

SUSTAINABILITY INDICATORS: A BIBLIOMETRIC LITERATURE ANALYSIS

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Abstract

Given increasingly pressure for companies to contribute to a world's sustainable development, there is a need to have performance indicators that are able de represent a firm's situation not only under a financial perspective, but also under an environmental and social point of view. In this context, the paper engages to answer the research question "based on the papers already published and potential studies still to come, how can the academic literature support corporate sustainable development?". The present paper consists in a systematic literature review, that counts with descriptive statistical and network analysis of a sample of articles related to sustainability indicators. As results, great potential of publication in this area is identifies, such as in bringing performance measurement system (PMS), stakeholders theory and corporate social responsibility (CSR) literature nearer to sustainability issues. Academics are then able to support corporate managers in providing them tools, concepts and practical frameworks, so that the firms are able to go beyond an empty green marketing image, building gradually more sustainable business processes.

Keywords: performance indicators, performance measurement system, sustainability, sustainable development, sustainability indicators.

1. INTRODUCTION

“You are what you measure” is a well disseminated motto in performance measurement system (PMS) literature, used for example, as title for (HAUSER; KATZ, 1998). Since metrics can be applied to influence decisions and actions, which then results in firms outcomes (HAUSER; KATZ, 1998), performance measurement is necessary in several business processes, such as new product development, marketing strategies, operations management, etc. In the 1990’s the literature on PMS intensified the proposition of frameworks for performance indicators, embracing a more multidimensional and dynamic approach (NEELY, 2005). Reaching a step forward, corporate managers are now beginning to be demanded to monitor the firm’s performance under the perspective of sustainable development.

One of the reasons for this is that, considering the global context with critical environmental and social issues (such as climate change caused by green house gases (GHG), shortage of natural resources and social inequality) political pressure and governments are being driven to engage the countries into a more sustainable development (ELKINGTON, 1997). Yet the role of corporations should not be diminished, since companies are the organizations with the resources, technology, worldwide reach and motivation to achieve sustainability (ELKINGTON, 1997). The author argues that there is a tendency that higher levels of the organization become gradually more responsible for sustainability issues, emphasizing the strategic nature of the matter. Companies that engage in incorporating sustainable development into their strategy can, not only reach higher stakeholders satisfaction, but also enhance image and reputation, reduce cost, motivate employees, improve competitiveness, reduce risks, among others (SEARCY, 2012). So, if firms are intending to become sustainable, there is a strong motivation for them to implement a PMS that is able to measure the corporate performance not only on financial dimension, but also on environmental and social dimension.

In this context, the research question is: “based on the papers already published and potential studies still to come, how can the academic literature support corporate sustainable development?”. In order to do so, the objective of this paper is to identify the main subjects discussed in the literature related to sustainability indicators in corporate context. It enables to improve the understanding and delimitation of the problem faced by corporations and academy in the area of sustainable indicators, as well as identify possible future research questions to be investigated. The paper is divided in five sections. The first section discusses briefly the conceptual context in which the paper is built. After describing the research method in section 3, the paper follows in section 4 with statistical and network analysis of the

articles sample. Finally, section 5 brings the paper conclusions and limitations.

2. MAIN CONCEPTS

2.1. Sustainability in corporate context and its challenges

The discussion conducted by World Commission on Environment and Development (WCED) in Brundtland Report brings that in order to reach sustainable development, people have to be able to “meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). Linked to this idea, the concept of triple bottom line (TBL) attributed to Elkington (1997) highlights the complex and intrinsic interrelationship between economic, environmental and social issues. So, there are interesting definitions related to sustainability such as that “a sustainable corporation is one that creates profit for its shareholders while protecting the environment and improving lives of those with whom it interacts” (SAVITZ; WEBER, 2006). Considering these definitions, the use of expressions related to sustainability (such as sustainable development, corporate sustainability and others) in this paper relate to corporate issues, which considers not only economic, but also environmental and social drivers. The cross-impact between the sustainability pillars – economic, environmental and social – is an interesting, yet challenging task (ELKINGTON, 1997). Since objectives of each pillar may not be completely align, complex tradeoffs between them may appear. Companies that are able to identify and explore positive cross impacts have an opportunity to explore, what (SAVITZ; WEBER, 2006) denominated as the “sweet spots”.

The interaction between economic and environmental issues has several matters related, as eco-efficiency (ELKINGTON, 1997). In the corporate context, it implies that products and services are to be delivered, using less resources and generating less waste and pollution (WBCSD, 2000). A possible conflict for firms is that, in order to be more eco-efficient, financial and human resources have to be invested. There are also firms which recognize this additional effort, implementing, for example, ISO14000 environmental certification, as pointed out by (GONZALEZ-BENITO; GONZALEZ-BENITO, 2005). Furthermore, there are also academic evidence for positive correlation between environmental initiatives and corporate financial performance, as presented by (DOWELL; HART; YEUNG, 2000; RAO; HOLT, 2005). The sweet spot explored by GE case is the fulfillment of growing market demands on cleaner technologies, such as wind power, gas turbines, hybrid locomotive engines and efficient jet engines (GONZALEZ-BENITO; GONZALEZ-BENITO, 2005).

The cross-impact between economic and social pillars is well explored by the literature on Corporate Social Responsibility (CSR), which is discussed for example in Carroll and

Shabana (2010) and Garringa and Mele (2004). Social issues in corporate context are treated under two aspects: intern (focus on employees and their families) and extern (local community) (MELONETO; FROES, 1999). Although there is still not completely consensus (MCWILLIAMS; SIEGEL, 2000), the literature presents some evidence regarding the positive correlation between social initiatives and economic corporate performance (CALLAN; THOMAS, 2009; VITEZIĆ, 2011; WADDOCK; GRAVES, 1997). An example of sweet spot is the PepsiCo's case, in which the firm identified potential for market share increase, investing in products more concerned with public health, such as Quaker Oats, Tropicana (healthier juice product line) and others (SAVITZ; WEBER, 2006).

There is a close interaction between environmental and social issues of sustainability, since changes in natural resources impact the ability to meet the demands of people's needs (BURGER; MAYER, 2003). The challenge for companies is therefore offer solutions to consumer needs that are compatible to the repayment capacity of resources, ensuring the survival of the business itself. Furthermore, a study conducted by Orlitzky et al. (2003) empirically verified a positive correlation between the financial performance of a company and its performance on social and environmental aspects. As consequence of their findings, although slightly controversial, the authors argue the reduced importance of government influence in new regulations aimed at the social and environmental pillar, since the positive financial result itself would be enough to interested firms in having such concerns followed.

2.2. Measuring corporate performance

The literature on performance measurement system (PMS) - independent of sustainability literature - has been discussed since the 1990's (NEELY, 2005). PMS is composed by discussions on three levels: the individual indicators (or metrics), the set of indicators and the relationship between the set of indicators and the context in which it is inserted (NEELY; GREGORY; PLATTS, 1995). Some interesting aspects of PMS literature can be highlighted.

- Characteristics expected from good indicators are: non-ambiguous (the causal relationship between indicators and their consequences), comprehensive (the indicator covers a reasonable amount of possible values), direct (represents a particular result directly), operational (information on the indicator can be properly obtained or estimated) and intelligible (the indicator can be easily understood and communicated) (KEENEY; GREGORY, 2005).

- PMS can influence corporate results, since it impacts directly managers' actions and decisions (HAUSER; KATZ, 1998).

- PMS is more than a list of performance indicators, demanding also the understanding of cross-impact between indicators themselves as well as the consolidations of the needed

infrastructure to acquire, collate, sort, analyze, interpret and disseminate data (BITITCI et al., 2000; NEELY, 1998).

- Strictly financial indicators are not enough to evaluate a firm's performance and have to be balanced (KAPLAN; NORTON, 1992), demanding a multidimensional framework that considers intern and extern aspects (AZZONE; MASELLA; BERTELE, 1991; KEEGAN; EILER; JONES, 1989), leading (determinants) and lagging (results) indicators [26] and stakeholders needs (NEELY; ADAMS; CROWE, 2001)
- PMS have to be linked to corporate vision, strategy (KAPLAN; NORTON, 1992; LYNCH; CROSS, 1991; NEELY; ADAMS; CROWE, 2001), capabilities and business processes (NEELY; ADAMS; CROWE, 2001).
- PMS have to be dynamic, enabling that the most important aspects or decision-making are been monitored (KENNERLEY; NEELY, 2002; LYNCH; CROSS, 1991).

2.3. Measuring corporate sustainability performance

The aspects mentioned in Section 2.2. regarding performance measurement can be adapted and applied to the discussion on sustainability indicators. Given the triple bottom line framework (ELKINGTON, 1997), the present paper considers as sustainability indicators the measurement of a firm's performance regarding its financial, environmental and social perspective. Several initiatives engage themselves to support companies with sustainability indicators (LABUSCHAGNE; BRENT; VAN ERCK, 2005), the most expressive of which is the GRI –Global Reporting Initiative (PARRIS; KATES, 2003). It consists on an international non-governmental organization engaged in promoting economic, environmental and social sustainability under the vision that “a sustainable global economy (is) where organizations manage their economic, environmental, social and governance performance and impacts responsibly and report transparently”, through which it has the mission to “make sustainability reporting standard practice by providing guidance and support to organizations”. So the Initiative has been studying an set of indicators to be used as basis for firm sustainability report. Table 1 brings an overview of indicators contemplated in models and frameworks for sustainability indicators, considering international entities, GRI (Global Reporting Initiative), ISO14000 (environmental certification), and ISO26000 (social certification), as well as Brazilian entities, Ethos Institute for social corporate responsibility and Balanço Social proposed by Ibase (Instituto Brasileiro de Análises Sociais e Econômicas). Since the models have their own application context and objective, the set of indicators differ from each other.

Table 1 – Sustainability indicators

		GRI	ISO14000	ISO26000	Ethos	Balanco social
Environmental indicators	Investment in environmental projects					
	Material consumption					
	Emissions and waste					
	Water consumption					
	Reduction of environmental impact of the product					
	Impacts of the operation on the local environment					
	Energy consumption					
	Reduction of environmental impact of the operation					
	Initiatives to reduce energy consumption					
	Investment in nuclear energy					
	Environmental compliance					
	Environmental education and awareness					
	Commitment to improving environmental quality					
	Product features					
Economic indicators	Net revenue					
	Significant financial assistance received from government					
	Coverage of the pension plan					
	Comparison of the lowest wage with the local minimum wage					
	Local hiring					
	Gross Payroll					
	Significant indirect economic impacts					
	Encouraging local suppliers					
	Infrastructure/services for public benefit (donation or pro bono)					
	Operational profit					
	Financial risks and opportunities due to climate change					
	Total added value to distribute to shareholders					

Table 1 – Sustainability indicators (cont.)

		GRI	ISO14000	ISO26000	Ethos	Balanco social
Social indicators (external)	Operational impact on the local community					
	Ethic					
	Participation in public policy and political parties					
	Customer satisfaction / Impact on consumers					
	Human rights					
	Suppliers					
	Product					
	Child / forced labor					
	Lawsuits for unfair competition, anti-trust and monopoly practices					
	Support children's future					
	Service to the community					
	Product features					
	Communication					
	Competition					
	Financing of social action					
	Impacts of the operation on local comunidade					
	information					
	Freedom of association and collective bargaining					
	Fines and non-monetary sanctions due to laws and regulations					
	Non-discrimination					
	Volunteer program					
	Relationship with union					
Social indicators (internal)	Health and safety					
	Benefits					
	Equality between employees (gender, race, etc.)					
	Training					
	Welfare of employees					
	Populational characteristics of employees					
	Corporate governance					
	Collective bargaining					
	Career plan					
	Turnover					
	Accidents at work					
	Anticorruption					
	Citizenship					
	Internal communication					
	Organizacional culture					
	Work practices					
	Outsourcing					

In the context discussed so far, there are several gaps still to be explored regarding sustainability indicators for corporate context. The section to be next presented describes the method used to investigate paper publications that considered performance indicators and sustainable development.

3. RESEARCH METHOD

In order to obtain an overview of the literature on the intersection of topics related to corporate sustainability and performance measurement system, the database ISI Web of Knowledge (Web of Science) was consulted, considering publications until May 2012. This base was chosen because of its comprehensiveness, as well as compatibility with Sitkis, a tool to support the bibliometric analysis. The following filters were used: (i) Topic: sustainability or "sustainable development" or "triple bottom line"; (ii) Topic: indicator* OR measure* OR metric* OR Index*; (iii) Topic: performance; (iv) Topic: corporat* or firm or organization or company or industry or business; (v) Web of Science Category = (BUSINESS OR MANAGEMENT); (iv) Document type = (ARTICLE OR REVIEW). Indicators can have as analysis unit an individual, a company, an industrial sector (SEARCY, 2012) or even a country or a set of them. Thus, the filter (iv) was required in order to limit the sample into research focused on a particular company or group of companies. Furthermore, the criterion (v) restricts the approach of the articles to be more focused on aspects of management and decision making.

After reading the titles and abstracts of articles from the initial sample, a list of 67 articles was obtained, considered more appropriate for the research objective. The initial analysis counts with descriptive statistics, so that a quantitative and objective overview of the article sample to be discussed. Then, using the software Sitkis (SCHILDT, 2002), networks of relationship between sample articles and references used as well as between keywords were built, showing clusters of topics covered by the articles in the sample. The analysis of the keywords is useful to demonstrate concepts associated with sustainability, giving greater consistency to the conceptual discussion of sustainable development and performance indicators. At last, the main results gathered in the research is discussed, enabling the identification of the main highlights as well as possible gaps in the literature.

4. RESULTS

4.1. Statistic analysis

As shown in the research method, the initial data analysis is conducted with a descriptive statistics of the collected articles sample. As illustrated in Fig. 1, the publications on

corporate sustainability and performance indicators are recent, with evident acceleration in the last five years. Considering the journals with greater number of publications, there is an intense participation of the Journal of Business Ethics (with JCR impact factor 1.125) and the Business Strategy and the Environment (without impact factor JCR), as shown in Fig. 2.

Figure 1 - Annual evolution of publications.

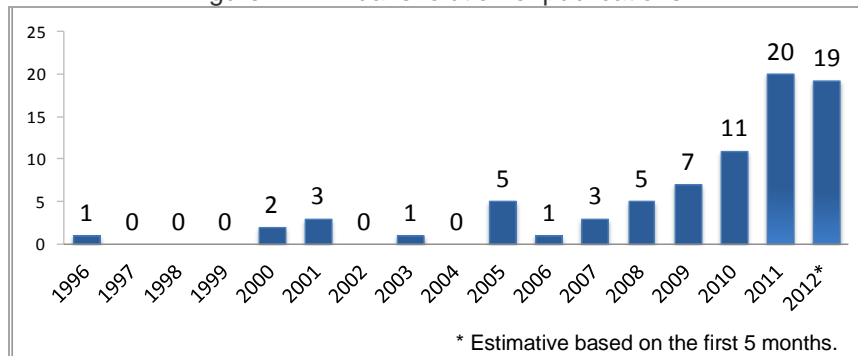
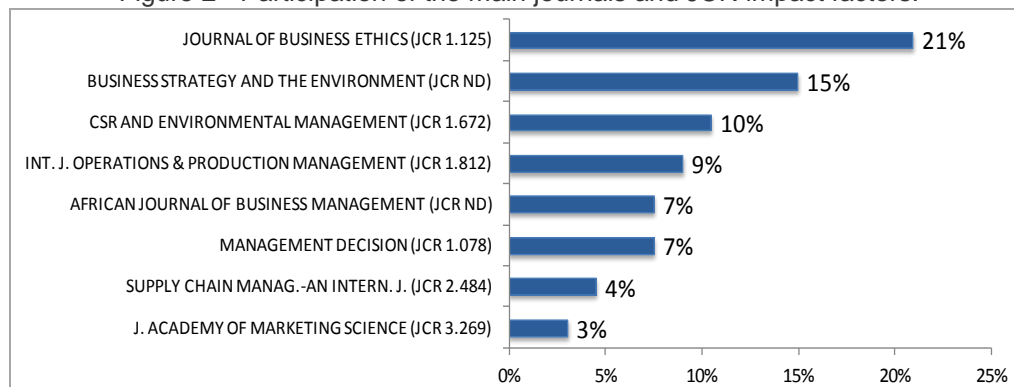
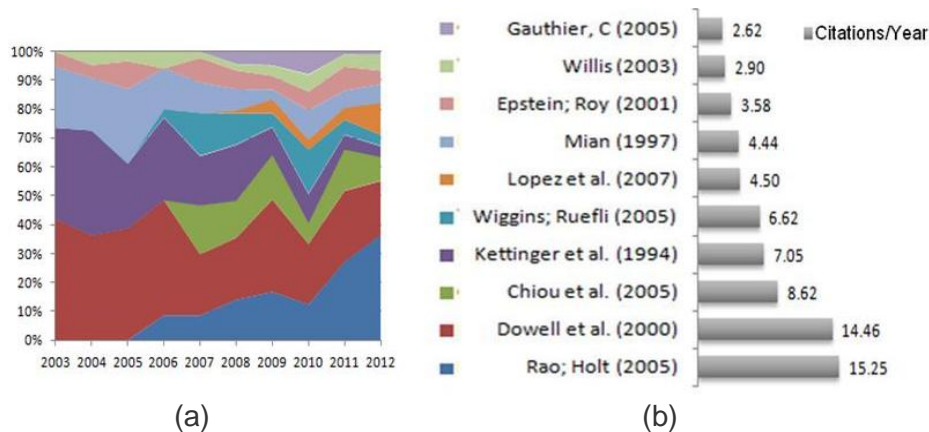


Figure 2 - Participation of the main journals and JCR impact factors.



Analyzing the number of citations, it is possible to identify the most relevant articles in the sample studied. Fig. 03 shows data on the ten most cited articles. In Fig. 03 (a) there is a rapid acceleration in the number of citations soon after publication of these major items. Furthermore, Fig. 03 (b) shows that the articles that appear to be of great influence are Dowell et al. (2000) and Rao and Holt (2005), with about 15 citations annually. Both studies verify the impact of green initiatives in supply chain competitiveness of companies located in the United States and Southeast Asia, respectively. In both cases, the statistical correlation was found positive, justifying the financial return on environmental investments.

Figure 3 - Most cited articles.



4.2. Network analysis

Using the tool SITKIS (SCHILDT, 2002) to organize the output data from the ISI Web of Knowledge (Web of Science) database, the software UCINET to create relationships and NetDraw to draw relationship diagrams (BORGATTI; EVERENTT; FREEMAN, 2002), two networks were built to assist in the analysis of the articles collected. The first network relates the articles of the sample to the references used at least once throughout the text (see Fig.4), showing the connection between the elements in the sample. In order to improve the interpretation of the diagram, relationships between articles and references that connected a single article to one or more references were excluded from the network. This action emphasizes the inter-relationship between articles and references which are more interesting, highlighting the references more relevant, used by more than one article in the sample. As result, the network obtained is shown in Fig. 4. Given the low intensity of connections, it can be said that the initial basis for the construction of studies on performance indicators is not yet fully consolidated (see Fig. 4). The references cited more than once in the sample and, therefore may have more relevance in the literature, are (HOKKANEN; LAHDELMA; SALMINEN, 2000; KOHLER, 1999; MCWILLIAMS; SIEGEL, 2000; VANDIEREN, 1995; VELEVA; ELLENBECKER, 2001). The main focus of each study is shown next.

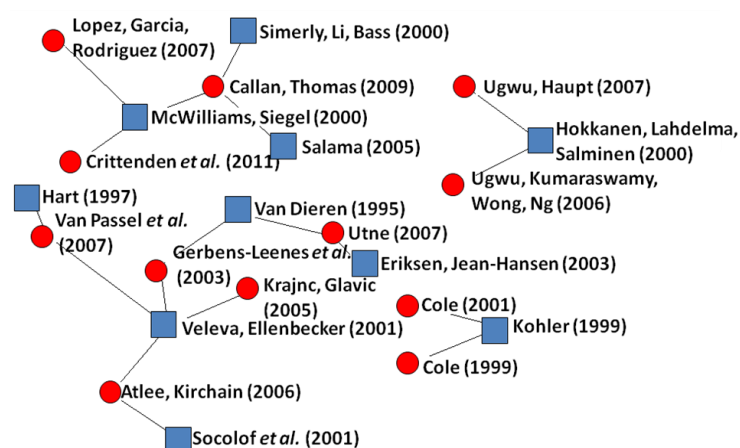
- Based on several publications, the authors present a set of core and supplemental sustainable production indicators (SPI's) (VELEVA; ELLENBECKER, 2001);
- Criticizing studies on correlation between social initiatives inserted in context of CSR and financial performance, the paper verify the relevance of the variable which is proxy for Research & Development as key to such analysis. As result, the authors find no statistical correlation between social and financial performance in firms (MCWILLIAMS; SIEGEL, 2000);

- Focusing on the environmental pillar, the book emphasizes the importance of introducing an environmental issues in the financial corporate report, considered by the author fundamental for political decisions and public opinion (VANDIEREN, 1995);
- In Kohler (1999), the concept of green building is understood as more than an environmental concern, demanding also an economic and social point of view for decisions to be made.
- With a more specific, yet complex, problematic, Hokkanen et al. (2000) applied a multi-criteria method to support the choice of a firm to provide the service of soil cleaning for residential area construction. The method enables a consensus to be reached, even if preferences are not completely clear for decision-makers.

Thus, as presented, while Hokkanen et al. (2000) have its central focus a specific issue which relates to the environment (soil cleaning to be used by the community), the other references (KOHLER, 1999; MCWILLIAMS; SIEGEL, 2000; VANDIEREN, 1995; VELEVA; ELLENBECKER, 2001) have a more conceptual characteristic, seeking to better understand sustainable development in the context of organizations.

Although the criteria to select the articles in the sample includes the discussion of performance indicators, Fig. 4 presents no systematic use of references which are linked to PMS literature. There is a relevant potential of using these references as part of conceptual basis for further literature on sustainability indicators, since PMS knowledge area is a consolidated one, with frameworks well explored and validated (NEELY, 2005).

Figure 4 - Network of articles of the sample and their references.

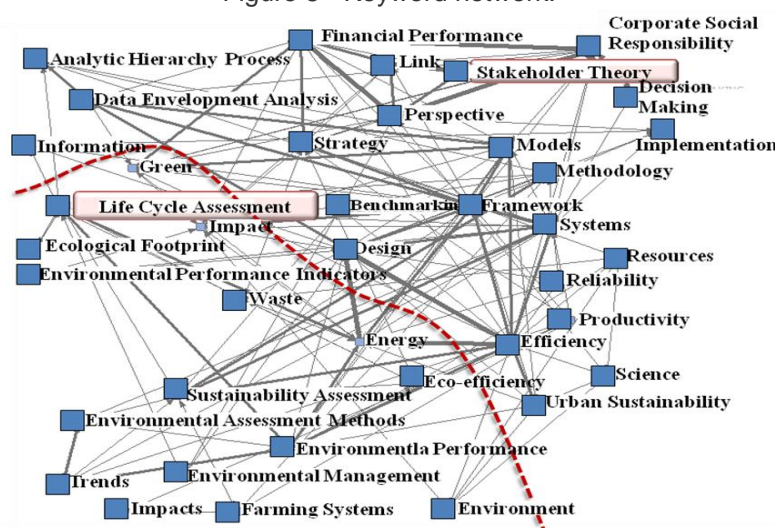


The second network shows the connections between the keyword (see Fig. 5). It brings not only the main concepts which support the discussion on sustainable development, but also intensity of the relationship between them (line strengths). The expression “efficiency” is well

connected with the others, such as with “design”, “energy”, “environmental performance” and “framework” (see Fig. 5). The network highlights also the presence of papers related to “strategy”, which is being used in connection with “financial performance”, but also to “eco-efficiency” e “framework”. This is an evidence that the discussion on sustainability can also be connected to corporate strategy, justifying financial investments and human resources to improve the sustainability indicators.

Some expressions identified in Fig. 5 are more complex to understand. So following an overall discussion on the main aspects regarding “corporate social responsibility”, “stakeholder theory” and “life-cycle assessment” will be presented. The first is the concept of corporate social responsibility (CSR). This concept is related to the discussion of sustainable development (GARRIGA; MELÉ, 2004). CSR can be defined as "actions that appear to further some social good, beyond the interests of the firm and that is required by law" (MCWILLIAMS; SIEGEL; WRIGHT, 2006). The concept is interesting to provide the idea of CSR to trespass the minimum demanded from the firm, including (yet not being sufficient) the corporate interests. By norm ISO26000, CSR is defined as the "responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behavior that: contribute to sustainable development, promote health and welfare for society, takes into account the expectations of stakeholders, complies with applicable law, is consistent with international norms of behavior and is integrated throughout the organization and practiced in its relationships.". Interestingly, the perspective of CSR ISO26000, in contrast to the definition of McWilliam et al. (2006), refers not only to the social pillar of sustainability, but also to the environmental pillar. Porter and Kramer (2006) argue that social initiatives should not be considered as an expense for the company, but as an opportunity for innovation and thus for competitive advantage.

Figure 5 - Keyword network.



Another concept present in Fig. 5 is the “stakeholders theory”, which deals with stakeholders such as customers, employees, suppliers, local community and government (HILLMAN; KEIM, 2001). Effective management is able to build intangible and socially complex resources that contribute to the company's ability to overcome its competitors and to the creation of long-term value [50]. In this context, the literature discusses the influence of stakeholders in decision-making related to sustainable development (EPSTEIN; WIDENER, 2011; SPRENGEL; BUSCH, 2011) and to CSR (PELOZA; SHANG, 2011; ROBERTS, 1992). Despite the link between sustainability and stakeholder management, a study with 184 Spanish companies finds evidence of little impact of stakeholders as motivation to the decision on implementing ISO14000 (GONZALEZ-BENITO; GONZALEZ-BENITO, 2005). The authors identify that the key motivators for environmental initiatives are ethical drivers (decision makers' desire for environmental performance improvement) and competitive drivers (including operational drivers, such as cost reduction and productivity improvement, and business drivers, associated with the company's image). Thus, it appears that the literature on the role of stakeholders in the discussion of sustainability is still not in totally consensus.

As highlighted in the lower left corner of Fig. 5, there are some keywords that are more focused on the environmental pillar of sustainability, such as "eco-efficiency", "environmental management" and "life-cycle assessment" (LCA). LCA is a tool, among others such as risk analysis, environmental performance evaluation and environmental auditing, that help companies understand and deal with environmental aspects and potential environmental impacts, which analyzes the environmental impacts throughout the product lifecycle (ISO14040, 2008). It means that the analysis contemplates several processes: raw materials acquisition, production, use, recycling and final disposal, ie, from cradle to grave (ISO14040, 2008). Applying this logic to management level, there is also the concept of "life-cycle management" (LCM). Thus, the LCM is intended to make the management of products and services towards more sustainable consumption and production (UNEP, 2006). In addition, the LCM is related to the systematic integration of sustainability into organizational processes of strategy, planning, product design and development, purchasing decisions and communication programs.

5. CONCLUSIONS AND LIMITATIONS

As presented in section 1, the paper positioned itself to answer the following research question: “based on the papers already published and potential studies still to come, how can the academic literature support corporate sustainable development?” As result of the systematic analysis of the literature about sustainability indicators, the paper presents initially

evidence of potential future publication in the area, since it has been only recently explored (see Fig. 1), as well as does not present solid set of references over which the literature is building itself upon (see Fig. 4). It is also interesting to notice that the literature on sustainability indicators have been using other concepts, for which academic literature is less recent, such as stakeholder theory and corporate social responsibility. Practitioners may be more familiar with these terms, which have been explored by academy since mid 1980's (Donaldson and Preston (1995) for stakeholder theory and Carroll (1994) for CSR) in comparison with sustainability indicators, which have been studied more systematically in the last 5 years (Fig. 1). The way stakeholder theory (EPSTEIN; WIDENER, 2011; GONZÁLEZ; SARKIS; ADENSO-DÍAZ, 2008; SPRENGEL; BUSCH, 2011) and CSR (CALLAN; THOMAS, 2009; PORTER, 2008) are being used as basis for sustainability indicators has already begun to be understood, but still presets potential to be leverage.

In the sustainability indicators discussion, life-cycle analysis (LCA) is also of relevance and has been explored by environmental series ISO14000. It is a consolidated tool to support environmental management in an operational level of processes. At the same time, in the strategic level, the literature on performance measurement system (PMS) has also been already well explored (CRITTENDEN et al., 2011; HOLLIDAY, 2001). Yet the link between operational and strategic levels considering sustainability indicators is still not very clear. In this direction, further research gathering PMS frameworks, such as BSC Balanced Score Card (KAPLAN; NORTON, 1992), Lynch and Cross' pyramid (LYNCH; CROSS, 1991) and prism model (NEELY; ADAMS; CROWE, 2001), with the challenges proposed for companies to be more sustainable can be of great contribution. For example, the literature presents already a proposition for a Sustainable Balanced Score Card in (HUBBARD, 2009).

The research limitations are not to be ignored, since the discussion was conducted based on a sample of the literature on sustainability indicators, as well as limited to ISI Web of Knowledge (Web of Science) data base. Studies with a wider range of database can come as complement to the present research. Moreover, it is also to be noted that further literature on sustainability indicators enables firms to reach a more complex picture of themselves, considering also environmental and social perspective in addition to financial performance. So, academics can contribute to corporate manager with tools, concepts and practical frameworks, so that the firms are able to go beyond an empty green marketing image, building gradually more sustainable business processes.

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