
	Occupational health and safety	GRI_SOC_C
	Training and education	GRI_SOC_D
	Diversity and equal opportunity	GRI_SOC_E
	Investment and procurement practices	GRI_SOC_F
	Non-discrimination	GRI_SOC_G
	Freedom of association and collective bargaining	GRI_SOC_H
	Child labour	GRI_SOC_I
	Forced and compulsory labour	GRI_SOC_J
	Security practices	GRI_SOC_K
	Indigenous rights	GRI_SOC_L
	Community	GRI_SOC_M
	Corruption	GRI_SOC_N
	Public policy	GRI_SOC_O
	Anti-competitive behaviour	GRI_SOC_P
	Compliance	GRI_SOC_Q
	Customer health and safety	GRI_SOC_R
	Product and service labelling	GRI_SOC_S
	Marketing communications	GRI_SOC_T
	Customer privacy	GRI_SOC_U
	Compliance of products and services	GRI_SOC_V

Note: [a]Codes created for the purposes of this research
Source: Created by the authors, based on GRI (2008)

Table II. Social and environmental indicators used in the survey

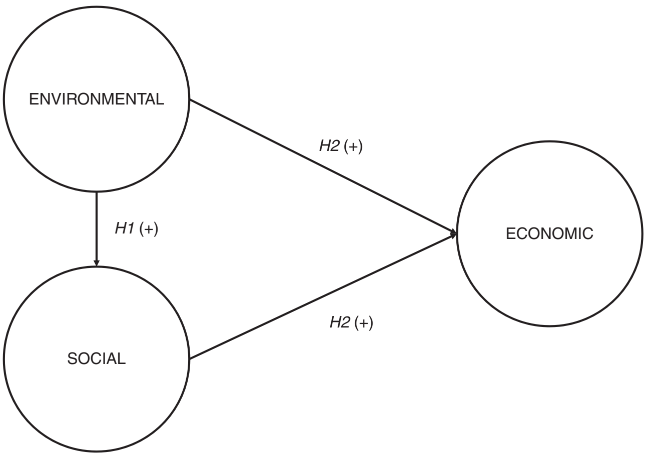

Figure 1. Conceptual model and hypotheses

The research universe was the set of companies associated with the Centre of Industries of São Paulo State (CIESP). To each company, an invitation letter was sent by the board of social responsibility from CIESP with instructions to access the electronic questionnaire.

In order to reach the purposes of the study, the instrument for data gathering was threefold: for economic dimension, 20 BSCs indicators, according to Henri (2009); 9 and 22 indicators from GRI (2008) environmental and social dimensions, respectively, and questions regarding companies' characteristics, as shown before in Tables I and II. To each of these indicators, the respondent should identify its degree of use, respecting a seven-point scale, with "1" being "not at all" and "7" as "at a great extent", with verbal anchors at the extremes.

4.2 Statistics

In this study, the chosen indicators were used as observed variables of latent variables (constructs) and were treated as a scale. Moreover, the relationship between constructs were hypothesised and defined. The multivariate technique used was partial least squares–structural equation modelling (PLS–SEM or PLS path modelling), a second-generation technique primarily used to develop theories in exploratory research (Hair, Gabriel, and Patel, 2014; Hair, Hult, Ringle and Sarstedt, 2014).

From Shook *et al.* (2004) initial analysis of SEM usage in strategy research to Robins's editorial (2012) in a special issue of *Long Range Planning* devoted to the use of PLS–SEM, this technique is growing in importance and relevance in strategy research. An SEM model is composed of two main components: the measurement model (or outer model) and the structural model (or inner model). The measurement model is used to show the relationships between the constructs and the indicators, and the structural model displays the relationships between the constructs (Hair, Gabriel and Patel, 2014).

In any SEM approach, the measurement model is validated using confirmatory factor analysis (CFA). CFA is useful to test a hypothesis based on past evidence and/or theory and requires a strong knowledge of observed measures that define the latent variable. Conversely from exploratory factor analysis (EFA), CFA provides a greater emphasis on theory testing and also offers a robust set of analytic procedures, not available on EFA (Brown, 2006). Since CFA is focussed only on the link between the factors and their measured variables, in the context of a SEM represents the measurement model (Byrne, 2009).

PLS–SEM was used for model measurement, and the constructs were hypothesised as reflective. Reflective models are the most used measurement model in social sciences and have its roots in classical test theory. This measurement model is useful when the hypothesis of causality is generated from the construct to the indicators. The structural model was assessed in their key results: significance and relevance of relationships, predictive accuracy, effect size and predictive relevance. Data were analysed using SmartPLS 2.0 (M3) (Ringle *et al.*, 2005).

5. Results

5.1 Sample characteristics

Brazil has the largest economy in Latin America. It is also known for representing the first letter of the five countries from the BRICS acronym. São Paulo State is one of the 27 Brazilian federative units and responsible for more than 31 per cent of Brazilian GDP. It is also known as the best infrastructure, the largest labour force and the most powerful technological and industrial park. Its industrial sector is the largest employer in the country, with more than 2.5m people.

The survey gathered 149 companies. We can highlight their main characteristics as: the predominance of transformational industrial companies (87.2 per cent); mostly of them are micro, small and medium companies, with annual revenues less than USD60m (73.2 per cent) and a number of employees less than 99 (59.1 per cent). Of these companies, mostly, only 11.4 per cent are negotiated in the open market. They mostly have domestic (79.9 per cent) and private capital (99.3 per cent).

On variance based structural equation modelling, as PLS–SEM used in this study, normality is not a required assumption as in co-variance-based structural equation modelling (e.g. using software like LISREL, AMOS, EQS, MPLUS, LAVAAN, and others). Hair, Gabriel, and Patel (2014)/Hair, Hult, Ringle and Sarstedt (2014) considered worthwhile to evaluate the data distribution. Following this suggestion, data were tested using theory-driven methods (Razali and Wah, 2011), namely, Shapiro–Wilk test (SK) for univariate normality and Mardia's skewness and kurtosis, Henze–Zirkler and Doornik–Hansen for multivariate normality. The results for univariate normality are presented in Table III.

The results for multivariate normality are presented in Table IV.

The null hypothesis of all normality tests performed is not supported, which support the statement of non-parametric data, and it is suitable for PLS–SEM.

5.2 Assessment of measurement model

The estimation of a measurement model implies in the definition of relationships between the indicators (observed variables) and the construct (the latent variable). To assess a certain measurement model, several criteria of reliability and validity must be evaluated. The complete assessment of a measurement model includes the composite reliability to evaluate internal consistency, individual indicator reliability and average variance extracted (AVE) to check convergent validity, Fornell–Larcker criteria and cross-loadings to assess discriminant validity (Hair, Hult, Ringle and Sarstedt, 2014).

Composite reliability (ρ_c) is measured from 0 to 1, and higher values are equal to higher levels of reliability. As a rule of thumb, values between 0.7 and 0.9 are considered satisfactory. Indicator reliability and AVE are common measures of convergent validity. Indicator reliability is measured by its outer loading, and the expected measure is above 0.7. AVE should be above 0.50. These values are shown in Table V.

Finally, discriminant validity is assessed by three measures: Fornell–Larcker criteria cross-loadings and disattenuated correlation. Fornell–Larcker criteria compare the squared root of the AVE of each construct to the correlations with other latent variables (or constructs), and the value of AVE should be greater. Also, an indicator's outer loading on the associated construct should be greater than any of its loadings in other constructs (cross-loaded), and the disattenuated correlation approach is an estimate of what is the true correlation between two constructs if they were perfectly measured. Disattenuated correlation between two constructs close to 1 indicates the lack of discriminant validity (Hair, Gabriel, and Patel, 2014; Hair, Hult, Ringle and Sarstedt, 2014).

All indicators present outer loading above 0.7 and cross-loading confirmed discriminant validity. All parameters fitted or exceeded the minimum threshold. Table VI shows the squared root AVE (italics) compared to the latent variable correlations, according to Fornell–Larcker criteria.

The next step was to identify disattenuated correlations, which was calculated for each pair of constructs, as shown in Table VII.

All parameters fitted or exceeded the minimum threshold suggested by the literature, what validates the proposed scale. Thus, the results suggest that it is possible to consider a firm's sustainable performance through a set of 24 indicators, six for the economic dimension, nine for the environmental and nine for social performance, as presented in Table VIII.

TBL dimension	Indicator	Shapiro–Wilk test Statistic	df	Sig.
Economic indicators	OperIncF	0.750	149	0.000
	SalesGrowF	0.720	149	0.000
	ROIF	0.868	149	0.000
	ROEF	0.923	149	0.000
	CashFlowF	0.779	149	0.000
	CostUnitF	0.815	149	0.000
	MShareC	0.893	149	0.000
	RespTimeC	0.861	149	0.000
	OnTimeDelC	0.733	149	0.000
	NComplC	0.782	149	0.000
	NWaClaimC	0.831	149	0.000
	SurveySatC	0.846	149	0.000
	MatEffVarP	0.895	149	0.000
	ManTimeP	0.819	149	0.000
	MatLossP	0.872	149	0.000
	LabEffVarP	0.893	149	0.000
	NNewPatL	0.855	149	0.000
	NNewProdL	0.930	149	0.000
	TimeNewPrL	0.919	149	0.000
	EmplSatL	0.874	149	0.000
Environmental indicators	Materials	0.920	149	0.000
	Energy	0.884	149	0.000
	Water	0.872	149	0.000
	Biodiversity	0.872	149	0.000
	Emissions, effluents and waste	0.881	149	0.000
	Environmental aspects of products and services	0.896	149	0.000
	Environmental compliance	0.855	149	0.000
	Transporting	0.914	149	0.000
	General environmental issues	0.906	149	0.000
Social indicators	Employment	0.904	149	0.000
	Labour/management relations	0.920	149	0.000
	Occupational health and safety	0.859	149	0.000
	Training and education	0.893	149	0.000
	Diversity and equal opportunity	0.933	149	0.000
	Investment and procurement practices	0.921	149	0.000
	Non-discrimination	0.885	149	0.000
	Freedom of association and collective bargaining	0.906	149	0.000
	Child labour	0.810	149	0.000
	Forced and compulsory labour	0.812	149	0.000
	Security practices	0.840	149	0.000
	Indigenous rights	0.768	149	0.000
	Community	0.900	149	0.000
	Corruption	0.857	149	0.000
	Public policy	0.885	149	0.000
	Anti-competitive behaviour	0.868	149	0.000
	Compliance	0.878	149	0.000
	Customer health and safety	0.864	149	0.000
	Product and service labelling	0.885	149	0.000
	Marketing communications	0.903	149	0.000
	Customer privacy	0.804	149	0.000
	Compliance of products and services	0.869	149	0.000

Source: Created by the authors

Table III.
Univariate normality test

Test	Statistics	χ^2	df	Sig.
Mardia				
mSkewness	1,304.384	33,069.838	23,426	0.000
mKurtosis	3,012.019	657.991	1	0.000
Henze–Zirkler				
1.000388	2.34e+07	1	0.000	
Doornik–Hansen				
		523.317	0.000	

Source: Created by the authors

Table IV. Multivariate normality test

	AVE	ρ_c	R^2	Cronbach's α
BSC_FULL	0.5698	0.88796	0.282	0.853
GRI_ENV	0.6440	0.9418		0.930
GRI_SOC	0.6026	0.9577	0.555	0.915
Reference values	> 0.50	> 0.708	Weak = 0.25 Moderate = 0.50 Substantial = 0.75	> 0.708

Source: Created by the authors

Table V. AVE and composite reliability for each construct

	BSC_FULL	GRI_ENV	GRI_SOC
BSC_FULL	*0.7725*		
GRI_ENV	0.5310	*0.8025*	
GRI_SOC	0.4550	0.6921	*0.7763*

Source: Created by the authors

Table VI. Correlations among constructs

	Original correlation	Disattenuated correlation	Discriminant validity
BSC_FULL–GRI_ENV	0.8879	0.5866	Supported
BSC_FULL–GRI_SOC	0.4550	0.4934	Supported
GRI_ENV–GRI_SOC	0.6921	0.7287	Supported

Note: Reference values < 0.90
Source: created by the authors

Table VII. Disattenuated correlations among constructs

5.3 Assessment of structural model

In SEM, the structural model is used to confirm the relationships hypothesised between the constructs. Several results are used to confirm or reject the hypothesis of a certain relationship, and the most common are the size and significance of path coefficients, the coefficients of determination (R^2), predictive relevance (Q^2) and effect sizes (f^2). The structural model is presented in Figure 2.

Both the size and significance of a structural model in PLS–SEM are assessed by bootstrapping that generates an empirical *t*-value. Table IX presents the results of bootstrapping for each indicator.

The results for the significance testing results of structural model path coefficients are presented in Table X.

The path coefficients in a PLS–SEM can be interpreted as the hypothesised relationships between the constructs and must be interpreted relatively to one another. In this study, two of the relationships are significant at a level of 1 per cent, and the effect of GRI_ENV on GRI_SOC is higher than the effect of GRI_ENV on BSC_FULL and the smallest effect occurs on GRI_SOC related to BSC_FULL.

To assess the predictive relevance (Q^2) in PLS–SEM, the common procedure is blindfolding. Values of Q^2 higher than 0 suggest that the model has predictive relevance for certain endogenous constructs. The coefficient of determination R^2 (the most commonly used measure to evaluate the structural model) is also a measure of the predictive accuracy of a certain model. The value of R^2 ranges from 0 to 1 and values of 0.75, 0.50 and 0.25 can be described as substantial, moderate or weak (Hair, Gabriel, and Patel, 2014; Hair, Hult, Ringle and Sarstedt, 2014). Table XI presents the values of Q^2 and R^2 for the hypothesised model.

The final assessment of a PLS–SEM structural is the effect size (f^2). Effect size is useful to analyse the relevance of constructs in explaining how much a predictor construct contributes to the R^2 value of a target construct in the structural model. Results from 0.02, 0.15 and 0.35 can be interpreted as small, medium and large effect sizes (Hair, Gabriel, and Patel, 2014; Hair, Hult, Ringle and Sarstedt, 2014). Effect sizes are presented in Table XII.

5.4 Hypotheses results

The results pointed out that: *H1* was confirmed; *H2* was not confirmed and *H3* was confirmed.

6. Discussion and conclusions

6.1 General remarks

As our results show, a set of indicators that covers the main aspects of sustainability performance can be useful for industrial companies' management, according to the TBL approach. Within the economic dimension, on-time delivery, number of customer complaints and survey of customer satisfaction are typical indicators related to the firm's value proposition and emphasise the importance of the client as a major stakeholder for companies in the industrial sector (Kärkkäinen *et al.*, 2001; Hourneaux, Siqueira, Telles and Correa, 2014). On the other hand, materials efficiency variance, rate of material scrap loss

Economic Dimension	Environmental dimension	Social dimension
On-time delivery	Materials	Labour/management relations
Number of customer complaints	Energy	Occupational health and safety
Survey of customer satisfaction	Water	Training and education
Materials efficiency variance	Biodiversity	Non-discrimination
Rate of material scrap loss	Emissions, effluents and waste	Freedom of association and collective bargaining
Labour efficiency variance	Environmental aspects of products and services	Child labour
	Environmental compliance	Forced and compulsory labour
	Transporting	Security practices
	General environmental issues	Compliance

Source: Created by the authors

Table VIII.
Triple bottom line performance measurement and representative indicators for each dimension

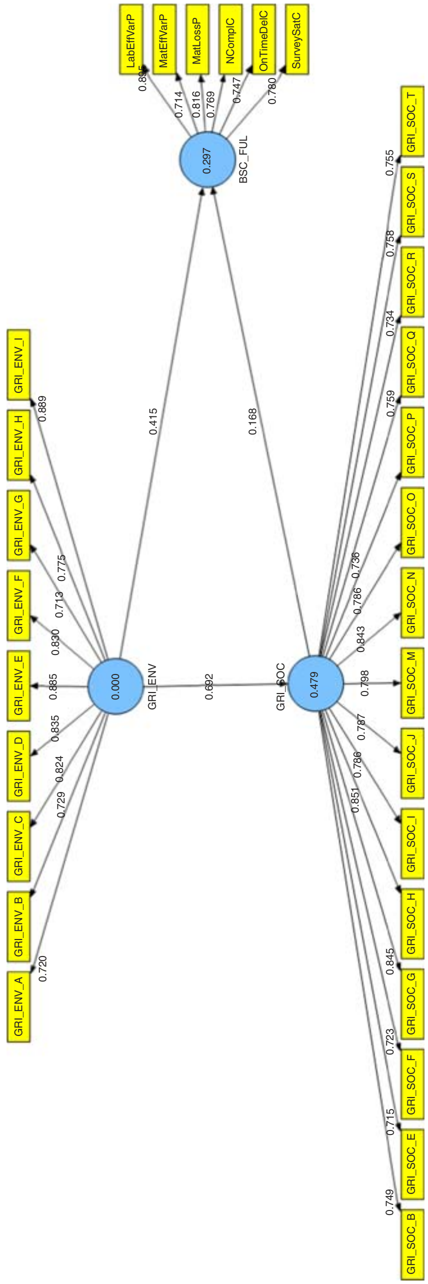

Figure 2.
Structural model

Latent variable	Indicator	Outer weight	*t*-value	Sig. level	*p*-value
Economic	BSCF1	0.678	7.587	***	0.000
	BSCF2	0.715	8.493	***	0.000
	BSCF3	0.855	36.384	***	0.000
	BSCF4	0.813	25.948	***	0.000
	BSCF5	0.690	7.386	***	0.000
	BSCF6	0.753	13.029	***	0.000
Environmental	GRI_ENV_A	0.731	14.745	***	0.000
	GRI_ENV_B	0.744	16.042	***	0.000
	GRI_ENV_C	0.832	24.624	***	0.000
	GRI_ENV_D	0.830	26.534	***	0.000
	GRI_ENV_E	0.887	46.394	***	0.000
	GRI_ENV_F	0.828	19.445	***	0.000
	GRI_ENV_G	0.705	12.365	***	0.000
	GRI_ENV_H	0.764	16.525	***	0.000
	GRI_ENV_I	0.885	38.134	***	0.000
Social	GRI_SOC_B	0.766	20.352	***	0.000
	GRI_SOC_C	0.777	26.504	***	0.000
	GRI_SOC_D	0.744	19.918	***	0.000
	GRI_SOC_G	0.799	22.637	***	0.000
	GRI_SOC_H	0.825	26.083	***	0.000
	GRI_SOC_I	0.787	19.057	***	0.000
	GRI_SOC_J	0.793	20.541	***	0.000
	GRI_SOC_K	0.710	14.397	***	0.000
	GRI_SOC_Q	0.742	16.007	***	0.000

Note: ***$p < 0.001$
Source: Created by the authors

Table IX.
Bootstrapping results for each indicator

	Path coefficients	*t*-values	Significance level	Hypothesis
GRI_ENV → BSC_FULL	0.415	3.863	$p > 0.01$	Confirmed
GRI_ENV → GRI_SOC	0.692	15.183	$p > 0.01$	Not confirmed
GRI_SOC → BSC_FULL	0.168	1.556	$p > 0.10$	Confirmed

Source: Created by the authors

Table X.
Significance testing results of structural model path coefficients

	R^2	Q^2
BSC_FULL	0.282	0.1619
GRI_SOC	0.555	0.2724

Source: created by the authors

Table XI.
Results of R^2 and Q^2 values

	f^2
BSC_FULL	0.379
GRI_SOC	0.497
GRI_ENV	0.562

Source: Created by the authors

Table XII.
Results of f^2

and labour efficiency variance are economic indicators directly related to the efficiency of the industrial process – crucial for industrial companies – and may have a high impact on firm's economic performance.

In the environmental dimension, the indicators materials, energy and water are the ones that have the highest priority on the measurement of production costs (Hourneaux Jr, Hrdlicka, Gomes and Kruglianskas, 2014). Other indicators such as emissions, effluents and waste, environmental aspects of products and services, environmental compliance, and general environmental issues are also typical in industrial process and should be measured, as well. Transporting also has important impacts on industrial companies (González-Benito and González-Benito, 2006). Finally, biodiversity has been considered as a relevant issue for companies in an ecosystem like Brazil, one of the richest in the world (Ramalho *et al.*, 2016). It is important to state that it may lose its importance in other industrial contexts.

In the social dimension, the indicators labour/management relations, occupational health and safety, training and education, non-discrimination, freedom of association and collective bargaining, child labour, forced and compulsory labour, and security practices emphasise the importance of the employees as another major stakeholder for industrial companies (Shields and Young, 1992; Galeazzo and Klassen, 2015; Maia *et al.*, 2018). Therefore, the social dimension can be seen as critical and complex for sustainability performance. Compliance, the other indicator is broader and can address the attempts to fit the regulations and possible ethical conflicts, sometimes with grave and unintended consequences to the companies (De Cremer and Lemmich, 2015).

Regarding the study's hypotheses, the results pointed out that there are positive associations between the degree of use of environmental indicators and social indicators for *H1*. These findings emphasise that companies that have social and environmental orientation can achieve some synergy in these two aspects of sustainability. As mentioned before, the multidimensionality of sustainability and its intrinsic overlapping within measures underpins these relationships between environmental and social dimensions.

For *H2*, we conclude that economic, environmental and social indicators have different degrees of use in firms. Despite this logical deduction, companies can be misled to try to achieve the so-called balanced among the three sustainability dimensions, as we can recall some ideas like the three-legged stool as a representative figure for the TBL approach.

On the other hand, in *H3*, a positive association between the degree of use of environmental and social indicators and the use of economic indicators was not confirmed. This result suggests that companies can follow environmental and social performance regardless of their economic performance and vice versa. Again, the idea of a TBL approach as balanced as understood by common sense can be trick or misunderstood.

6.2 Academic implications

In brief, performance measurement is multidimensional and complex (Bourne *et al.*, 2000; Chenhall and Langfield-Smith, 2007; Richard *et al.*, 2009). As a logical consequence, sustainability performance should present different dimensionalities and levels for its measurement (Van Marrewijk and Werre, 2003). Trying to find new and better ways to deal with these issues have been seen as of increasing importance (Searcy, 2012).

Although our suggestion – or any other framework, actually – could not be considered as a complete or ideal solution to measure a firm's sustainable performance, it can be seen as another path to recognise the importance of sustainability for companies' management.

Thus, this study aims to propose and validate a framework for measuring a firm's performance from TBL perspective. The proposed model is not expected to be considered as the only possible approach to support the assessment of TBL in organisations. Furthermore, the so-called balance on the TBL dimensions is rarely discussed, and it seems to be something highly important to be done.

We also emphasise the need for more clarification on the "balance" of the TBL approach to avoid misconceptions or misunderstandings among scholars.

6.3 Practical implications

This research indicates that the use of the TBL performance indicators can be done in different ways and degrees. It is also important to emphasise that several other factors can also influence the sustainable performance assessment, such as: industry, company size, local regulation, stakeholders' efforts, competitive scenario, company lifecycle, amongst many others that could be used as moderators and/or mediators in the proposed model, generating a broader comprehension of TBL in practice and its impact on managerial aspects of every company, given an unique nature of every business.

This framework is supposed to work as a minimum set of indicators that could provide managers, policymakers and researchers subsidies to identify gaps and opportunities to enhance the overall performance of a certain organisation on regard of sustainability. This minimum set of indicators is intended to be used by industrial companies as a reliable instrument to sustainable performance assessment of the current stage of the TBL deployment and provide alternative approaches to address specific issues related to the environmental, social and economic sustainability.

6.4 Limitations and further research

This study has its limitations, mainly related to the non-probabilistic sample and to the specific context in which it was done, Brazilian industrial companies. Additionally, those indicators used as proxies are generic indicators employed as a way to make it possible for all the firms to participate in the research, instead of specific ones that could lead to missing data. Future research works could also investigate the fitness of the model for companies, and also take into consideration variables that could moderate or mediate the sustainable performance assessment.

As a sequence to this work, besides the possibility of counting on a larger sample and replicating this instrument in other circumstances, we suggest an investigation on the reasons for the use of this or that set of indicators over others, and on what basis it occurs, in order to enhance the quality and robustness of these indicators, as suggested by Singh *et al.* (2012).

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