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Full Length Research Paper

Sustainability as a topic in business and management research: A bibliometric analysis

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Sustainability has been the subject of an intense debate in the academic literature. The concern on sustainability is associated with the way managers run companies, as well as the behavior of worldwide societies towards sustainable practices or actions. It involves an actual relationship among government, markets, corporations and sustainability, in which government exerts a major role, by the regulations and provisions of environmental standards. This study aims to identify the current academic literature on sustainability, as a topic in management and business research, using bibliometric analysis, in order to gather insight into such a body of knowledge, as well as to investigate which topics are associated with this subject and considered as the most relevant ones. Data analysis involved both qualitative and quantitative approaches. In terms of qualitative research, subjects were dealt with aspects regarding their content, keywords and subject relevance. Concerning quantitative data, the following variables were adopted: total number of publications, authors, subject areas, document sources, titles, publishing years, institutions, languages and countries. The methodology in this paper involves extracting data from the ISI web of science, description of predominant journals and their impact factor are also mentioned, by checking those at Journal Citation Report (JCR). It is possible to verify the most prolific authors and their impact, as well as the frequency the researched articles have been cited. Finally, deriving from such analyses, conclusions and research opportunities for further studies are displayed.

Key words: Sustainability, management, business, bibliometric analysis.

INTRODUCTION

According to the Brundtland Report, sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainability reporting examines the sustainability performance or the social, economic and environmental impacts made by a country, a city, a community or an organization. Sustainability reporting allows the reporting unit to measure discloses and be accountable for its performance towards the goal of sustainable development.

Sustainability has been the subject of an intense debate in the academic literature. The concern on sustainability reflects the way managers run the companies, as well as the behavior of worldwide societies towards sustainable practices or actions. Wilkinson and Hill (2007) claim there is an actual relationship among government, markets, corporations and sustainability, in which government exerts a major role in sustainability, by regulations and provisions of environmental standards.

Most of the articles related to sustainability, whose references are available in ISI web of science, somehow deal with such kind of argument establishing a strong relationship among governments, markets, corporations

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and sustainable practices. That is related to the fact most articles about sustainability are centered in debating how society, government, markets dynamics and corporations face and deal new paradigms regarding sustainability.

This research work aims to identify as a problem of investigation the actual directions on the approach of sustainability as a topic of management, whether there is a predominance of sustainability as a practice of management or as a stimulus for product development or even an orientation for corporate social responsibility (CSR) programs. Sustainability is a new field of studies, in which there is academic production of different subjects that renders on a multidisciplinary area of approach.

This paper will present an overview of the stage of development of sustainability in an international basis as a research topic and is organized as follows: an overview of the debate on sustainability; considerations of method and data used for this research; explanation of the search terms selected for retrieving data and tools for analytical purposes; analysis of the results and; conclusion suggestion of viable avenues for further research.

THEORETICAL REVIEW

Wilkinson and Hill (2007) articulate a discussion on sustainability describing how such complex relationship is predominant in most sustainable actions and corporate plan. Once these authors elaborate a deep reflection on this subject, their article will be referred here as the starting point for an analysis on how literature articulate research on sustainability as a framework. They quote the definition proposed by the World Commission on Environment and Development (WCED) (WCED, 1987) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” In the sequence of their discussion, there is a remark on the concept of sustainability stating that its importance is mainly associated with maintenance, renewal or restoration of something specific, that is they emphasize the necessity of thinking on the ethical dimension between current economic pressures and the future needs of the environment. The authors also reinforce the role governments can play by providing ruling preservation of quality of life, in the economic context sustainable actions may be seen as an increase in costs and risking to organizational competitiveness in general.

In relation to environmental practices, countries differ in the way they have proceeded in order to achieve leadership in environmental technology. This happened due to government specific policies and relationship with industry. In that sense, Wilkinson and Hill (2007) declare governments cannot solve the world’s natural problems alone, if the economic environment is unsupportive. The authors quoted the study of Dunphy and Griffiths (1998) and said “there is a growing perception that a dominant market model is failing from an environmental perspective, due to the successful creation of short term profit advantages for organizations may contribute to long term problems in wider system”. They also emphasize that despite companies have made efforts to compete in environmentally sensitive markets by promoting “green products”, there are other reasons that generate a crisis, such as, population augmentation, overuse of non-renewable resources, growing exotoxins, disparities in income in societies.

Besides all the problems mentioned before, governments have diminished control over private companies, particularly multinational ones, with operations all over the planet. This explained the way governments have acted in the perspective of global economies, which causes effects for both humanity and the environment. Apart from governments’ initiatives towards sustainability, there are also challenges for business, which cannot be neglected. First, the commercial pressures for increasing environmental practices, such as, customers referring to the proper use of non-renewable resources and being more conscious of the need of protecting the environment accusing specially industries for disrupting environmental scene. In the second place, there are internal organization pressures related to the sustainability of human resources in an environment or stimulating staff turnover, decreasing firm loyalty, increasing work hours and stress levels and decreasing of satisfaction levels.

Wilkinson and Hill (2007) think these two challenges can help both human and ecological sustainability, as well as for a company that can promote long-term business success and ecological survival. However, it is implied to be aware of changes in structures, operations and values they promote, as well as a clear focus on long-term actions. Having such sensible reflection on how governments, corporations and societies are integrated with efforts to understand and adopt sustainable attitudes.

In such a scenario, organizations establish their parameters to design and develop products to the market which are impacted less to the environment, besides marketing management in order to influence consumer his awareness towards nature. So operation management is expected to adopt a different perspective of the usual concern on parameters of costs, since there is a concern on associate resource efficiency to environmentally sustainable procedures.

Referring to a comparative approach to sustainability, strategy and competitive advantage, Rindova and Kotha, 2001) state that in very competitive environments, the established paradigms of sustainability of competitive

(advantage and stability of organizational form are limited in terms or applicability. These authors elaborate an in-debt case analysis of the firms Yahoo! and Excite. Their study describes how the organization forms, function, and have a competitive advantage in the context of sustainable actions. The authors propose the concept of "continuous morphing" to describe the comprehensive transformations through which the focal firms sought to have a competitive advantage on the Internet.

Still on competitive advantage, the authors Peteraf and Bergen (2003) defend heterogeneity among rivals, which means that each company faces a single competitive set. This implies that the utility of firm-level approach to competitor identification and analysis, especially under certain dynamic environmental conditions.

In a recent article from ISI web of science, one of the few published in Portuguese, the authors Brito and Berardi (2010) argues that issues related to the themes of social responsibility and sustainability have become recurrent and are considered as challenges by several research lines and sorts of business.

The study presents and verifies the implications of the relationship with stakeholders in supplying chain management. In terms of methodology, the authors decided to carry out a meta-study empirical articles published on linkages among companies, sustainability and competitive advantage. They intend to investigate whether the social environmental strategies applied to the supply chain render for stakeholder management and development of dynamic capabilities. Their study also aimed at verifying whether the environmental strategies actually represent a source of competition for the analyzed companies.

In a similar approach, Borland (2009) displays a concept of global "strategic sustainability", represented by a conceptual framework, the "spheres of strategic sustainability". The author examines ways, possible solutions and a vision for corporate strategic sustainability in the macro context of the environment and the world.

In another article, the authors Cruz and Boehe (2008) defend the proposal of identifying some emergent issues when sustainability is introduced into global value chains. Such issues deal with the conditions under which a sustainable global value chain might gather international competitiveness.

An inner analysis comprehending US non-financial firms, carried out in the years 1999 to 2002, Lo and Sheu (2007) describe in their article the results of their research and find a strong interaction effect between corporate sustainability and sales growth in firm value. Moreover, there is proof to sustain that being sustainable causes a firm to elevate its value. This indicates that companies with remarkable sustainable development strategies are more likely to be rewarded by investors with a higher valuation in the financial markets.

Concerning the relationships among sustainability, innovation and technological development, Lombardi and Basden (1997) suggested an application of technology and environmental planning that share important characteristics like concern with planning, evaluating, and directing human activity in a wider context, and such activity is multiaspectual, multimodal, and multi-disciplinary in scope.

In other academic research, Olin and Shani (2003) state new technologies are having a widespread impact on new product development projects. In the tele-communication industry, companies are forced to integrate old and new ways of working with the use of unknown technologies. There is a current need to create sustainable work systems.

Relating sustainability and technology management, Paramanathan et al. (2004) relate issues in the implementation of industrial sustainability and the contribution that technology management research has to offer. The idea of sustainability is attracting more attention from different sectors. Industrial sustainability now seems to move up the management agenda in many organizations. The discussion proposed by the authors outlines the contribution that technology management research can make towards the effective implementation of industrial sustainability.

In a recent article, Melville (2010) develops a discussion on information systems innovation for environmental sustainability that demonstrates the critical role that information system can exert in beliefs about the environment, in creating possibilities to sustainable processes and practices in organizations, and in improving environmental e economic performance.

Regarding sustainability and changes in organizations, Shrivastava (1995) declares that ecological problems for organizing activities have risen significantly, despite societies tend not to understand the actual role corporations play in achieving ecological sustainability. The article presents the implications of ecologically sustainable development for corporations.

The study contains details on corporate ecological sustainability through the concepts of total quality management, ecological sustainable competitive strategies, technology transfer through technology for the nature-swaps, and reducing the impact of populations on ecosystems.

Sustainability in a wider range of relationships established among governments, corporations, stakeholders, consumers and societies is very clear in the article of Buchanan et al. (2005). The authors define sustainability as the process through which new working methods, performance goals and performance trajectories are sustained for an appropriate period to a given context. They review the recent literature on sustainability, proposing a provisional model of the processes

influencing change sustainability and other ventures for future research. Their approach suggests that sustainability depends on a variety of factors at different parameters of analysis: substantial, individual, managerial, financial, leadership, organizational, cultural, political, processual, contextual and temporal.

In another context, Pitelis (2004) discuss the nature and the role of (corporate) governance and (shareholder) value and their implications for (sustainability) economic performance. They criticize the present theories and propose a model of the determinants of value-wealth creation at the firm, national and global levels and explore current economic debates on governance and sustainable economic performance in its context. They reach the conclusion that stakeholder value derives from the concept of sustainable value, that national governance and global economic governance are essential for creating sustainable global value-wealth, as well as economic performance.

A specific approach to sustainability is proposed by Tarzijan et al. (2008) in their evaluation of the main determinants of business performance, focus on the sustainability on profits for an emerging economy such as Chile. Their analysis is based on the comparison of the results obtained with Chilean data to those in the USA.

Something towards a similar reasoning is shown by Marshall (2007) concentrates the analysis on reviewing the differences of gender in leadership, especially in the emerging field of CSR. This text investigates the way men and women act as leaders and what is specific in terms of gender.

Reinforcing sustainability as a significant topic for corporate contexts, Stasiškienė and Šliogerienė (2009) introduce their article saying corporate responsibility has become an important issue for management. The responsibility of the organization for the public environment (ecological, social and economic aspects of the environment) has become a matter of management attention referring to the whole organization and all major stakeholders.

The complex and intricate environment are discussed by Neubaum and Zahra (2006), who focus on scandals at Enron and WorldCom that have intensified debates referring to corporate governance and corporate social performance (CSP) and the state of consciousness of shareholders, managers and public policy makers. Based on the theory of stakeholder salience, the authors suggest that institutional owner's activism; moderate the institutional ownership – CSP relationship. Still regarding corporate governance, Aras and Crowther (2008) discuss how corporate governance is fundamental to the continuing operation of any corporation.

In a similar way, sustainability seems to be fundamental to the continuing operation of any corporation.

METHODS AND DATA

Based on the bibliometric principle that knowledge of the disciplines is concentrated in only a small proportion of important journals, we retrieved citation data from ISI web of science (ISI, 2012) to use to conduct the searches and retrieve publication data. All five available citation index databases were used in the search: Science citation index expanded (SCI-expanded), social sciences citation index (SSCI), Arts and humanities citation index (A and HCI), CPCI-S and CPCI-SSH.

Searching all of the five citation index databases was done in order to get a sense of all scientific disciplines and areas contributing to the research on sustainability as topic in management and business research.

On ISI web of science, using a search string to search from topic includes in the results hits in the publication title, abstract, author, keyword or keyword plus® fields (Gupta et al., 2004). Keyword plus® are words or phrases that frequently appear in the titles of a publication's reference, but do not necessarily appear in the title of the publication or in a list of author keywords.

This paper aims to identify the current state of this academic literature regarding sustainability, and thus identify and analyze its knowledge base by using bibliometric analysis.

While scientometrics is regarded as the measurement of both scientific and technical research activities, bibliometrics is its sub-category, focusing primarily on the quantitative study of scientific publications for statistical purposes. Bibliometric methods serve the purposes of description, evaluation and scientific monitoring.

This inquiry is motivated by two research questions:

1) How the articles relate the concept of sustainability to the actions carried out by the government, corporations and society as a whole?
2) What other concepts are directly connected with sustainability and how literature is likely to set the stage for future work?

Having as reference the research questions mentioned earlier, a series of procedures were carried out in order to obtain a proper sample and go further in the inquiry phases. In the search of papers related to the topic of sustainability, performed at ISI web of science, only articles were included after document types. Book reviews, editorial materials, meeting abstracts, proceedings papers, notes and reprints were put apart and the search was refined. Thus retrieving everything from 1945-2010 for SCI-EXPANDED, 1956-2010 for SSCI, 1975-2010 for A and HCI, CPCI-S and CPCI-SSH. Other restrictions were applied to the subject area. For subject areas only papers in "BUSINESS", "Business Finance" "Economics", "Management" were selected. All searches were performed on January 27th, 2012.

In the search for "sustainability" in a topic, in web of science, the time span was "all year", resulted, at first in over 35,263 hits (papers), that were restrained to 3,009 ones, by using specific filters in order to diminish the amount of papers, in order to organize their piece of information to display in the present analysis.

ANALYSIS AND RESULTS

There are 3,009 articles centered on the theme of sustainability. According to what they present on the abstracts, for most recent articles in the database and by analyzing the predominant topics listed as keywords, using the software UCINET/Netdraw, it is possible to

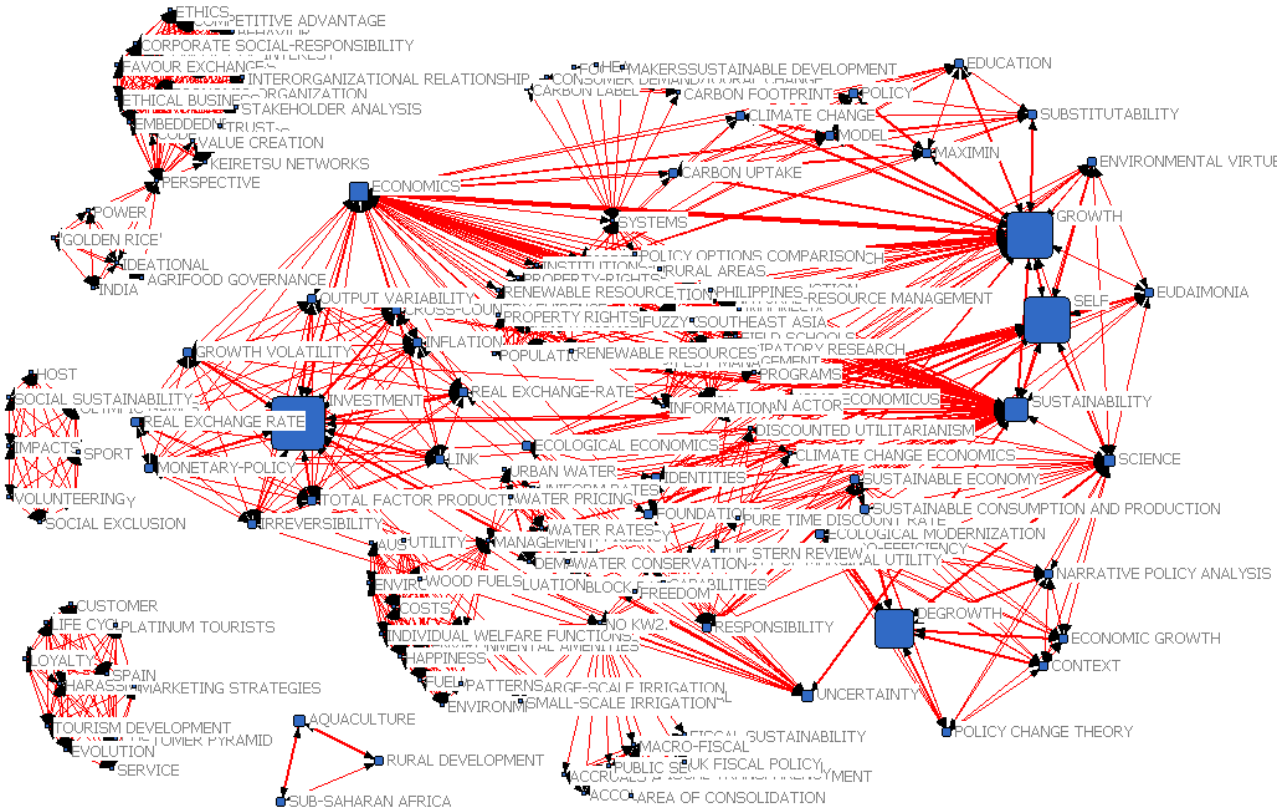

Figure 1. Network for main topics listed as keywords.

verify the hot topics, that is, the more frequent mentioned words.

As it can be noticed in Figure 1, *the topics investment, sustainability, growth, and economics* are the most frequent words chosen as key words for recent articles. This shows that much of what is produced at this time is still based on economic sustainability. However, if one checks only the abstracts of all articles with the aid of tools of textual analysis as *textstat*, it is possible to verify the hot topics, that is, the most frequent mentioned words. *Sustainability*, *management*, *development* and *corporate social responsibility* are the most frequent words chosen as keywords in the abstract of the 3,009 selected articles, what suggests that most of those publications are effectively focused on dealing with the subject of sustainability in perspectives of management approach, as well as a drive for development and stimulus to corporate social responsibility actions. Innovation is also to be considered as relevant as well as other results, despite not as stressed as the top ones, such as, energy and biofuels (including biodiesel and bioethanol as alternatives), government, technology and the proper notion of competitive advantage.

Another criteria adopted in the search for articles having *sustainability* as a topic in ISI web of science was the option for filtering publications until 2012. The results reveal a predominance of publications on *sustainability* as subject particularly in the years 2011 (456 articles, 15.2% of the 3,009) and 2010 (412 articles, 13.7% of the 3,009). For 2009 (360 articles, 12% of the 3,009) and 2008 (275 articles, with 9.1% of the total), what confirms a rising trend in conducting academic studies on sustainability, in the last five years as showed in Table 1.

Of the 3,009 articles (Table 2) 2,934 are in English, 27 in Spanish, 11 in Czech and nine in Portuguese, what can be explained by the fact that English language is the most frequent in business approach, as well as in academic production. Besides this, if we consider the number of publications by country (Table 3), USA (938 publications), England (382) and Australia (217), embed 1,537 articles (51.1% of the total) still among the major producing countries in sustainability has to Netherlands (223 articles) and Germany (189 articles). From emerging economies China (62 articles) and Brazil and Turkey (39 articles) and finally India with 29 articles.

Similarly, institutions (Table 4) with highest records in

Table 1. Publication by year.

Year	Count	% of 3.009
2011	456	15.2
2010	412	13.7
2009	360	12.0
2008	275	9.1
2007	228	7.6
2006	158	5.3
2005	129	4.3
2004	112	3.7
2003	104	3.5
2000	96	3.2
2001	94	3.1
1999	93	3.1
2002	91	3.0
1998	80	2.7
1997	73	2.4
1996	51	1.7
1995	49	1.6
1994	48	1.6
1993	23	0.8
1991	21	0.7
1992	18	0.6
1990	5	0.2
2012	5	0.2
1981	4	0.1
1987	4	0.1
1989	4	0.1
1982	3	0.1
1988	3	0.1
1977	2	0.1
1984	2	0.1
1985	2	0.1
1986	2	0.1

Table 2. Articles by language.

Language	Count	% of 3.009
English	2934	97.5
Spanish	27	0.9
Czech	11	0.4
Portuguese	9	0.3
Slovak	8	0.3
French	5	0.2
German	5	0.2
Danish	3	0.1
Unspecified	3	0.1
Russian	2	0.1

Table 3. Publications by country.

Countries/territory	Count	% of 3.009
USA	938	31.2
England	382	12.7
Netherlands	223	7.4
Australia	217	7.2
Germany	189	6.3
Canada	165	5.5
Spain	147	4.9
France	118	3.9
Italy	101	3.4
Sweden	77	2.6
Peoples Repulic of China	62	2.1
Switzerland	62	2.1
New Zealand	61	2.0
Japan	49	1.6
Norway	48	1.6
Denmark	46	1.5
Austria	45	1.5
Belgium	39	1.3
Brazil	39	1.3
Scotland	39	1.3
Turkey	39	1.3
Finland	38	1.3
Taiwan	31	1.0
Wales	31	1.0
India	29	1.0

publications are predominantly located in English language countries. World Bank counts with 44 articles and IMF (International Monetary Fund-USA) with 29 articles both corroborate the results found in the most recent articles (Figure 1) about economic sustainability, followed by Harvard University counts with 41 articles, University of California (Berkeley-USA) with 31 articles, University of Amsterdam (Netherlands) and University of Queensland (Australia) with 28 articles each, than Erasmus University and Free University of Amsterdam (Netherlands) with 26 articles each.

Table 5 refers to the main journals in sustainability research classified by the largest number of records. Their respective impact factor, for top four journals, was also obtained at ISI web of science, specifically in the Journal Citation Report (JCR), a database where one can check the impact factor. The most cited publications are ecological economics (published by Elsevier Science since 1989 and an Impact Factor 2.754), Journal of Business Ethics (published by Springer since 1982 and an impact factor 1.125), World Development (published by Elsevier and an impact factor 1.612) and futures (published by Elsevier and an Impact Factor 1.349) in that order.

Considering the authors of the 3,009 selected articles, there are some who lead in terms of number of publications. Table 6 displays information on the most prolific authors. Asheim leads with 15 records, than Greiner with 10 records, Geels, and Wagner with nine records and Costanza with eight records are the most prolific authors.

Geir Bjarne Asheim is professor of economics at the Department of Economics, University of Oslo. Their academic experience includes the following topics: Microeconomics, game theory, behavioral economics, industrial organization, information economics, theory of regulation, economics of natural and environmental resources, capital and growth theory, applied welfare economics.

Greiner is an expert in sustainability of fiscal policy and economic growth. His research interests are in dynamic macroeconomics and public finance with a special emphasis on public debt and environmental problems in the context of growing economies, including climate

Table 4. Main institutions.

Institution	Count	% of 3.009
World Bank	44	1.5
Harvard University	41	1.4
University Calif Berkeley	31	1.0
Int Monetary Fund	29	1.0
University Amsterdam	28	0.9
University Queensland	28	0.9
Erasmus University	26	0.9
Free Univ Amsterdam	26	0.9
University Wisconsin	25	0.8
University Maryland	23	0.8
Open University	21	0.7
Australian Natl University	20	0.7
University British Columbia	20	0.7
Vrije Univ Amsterdam	20	0.7
Eindhoven University Technol	19	0.6
Griffith University	19	0.6
University Oslo	19	0.6
Stanford University	18	0.6
Cardiff University	17	0.6
Massey University	17	0.6
University Cambridge	17	0.6
Ohio State University	16	0.5
Texas A M University	16	0.5
University London, London School Econ Political Science	16	0.5
University Manchester	16	0.5

change. His works are both theoretical as well as empirical. He worked as a consultant to the World Bank and was invited to author the survey article Models of economic growth for the United Nations Educational, Scientific and Cultural Organization Encyclopedia of Life Support systems. He is a professor at Bielefeld University in Germany. The research expertise for both, Asheim and Greiner, corroborate the keywords identified in the recent research field of sustainability.

Conclusions

According to the results of the research on sustainability as topic of economics, business and management, and the procedures adopted for this bibliometric analysis, it is possible to state that most articles relate the concept of sustainability as regulations proposed by governments in general, as well as other concerns from global enterprises in propelling sustainable actions by a sense of pressure exerted from society as a whole. Most of the articles deal with sustainability directly connected to economic growth, development, innovation in products and in alternative to energy and fuel consumption. However, the actual review of the literature indicates new niche research. The example shown in Figure 1 shows a relationship among rural development, aquaculture and sub-Saharan Africa. Another example is the relationship among ethics, corporate social responsibility and stakeholder analysis.

This study confirmed that sustainability approach relates to the concepts of management, development, corporate social responsibility as well as environmental aspects. The 3,009 selected articles are predominantly dealing with the subject of sustainability in perspectives of economics, business and management, particularly as a drive for economic development and stimulus to corporate social responsibility actions. The research field is still dominated by economic aspects of sustainability but new research clusters on the rise.

The bibliometric analysis also reinforced the predominance of academic production in English language, since it is the most frequent in business approach, despite the most prolific authors like Asheim

Table 5. Main journals in research.

Source titles	Count	% of 3.009
Ecological Economics	551	18.3
Journal of Business Ethics	148	4.9
World Development	103	3.4
Futures	101	3.4
Tourism Management	57	1.9
Technological Forecasting and Social Change	50	1.7
Business Strategy and the Environment	46	1.5
Corporate Social Responsibility and Environmental Management	43	1.4
African Journal of Business Management	39	1.3
Systems Research and Behavioral Science	35	1.2
Food Policy	33	1.1
Environmental Resource Economics	31	1.0
Agricultural Economics	25	0.8
International Journal of Operations Production Management	23	0.8
Land Economics	23	0,8
International Journal of Consumer Studies	22	0.7
Systemic Practice and Action Research	22	0.7
Journal of Environmental Economics And Management	21	0.7
Management Decision	21	0.7
Technology Analysis Strategic Management	21	0.7
Applied Economics	20	0.7
Applied Economics Letters	20	0.7
Economics Letters	20	0.7
Journal of Policy Modeling	18	0.6
Economic Modelling	17	0.6

Table 6. Most prolific authors.

Author	Count	% of 3.009
Asheim, G. B	15	0.5
Greiner. A	10	0.3
Geels, F. W	9	0.3
Wagner, M	9	0.3
Costanza, R	8	0.3
Kolk, A	7	0.2
O'connor, M	7	0.2
Spangenberg, J. H	7	0.2
Uctum, M	7	0.2
Van Den Bergh, J.C.J.M	7	0.2
Van Marrewijk, M	7	0.2
Bohn, H	6	0.2
Buchholz, W	6	0.2
Krausmann, F	6	0.2
Martinet, V	6	0.2
Nijkamp, P	6	0.2
Pezzey, J.C.V	6	0.2
Sarkis, J	6	0.2

Table 6. Contd.

Simon, S	6	0.2
Withagen, C	6	0.2
Atkinson, G	5	0.2
Baumgartner, S	5	0.2
Byerlee, D	5	0.2
Ciegis, R	5	0.2
Ekins, P	5	0.2

and Grainer who are not from English language countries. There are several other publications in languages such as Czech, Portuguese, Slovak, Danish and Russian but marginally.

As shown by most of the results, sustainability has increased considerably as topic of academic articles the last five years, what certainly stimulate further studies in probably sustainable innovative products. Other works can intensify the debate on the financial impact on promoting sustainable practices, as well as analysis on the balance among sustainability, development, corporations and societies.

However, sustainability has restrictions on the implementation of its practices. Apart from government decisions, there are other restrains on sustainability approach, on this field – despite its multidisciplinary character – cannot replace other non-sustainable initiatives, because the relation involving demand and supply goes beyond any perspective of sustainability, due to the *modus operandi* of societies as a whole. Parallel to all this, on the point of view of corporations, sustainability implies on a greater effort of both data collection and communication for stakeholders.

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