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Eduardo Guilherme Satolo, Alexandre Tadeu Simon,

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Critical analysis of assessment methodologies for intraorganizational sustainability

Eduardo Guilherme Satolo

*Campus Experimental de Tupã Business School,
UNESP - Univ. Estadual Paulista, Tupã, Brazil, and*

Alexandre Tadeu Simon

*Industrial Engineering Post Graduation Program,
Methodist University of Piracicaba - UNIMEP, Santa Bárbara d'Oeste, Brazil*

Abstract

Purpose – Sustainability is in vogue nowadays. It is a new concept and it has yet to be studied in more depth and rigor to create a stronger understanding. There are several lines of research and development in this area, each one using a specific template for measuring sustainability what poses even greater difficulties to those interested in the subject. The purpose of this paper is to discuss and compare current models for measuring organizational sustainability.

Design/methodology/approach – The paper presents a literature review identifying six models that have synergies in their structures and methods for measuring sustainability. It also analyzes each model highlighting key individual features identifying similarities and differences.

Findings – Results indicates it is necessary to improve existing models and gathering positive features of each model may be the starting point for obtaining a measurement model of sustainability.

Research limitations/implications – This work is restricted to perform a critical analysis of models for measuring intra-organizational sustainability.

Originality/value – This is one of the first studies to investigate models that assess sustainability from the intra-organizational perspective.

Keywords Sustainability index, Sustainability, Sustainability dimensions, Sustainability measurement, Intra-organizational sustainability, Assessment methodologies

Paper type Literature review

1. Introduction

The sustainability concept is relatively new and in the last two decades has been gradually embraced by organizations and governments worldwide (Mullerat, 2010; de Lange *et al.*, 2012; Gasparatos and Scolobig, 2012). A great deal of research has been committed to developing the theme, and researchers have created their own definitions and principles (Xu *et al.*, 2006; Siena, 2008; Singh *et al.*, 2009; Barron, 2010; de Lange *et al.*, 2012; Hester and Little, 2013) which has created difficulties in understanding and implementing the concept in the organizational environment.

The term sustainability has been inflated; it is now ambiguous and carries contradictory and obscure associations (Smeraldi, 2009; Sheinbaum-Pardo *et al.*, 2012). This conflation occurred due to different definitions and applications of the terms sustainability, sustainable development, organizational sustainability and corporate social responsibility (CSR) depending on the purpose of the study (Montiel, 2008; Ardichvili, 2013; Gatti and Seele, 2014). A precise definition of sustainability is still missing (Sheinbaum-Pardo *et al.*, 2012).

Because of the many themes involving environmental and social issues, managers still appear confused when approached about social responsibility and sustainability



issues. Although important studies have been conducted and published on these two topics, these sometimes contributed to the uncertainty of managers due to ambiguous definitions and constructions (Montiel, 2008).

The CRS concept emerged in the 1990s due to several renowned authors' works on responsibility, emphasizing a discussion of ethical, and moral issues in business: environmental, educational, and those that characterize social injustices and that contribute significantly to defining the role of organizations. Currently, the theme of "social responsibility" relates strongly to business ethics, to the point of being transformed into a "business doctrine," without which there is no success. Over the years, the discussion of the term sustainability and its dimensions, conflicts, and confusion of themes has evolved (Ardichvili, 2013).

Although the concept of sustainability does not have a common definition, John Elkington's (1998) definition is widely used. It describes sustainability as mechanisms to ensure that current actions do not limit the economic, social, and environmental options for future generations (Elkington, 1998).

In the organizational dimension, Barron (2010) and de Lange *et al.* (2012) explained that the key to sustainable development is to integrate economic development, social progress, and environmental quality.

The economic dimension includes operating cost reduction through management of labor productivity, research and development expenses, and investments in training and other forms of human capital improvement. The environmental dimension addresses the impacts of processes, products and services on the environment, biodiversity and human health, and its improvement, reducing the amount of resources used. The social dimension aims to guarantee workers' rights and improvements in addition to the proactive engagement and participation of stakeholders (Jamali, 2006; Barron, 2010).

These three dimensions are interrelated, and no single dimension should be prioritized over another. Current research does not allow one to state that three dimensions embrace all sustainability fields (Sheinbaum-Pardo *et al.*, 2012; Sharifi and Murayama, 2013).

Sustainability applied to the business, called here organizational sustainability, is referenced in literature as corporate responsibility, and addresses mechanisms for displaying, measuring, and improving. Internationally, companies, governments, and non-governmental organizations have made important improvements in various conduct code models, standards, and methods (Jamali, 2006; Siena, 2008; de Lange *et al.*, 2012).

Smeraldi (2009) presented data about sustainability's evolution between 2004 and 2009. Using Get Abstract database, considering the main service for technical summaries, the author identified more than 5,000 titles on sustainability. Between 2007 and 2009, the sustainability theme stood out as the most discussed topic. Expanding this data collection for the period from 2010 to 2013, the Get Abstract (2014) database published more than 266 new titles addressing the organizational sustainability. This made sustainability the most popular theme in business literature, overcoming issues like trading, capital markets, marketing, recruitment, and project financing.

Linton *et al.* (2007) identified, roughly 1,300 scientific articles addressing sustainability, applied economics, business, and management, published in the Scopus database from 2004 to 2005. Expanding the data collection from 2006 to 2013, more 8,337 articles are published, which shows an average annual growth of 23 percent. This recently collected data confirms and justifies the importance of organizational sustainability and researchers' growing interest.

An organization should be prepared and well-structured to deal with sustainability issues and have basic needs to survive. These needs are met through interaction between the organization and the environment where it operates, which brings up the fact that an organization first needs to be structured internally before moving to external environments. In other words, organizations should plan, implement, verify, and measure internal sustainability before deploying and measuring outward actions (Lueneburger and Goleman, 2010; de Lange *et al.*, 2012).

Barron (2010) highlighted that organizations therefore cannot understand sustainability as a mechanism only for external actions. It is important to obtain the necessary internal sustainability, by the right management of its processes and analysis of its performance. This concept through this paper is called intra-organizational sustainability.

Barreto and Patient (2013) claim that exploring relations about organizational shifts and managerial patterns is crucial. de Lange *et al.* (2012) complement that little attention has been paid to how sustainable practices remain in place and continue to develop over time. Thus, it imperative to measure the levels of sustainability in an organization.

Many approaches to sustainable development indicators are being created, tested, and improved, but, there is no consolidated methodology for this purpose. Those currently in use have commonalities, but a consensus regarding the concept and application has yet to emerge. This lack of convergence results from the difficulty that arises when attempting to materialize the sustainability concept; beyond the conceptual basis, there is no consensus on what and how to measure (Siena, 2008; Hák *et al.*, 2012).

Several measurement models can be found in literature and in practical applications. Each one has its own data aggregation system and its own assessment. The goal of this work is to seek the similarities and differences between the main models for measuring intra-organizational sustainability available in literature and/or the ones used in industry through comparative analysis.

2. Developing a work method

The research method consisted of studying and analyzing bibliographic production in the subject area of sustainability within the period of 2006-2012. Through this process, the research provides a state-of-the-art report on sustainability, sustainability dimensions, sustainability index and sustainability measurement, highlighting the most important ideas, methods, and sub-themes that have more emphasis in literature. The process followed the steps proposed by Machi and McEvoy (2009), shown in Table I. At all, 64 models of sustainability assessment were identified in the literature. Using the parameters for selecting models, established in this research, six models were selected. Taking the arguments of analysis, a detailed study of the six models of intra-organizational evaluation was conducted which allowed the critical analysis and finally a description of the findings.

Several models that aim to measure sustainability in business are identified in the literature. In the main scientific databases like Scopus, Ebsco, Web of Science, and Wiley, for example, 64 different methods whose objective is to assess sustainability were found with approaches such as marketing, innovation and IT, development indices (human, regional, national), ecological development, and product life cycle and levels of investment. They are important models and contribute to scientific development but do not include the requirements of the selected models considered for the development of this paper, whose main focus is intra-organizational sustainability.

| Steps of Machi and McEvoy literature review process | Article section | Justification |
|---|--|--|
| Step 1: select a topic | Section 2: developing a work method | The topic selected in this literature review covers the intra-organizational sustainability assessment models. The sustainability theme stands out as one of the most studied in the literature, even though many research gaps are still perceived when analyzing their assessment. Articles about intra-organizational sustainability performance are scarce |
| Step 2: search the literature | Section 2.1: parameters for selecting models | Research and data collection conducted from bases: Scopus, Ebsco, Web of Science, Wiley Keywords: organizational sustainability research, evaluation and measurement Identified 64 models of sustainability assessment Study and classification of the 64 articles Identification of model articles which meet the selecting parameters, described on item 2.1 |
| Step 3: develop the argument | Section 2.2: arguments of analysis | Selection of 6 models for intra-organizational sustainability assessment that meet the search parameters Step responsible for developing the argument to be considered in step 4 (survey the literature) and step 5 (critique of the literature) Definition of the arguments for analysis and critique of models: application purpose of evaluation model; dissemination of the academic model (citation index); criteria for design, data analysis and results provided by the model; principles for data aggregation of models |
| Step 4: survey the literature | Section 3: intra-organizational sustainability assessment models | Detailed study of the six intra-organizational sustainability assessment models in order to identify strengths and weaknesses in their construction, structure, data collection mode, aggregation form of data collected and identified outcomes |
| Step 5: critique the literature | Section 4: critical analysis and considerations of sustainability measurement models | Step of critical analysis of literature, developed from the arguments defined in step 3 of the Machi and McEvoy (2009) process |
| Step 6: write the review | Section 5: conclusions | Final stage of the literature review that reports the findings of the conducted work, highlighting the main points of research and proposing future work |

Source: Adapted from Machi and McEvoy (2009)

2.1 Parameters for selecting models

Model selection in this work attempted to remain specific and avoid irrelevant discussions. The identified and selected works are based on the following parameters:

- (1) to present a sustainability assessment with a central focus on the internal aspects of the organization;
- (2) to present scientific criteria for obtaining data related to organizational sustainability;
- (3) to address sustainability measurement within the three dimensions proposed by the triple bottom line; and
- (4) to provide a measurable outcome of organizational sustainability.

2.2 Arguments of analysis

The stage of the evaluation models selection of intra-organizational sustainability, according to the proposal of Machi and McEvoy (2009), must follow a set of arguments which direct the review process. Four main arguments of analysis were defined for this study:

- (1) application purpose of evaluation model;
- (2) academic dissemination of the model (index citation);
- (3) criteria for design, data analysis and results provided by model; and
- (4) principles for data aggregation of models.

3. Intra-organizational sustainability assessment models

Eight models for measuring organizational sustainability were identified that meet the parameters presented in Section 2.1. Each one has its own method for data collection, aggregation, and analysis. Two of them stand out as variants of other models, and have been removed from the analysis to present a higher degree of similarity with the base model. Selected models are discussed in sub-sections below.

3.1 Dow Jones Sustainability Index (DJSI)

The Dow Jones Industrial Average (Dow Jones Sustainability Indexes (DJSI), 2013), is responsible for publishing the marketing drive in the United States and was created in 1986. In addition to the NASDAQ Composite and Standard & Poor's 500, it is one of the most important indicators of the American market.

In 1999, Dow Jones created a new management indicator, the DJSI World, the first leading company performance indicator in sustainability at the global level.

The model is based on the analysis of four sources of information to evaluate three aspects of opportunity and risk: economic, environmental, and social performance of each company:

- (1) Questionnaire: this is considered the main source of information in the DJSI World composition. It is handed out to candidate companies that seek to be part of the index, and it must be answered by upper management representatives.
- (2) Company documentation: various documents are required, including reports on sustainability/environment, health and occupational safety, as well as social

and financial reports. Other special reports required are intellectual capital management, corporate governance, research and development, and internal documentation, brochures, and web sites.

- (3) Media and stakeholders: published data in media is required, including television, newspaper, magazines, press releases, articles, and stakeholder information. This data is integrated into the evaluation system, and it can serve as the basis for company disqualification.
- (4) Company contact: DJSI World analysts must be able to get in contact with the companies themselves or with their stockholders to resolve any doubts.

To ensure quality and objectivity of internal and external audit procedures, multiple sources of information are used to control and maintain the input data, assessment, and results accuracy (Figure 1).

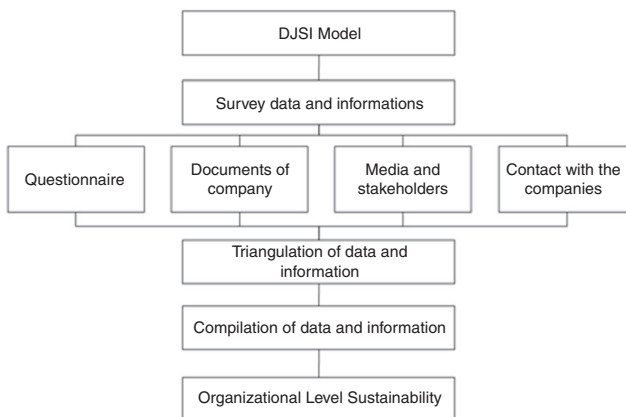
The survey questionnaire, the main source of information, assesses the triple bottom line's dimensions, subdivided into several criteria. To each one is assigned a relative weight that makes up the index calculation (Table II).

3.2 Business Sustainability Index (ISE)

The Business Sustainability Index (ISE, 2011) is a questionnaire that was published in 2000 to ensure good corporate citizenship. *Exame Magazine* (a Brazilian publication) created the index to generate a yearbook about these aspects for Brazilian organizations.

In 2007, this survey faced methodological reform in order to adopt a broader perspective. The model began to evaluate companies' strategies, commitment, and sustainability practices based on their performance in the sustainability dimensions: environmental, economic, and social. Other aspects continue to be evaluated: commitment, transparency, conduct against bribery and corruption, and cooperative management aspects.

The first model presented "closed" questions (multiple choice), provided by top management maintainers. The answers are statistically analyzed considering company performance in all dimensions. Although companies answer the same questionnaire, they are divided into two groups: moderate environmental impact (banks, financial institutions, services, technology and computing, telecommunications) and high environmental impact, including all other business sectors (Table III).



Source: Author's own elaboration

Figure 1.
DJSI world model

| MEQ 26,2 | Dimensions | Criteria | Dimension relative weight (%) |
|--|---------------|---|-------------------------------|
| 220 | Economic | Corporate governance | 18%+variable |
| | | Crisis and risk management | |
| | | Codes of conduct, complicity | |
| | | Corruption and bribery | |
| | | Specific criteria for the industry branch | |
| | Environmental | Environmental reports | 3%+variable |
| | | Specific criteria for the industry branch | |
| | Social | Development of human capital | 22%+variable |
| | | Attracting and retaining talent | |
| | | Labor practices indicators | |
| Corporate citizenship and philanthropy | | | |
| Social reports | | | |
| | | Specific criteria for the industry branch | |

Table II.
DJSI World model

Source: Adapted from DJSI (2013)

3.3 Ethos Social Responsibility (ESR) Indicators

The Ethos Institute for Business and Social Responsibility is a non-profit organization that seeks to mobilize, sensitize, and help companies manage their business in a socially responsible manner, making them partners in building a just and sustainable society. They developed a model of sustainability assessment called ESR Indicators, which is a tool for self-testing (Ethos Institute, 2011).

The questionnaire is divided into seven dimensions: values, transparency and governance; internal public; environment; suppliers; consumers and customers; community and; government and society. There are three types of evaluation indicators:

- (1) The Depth Indicator allows for evaluation of the current state of management. It is represented by four boxes that assess the level of a particular practice. The first box shows the basic performance level and evolves as the boxes on the right are read, allowing the company to be easily located on the scale. The last box corresponds to the best performance on that specific practice. Based on that, an excellence level can be assumed for that indicator.
- (2) The Binary Indicator comprises binary yes-or-no questions related to the first group of questions. It contains elements for validation and further evaluation of the stage in which the company identifies itself and contributes to the understanding of which practices should be incorporated into the business management.
- (3) The Quantitative Indicator proposes systematic survey data (which can be evaluated by annual series and cross-checked with other data). Not all indicators have quantitative data. However, those that have it should be raised precisely because it will be useful, especially in the company's internal monitoring.

After completion, a diagnostic report is generated showing the company's performance as presented by tables and comparison charts. This visual data positions the performance in relation to companies that compose the benchmark group (the ten

| Dimensions | Criteria | Number of questions |
|--|----------------------------------|---------------------|
| General | Appointments | 36 |
| | Alignment | |
| Nature of product | Transparency | 23 |
| | Personal impacts of product use | |
| | Diffuse impacts of product use | |
| Corporate governance | Legal compliance | 21 |
| | Property | |
| | Board of directors | |
| | Management | |
| | Audit and inspection | |
| Economic and financial | Conduct and conflict of interest | 42 |
| | Policy | |
| | Management | |
| | Performance | |
| Environmental | Legal compliance | 53 |
| | Policy | |
| | Management | |
| Environment for financial institutions | Performance | 48 |
| | Legal compliance | |
| | Policy | |
| | Management | |
| Social | Performance | 63 |
| | Legal compliance | |
| | Policy | |
| | Management | |
| | Legal compliance | |

Source: Author's own elaboration

Table III.
ISE model

companies that obtained the best performance) and the average of all companies that submitted the completed questionnaire. The report also shows company details using indicators and correlations with relevant tools and initiatives to assess manager social responsibility to facilitate the use of existing synergies (Figure 2).

3.4 Compound Index for Sustainable Development model

Krajnc and Glavic (2005) proposed a measurement model of sustainability based on what the authors called the Compound Index for Sustainable Development I_{CSD} , to create a traceable, integrated engine of information on economic, environmental, and social performance over time.

The model generation measuring sustainability has seven steps (Figure 3).

The first stage assumes that the company's impact can be determined according to the concept of the triple bottom line, converting the three aspects to determine the company contribution to the environmental, social, and economic spheres. In the next step, company needs to generate the global indicators that assess environmental, social and economic sustainability over time. These indicators should be on a standard scale allowing comparison, as suggested by the authors for annual scale. Once the global indicators are generated, company must sort them as positive or negative impacts on organizational sustainability in order to standardize the assessment parameters. To measure the indicators, the author proposes the use of an analytic

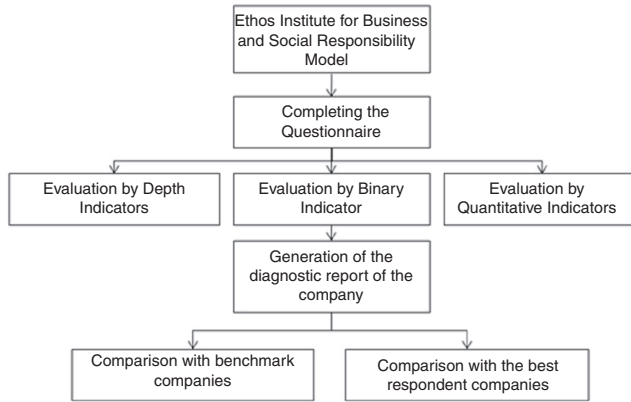


Figure 2.
ESR indicators
model steps

Source: Author's own elaboration

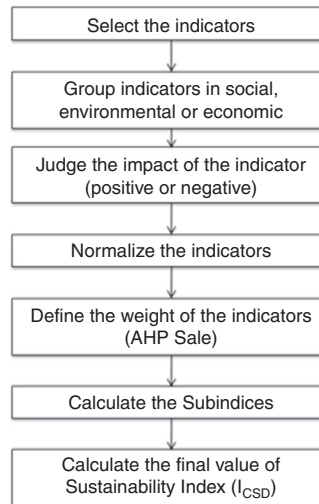


Figure 3.
 I_{CSD} model steps

Source: Adapted from Krajnc and Glavic (2005)

hierarchy process (AHP). This scale is used to derive indicator weights based on prioritization of impact by assessing the company's overall sustainability. It has strong academic acceptance and a simple application. The proposal presents a scale with nine levels.

After defining the indicators, the association is performed using AHP scales of comparison between pairs of indicators. Once this process is complete, I_{CSD} calculation is driven by the sum of positive and negative sub-indicators for each of the three categories (social, environmental, and economic), aggregated into the final indicator of company sustainability.

3.5 Composite Sustainability Performance Index model (CSPI)

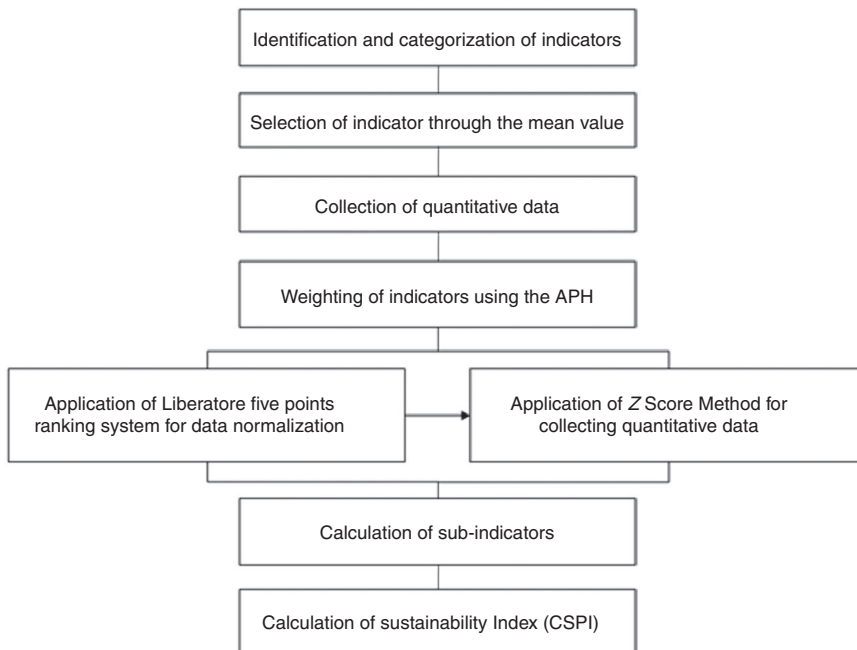
The CSPI model (Singh *et al.*, 2007), proposes to aggregate sub-indicators for sustainability and subsequent determination of a sustainability index using mathematical methods. Figure 4 shows the seven steps of the model.

The first step refers to the selection of indicators that compose the model. This selection is accomplished through a search based on general literature, empirical analysis, knowledge, intuitive appeal, or a combination of these factors.

From this primary survey, industry experts should analyze the indicators and select key indicators for industry application. To establish final sustainability indicators, experts carry out a screening on the new set of indicators using a Likert scale. By weighting indicators on a scale from 1 to 5 (not important to very important), the specialists indicate the actual importance of maintaining, this parameter in the assessment. After completing the questionnaire, the indices' averages are estimated by indicators, retaining those that obtain an average over three to create the CSPI model.

This procedure generated and selected the 59 indicators of the CSPI model, divided into five dimensions (Table IV).

The next step consists of collecting data using a measurement scale (Likert). In this step, the indicators produced are compared in pairs. For example, the responder should indicate if indicator A is minor (1) or highly significant (9) relative to indicator B in order to reflect the relative degree of perception for the indicator. When complete, this process generates an evaluation matrix of indicator pairs.



Source: Singh *et al.* (2007)

Figure 4.
CSPI model steps

| Dimension | Key topics | Dimension relative weight (%) | Number of questions |
|----------------------------|---|-------------------------------|---------------------|
| Organizational performance | Leadership Strategic planning and resource management Management of human resources Materials management Research and development Information technology | 18.0 | 12 |
| Technical aspects | Productivity Labor productivity Consumer satisfaction index Equipment availability | 17.5 | 14 |
| Economic | Net income/average capital per employee Investment in new processes and products Inventory turnover | 33.0 | 4 |
| Environmental | Power consumption Solid emissions | 14.0 | 15 |
| Social | Absenteeism rate Quality of life Non-discrimination, diversity and opportunity Autonomy Relationship with suppliers | 17.5 | 14 |

Table IV.
CSPI model

Source: Adapted from Singh *et al.* (2007)

The Liberatore system's data collecting procedure is employed to normalize data by multiplying overall weights for each matrix to obtain a value common to each dimension assessed by the model. Method *Z*'s score determines the value of some quantitative indicators of sustainability; if there is no actual value indicator, it uses a scale from 1 to 10 while observing the indicator's impact on the company's positive (+) or negative (-) aspects. Sub-indicator values are obtained to represent the five dimensions evaluated by the model.

The final sustainability index determination proposed by the CSPI model is performed by calculating a set of ten equations presented by Singh *et al.* (2007).

3.6 CSD model

Pohl's (2006) primary objective was to propose a model for measuring organizational sustainability for business units. It is based on four steps (Figure 5).

The first stage, which includes purpose, scope, and target, defines the organization's purpose in conducting a sustainability study. It is important for the company to have clearly defined the reasons for measuring sustainability performance, to understand why it is important to continuously improve, to know the strengths and weaknesses of sustainability management, to compare each year's data, and to compare an organization's business units.

The second step is the generation of indicators and data collection. The company should seek points of internal organization and formulate relevant indicators to

measure them. The organization is divided into four areas with relative weights that influence the evaluation of the company, as follows:

- (1) business, ethics, consumers, and consumer benefits (30 percent relative weight);
- (2) product and product development (30 percent relative weight);
- (3) social issues (20 percent relative weight); and
- (4) aspects of the environment (20 percent relative weight).

The third step consists of categorizing indicators according to evaluation measures. The indicators, are again subdivided and classified as indicators of environmental, social, or economic aspects. This division determines each indicator's impact using the evaluation scale proposed by the author.

After completing indicators evaluation, they are summed up, respecting the area division proposed and then multiplied by the relative weight. Then a sustainability evaluation for each of the four areas of the company is obtained. The sum represents the level of sustainability in the organization. The fourth step consists of analyzing the data and outlining the goals to improve organizational sustainability.

4. Critical analysis and considerations of sustainability measurement models

This section discusses sustainability models cited above. It includes the verification of aspects such as the purpose of the application, the literature citation model employed in the preparation, the number of questions, the principles for data aggregation, the analysis criteria for the data, and the model's results.

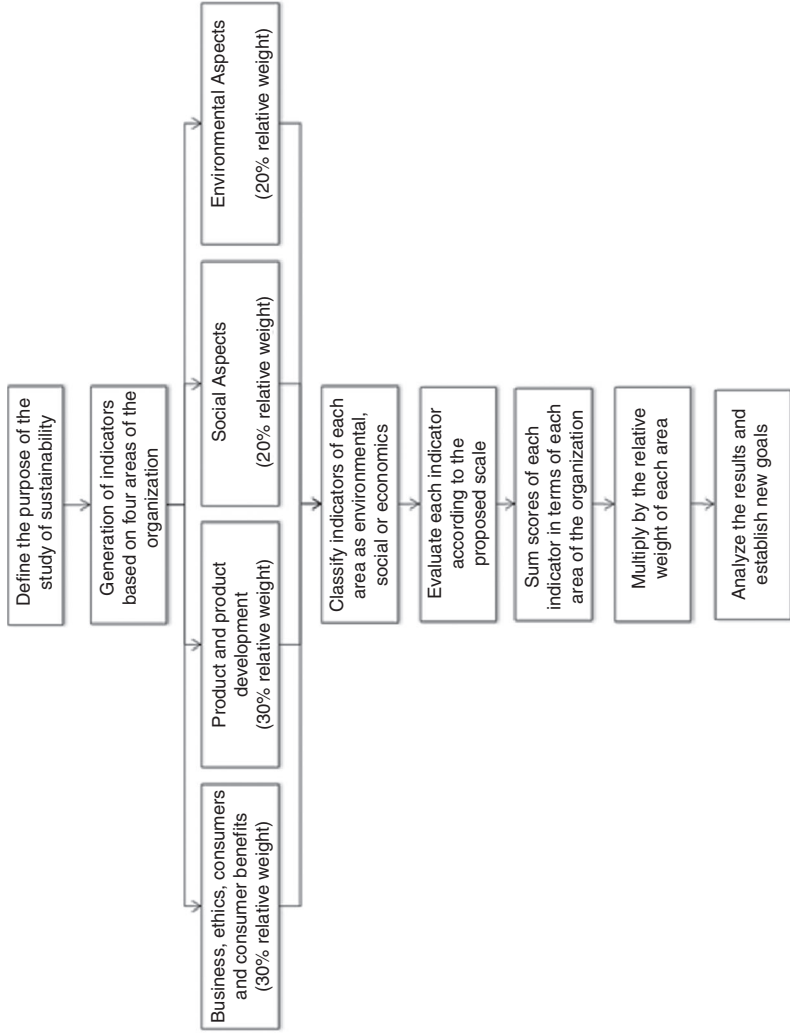
The literature's criticism of the current sustainability models focus primarily on conceptual and measurement issues that are not adequately resolved by current experiments. Researchers divide sustainability into many categories whose measurement on final indicator seems to be almost impossible. This fragmentation hinders the formulation of qualitative data and generation of policies for planning and decision making. This problem occurs not only due to the lack of common units for measuring sustainability but also due to the absence of quantitative criteria for certain values. These issues often emerge due to the application of different units for measurement and data analysis tools to make decisions in complex circumstances (de Lange *et al.*, 2012). These points do not appear to vary for the sustainability measurement models discussed in this literature review.

4.1 Application purpose of evaluation model

The first aspect to be discussed refers to the purpose of applying the model. Although all models have a common goal to conduct sustainability measurements the DJSI and ISE models go further by generating a ranking of companies that stand out in the market. These models differ from the other four models. The ESR Indicators model aims to provide measurement indicators for the organization while generating a management report containing graphs and indicators of improvements to be implemented. Models I_{CSD} , CSPI and CSD are restricted to displaying indicators of organizational sustainability.

4.2 Academic dissemination of the model (index citation)

Models with strong scientific characteristics commonly are cited as references in other work; this fact is an indicator of this dissemination. I_{CSD} presents the most citations



Source: Pohl (2006)

Figure 5.
CSD model steps

(212) and CSPI models, over 140 citations. DJSI World and ISE models have an average of 50 citations, while CSD and ESR Indicators models have less than ten mentions.

4.3 *Criteria for design, data analysis, and results provided by model*

The developed models share a high degree of similarity to the conceptual bases employed in the model. One of these bases refers to this paper's criteria used for selection and analysis, the triple bottom line. Researchers proposed different dimensions and criteria subdivisions to assess sustainability in their models. The DJSI models, ISE, and ESR Indicators show a high degree of similarity in their composition and division, which can be justified by the measurement models DJSI and ISE standing out as pioneers in sustainability assessment. They served as basis for creating the ESR Indicators. In their dimensions and categories of subdivisions, the I_{CSD} , CSPI, and CSD models are leaner than the other three models; however, as a negative point, they require the generation of measurement indicators.

The DJSI measurement model has a high degree of weighting on indicators, with a weight of 57 percent on the criteria evaluated depending on the branch of the activity to which the questionnaire is applied. ISE and ESR Indicators models have a large number of indicators to be assessed, 286 and 348, respectively. This assessment makes the procedure tedious, but may allow for verification through questioning the information's veracity.

In this respect, it is important to observe the model's approach to evaluating the economic dimension. Although some models preach a theoretical framework to measure the economic dimension, they end up leaving the measurement explicit, unlike with the social and environmental dimensions within its structure, as in the case of the I_{CSD} model. CSD allows the person in charge of selecting indicators to determine the mechanism for real assessment of the economic axis, which can result in a biased or misleading weight. The ESR Indicators model indicator performs some evaluation of the criteria of the economic dimension by means of a secondary axis. The ISE model has a structure that best evaluates the economic dimension, although the present assessment is extended within a range of 40 questions. The CSPI model performs the economic dimension evaluation using four indicators, and later compensates with a relatively high weight in its structure. The DJSI model, presents the economics measurement, but with relations that do not fit the concept of this dimension, involving issues such as sexual diversity, conflict management, code of conduct, management sensitivity, and ergonomic testing. These issues are more suitable for assessing the social dimension.

ESR Indicators models stands due to its closed set of questions (indicators) to assess organizational sustainability. This method facilitates the model's application when the company does not have experts who can generate/select the indicators being used in the organization. This feature does not occur with I_{CSD} , CSPI, and CSD models, leaving it to the organization's discretion to establish the important points for evaluating organizational sustainability. This framework for questionnaire preparation tends to generate a series of questions around the four models, although they have established all the steps that would allow achievement of a level of organizational sustainability.

The I_{CSD} model professes indicator standardization but does not present methods for indicator generation, leaving it to the discretion of decision makers on how to proceed. It is understood that each company will have its own mechanism for evaluation. It is not possible to determine a standard model, and it will develop an implementation constraint for firms that have trained specialists to create it.

The CSD model also leaves it to the company's employees' discretion to ensure indicator generation/selection and assess relative weights for each dimension. The model is confined to comparing business units of the same organization, prohibiting comparisons between companies. The CSPI model must be supported by quantitative data, which is in real numbers from the shop floor, often difficult to measure. The DJSI, ISE, and ESR Indicators models have a defined structure and indicators that make them easier to use. However, the structures of the DJSI and ISE models stand out negatively as they are extremely long. They include complex instructions, often making the process of filling them out tiresome and confusing. The ESR Indicators model does not allow for measurement of each dimension individually. Although it contains a long questionnaire, the ESR Indicators model stands out because it can be answered via the internet, and it has a high degree of interactivity, ease of completion, and direct questions at all stages.

As for the use of various information sources, using only one source of evidence during the process of data collection, with the I_{CSD} , CSPI, and CSD models, may present disparity between what was answered and what actually occurred in the organization. In the ISE and ESR Indicators models, triangulation minimizes this problem. Triangulation is based on the use and combination of different methods to study the same phenomenon understanding the interaction between the various sources of evidence to support the constructs, propositions, or hypotheses to analyze the convergence of evidence sources (Flick, 2006).

In their measurements, the DJSI World and ISE models have the feature of evaluating distinctly different branches of business. This feature gives these models a higher level of complexity, especially in the case of aggregation rates and calculating sustainability, because they generate different weights for the dimensions according to the branch of the company.

4.4 Principles for data aggregation of models

The processes of data aggregation and model results generated are more distinct. The DJSI World and ISE models do not provide a benchmark for the company immediately. This feature does not occur in the ESR Indicators model, which allows a comparison upon completion. This comparison uses results of comparative benchmarks in terms of companies, i.e., the best companies that answered the questionnaire. One downside of these three models is the non-availability of methods of data aggregation.

The I_{CSD} model uses the AHP for data aggregation. This scale is carried out by pair comparison association according to semantic level; the responses are treated as relationships on a trial scale meaning the AHP is associated with a fixed scale. The scale does not contain a zero point, assuming in principle that there is nothing worse than the zero point (Saaty, 1980). During the process, the author proposes the use of the symbol (+)/(-) to distinguish between positive or negative traits, thereby breaking a principle of the conceptual AHP method for the subsequent data aggregation to obtain the final index.

In the process of data aggregating, the CSPI model proposes using three methods to determine the final index of organizational sustainability. The first is the use of the Likert scale of values, which compares the degree of importance for indicator pairs. Quantitative evaluation is performed by the Z score method to allow their aggregation once all variables have been converted to a single numerical scale, minimizing distortions caused by the observed values at the extremes. From these results, obtained by methods that analyze data quantitatively and qualitatively, emerges

a matrix for calculation of sustainability indicators and sub-indicators. The main complicating factor of this mode is making exact calculations to generate the various indicators while, being restricted to a few experts with statistical knowledge to achieve it.

For aggregation and indicators formulation, the CSD model (Pohl, 2006) divides the model's dimensions into four categories, each one with a predetermined relative weight. The model does not provide pre-established indicators because it must know what factors are most important and one must have an understanding of which dimensions should have a greater relative weight than others; otherwise, an inconsistency in calculating the indicator could exist from the beginning. In the CSD model, the AHP scale of values is used for indicator weighting and performs the division into positive and negative points, a fact that is already contrary to the concept of scale. The most aggravating fact is that besides considering the positive and negative points, it has a strong tendency to weight negatively, as the positive scale ranges from 0 to 10 and the negative scale from 0 to 100.

5. Conclusions

The concept of organizational sustainability has been considered by academics from the perspective of evaluation indicators, which enable decision makers to draw up action plans to make companies more sustainable from social, environmental, and economic aspects. Organizations therefore, cannot understand sustainability as a mechanism only for external actions. It is important to achieve the necessary internal sustainability, by the right management of its processes and analysis of its performance. This can be called intra-organizational sustainability.

Several models that aim to measure sustainability in business are identified in the literature but not all include intra-organizational sustainability. The goal of this work was to select the main models for measuring intra-organizational sustainability available in literature and/or the ones used in industry and to seek the similarities and differences between them through a comparative analysis.

The bibliographic research identified six models of sustainability that conduct intra-organizational assessment and allow some considerations. Regarding the use of scientific methods for data collection, I_{CSD} , CSD, and CSPI models describe the steps for determining evaluation indicators, but companies have the responsibility to establish them, while DJS, ISE, and ESR Indicators models, establish these indicators what can be considered an advantage. Sustainability dimensions are presented in different ways in assessment models. The DJSI model uses the three dimensions according to their own definitions. In the ISE, ESR Indicators, and CSPI models, these dimensions are subdivided to generate a "new dimension," and in the I_{CSD} model the dimensions are grouped. The purposes of the models also differ. The DJSI and ISE models are intended to rank the organizations while the CSR, I_{CSD} , CSPI, and CSD models aim to provide management reports. Table V summarizes key information regarding sustainability assessment models.

Each of these models stands out and displays its own characteristics. These characteristics differentiate them in determining the evaluation indicators, establishing the scales of measurement, filling out the questionnaire and defining its purpose. Based on the analysis of the six assessment models, the ESR Indicators model can be considered the most complete one when analyzing the sustainability

Table V.
Table of comparative
models for
measuring
sustainability

| Model Parameters | DJWI World | ISE | Ethos RSE Indicator | I _{CSD} Model | CSPJ Model | Model CSD |
|--|--------------------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Country of origin | USA | Brazil | Brazil | India | Slovenia | Switzerland |
| Year | 1999 | 2000 | 2007 | 2005 | 2007 | 2006 |
| Finality | Rank companies | Rank companies | Provide management report | Provide management report | Provide management report | Provide management report |
| Dimensions | 3 | 7 | 7 | — | — | — |
| Number of evaluation criteria | 11 | 28 | 14 | Variable | Variable | Variable |
| Number of questions | 102 | 327 | 348 | Variable | Variable | Variable |
| Frequency citations in literature | 55 | 62 | 11 | 212 | 140 | 2 |
| Structure of the model | Triple bottom line | Triple bottom line | Triple bottom line | Triple bottom line | Triple bottom line | Triple bottom line |
| Type of questions | Open and closed | Closed | Binary, closed | Closed | Closed | Closed |
| Measuring scale | Likert | Likert | Likert | AHP | AHP | AHP |
| Level of difficulty in answering the questionnaire | Very high | Very high | Average | High | High | High |
| Allows assess each dimension individually | Yes | Yes | Yes | No | No | Yes |
| Employs data and information sources triangulation | Yes | For the finalists | Yes | No | No | No |
| Allows knowing company evaluation at the end of filling | No | No | Yes | Yes | Yes | Yes |
| Uses evaluation criteria according to the industry segment | Yes | Yes | No | Yes | Yes | Yes |
| Has final scale of comparison for evaluation | No | No | Yes | No | Yes | Yes |

Source: Author's own elaboration

of the organization with an intra-organizational focus, even though it still presents a less pronounced academic disclosure (low number of citations). The model is extensive as it is based on 350 questions. However, it is easy to fill out as it is supported by computerized systems that help both the process of gathering information such as the analysis and reporting, a feature not available in the other models. Additionally, the model can facilitate ranking of the organizations, and generates reports to establish improvement plans. The collected data are verified and documented using a triangulation technique. These aspects place this model ahead of the others.

However, development and improvement of the existing models are necessary. The analysis indicates positive and negative characteristics for each model, and this is a starting point for creating new and more consistent measurement models to assess intra-organizational sustainability.

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Corresponding author

Dr Eduardo Guilherme Satolo can be contacted at: eduardo@tupa.unesp.br

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