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Eco-innovation and organizational strategy: a bibliometric study in the last 15 years (2001-2015)

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Abstract

This study aimed to analyze the characteristics of publications dealing with the Eco-innovation and Strategy issues in the databases Web of Science and Scopus in the period 2001-2015, and identify what topics are being studied along this theme and which are the most relevant, conducting a comparison of results found in the two databases (Web of Science and Scopus). The study has a quantitative approach in order that sought to evaluate some variables related to scientific production on the subject researched. The analysis found 96 publications in the Web of Science and 109 in Scopus. Comparing both surveyed bases it is found that the number of publications increased dramatically in the last decade and that European countries lead the ranking as the number of publications. It is noticed that in both databases, the authors of the most cited publications are not among the authors who have published over in the period. The most cited articles in both surveyed bases belong to the journals: Journal of Cleaner Production and Technovation.

Keywords: Strategy; Eco-innovation; Bibliometrics; Web of Science; Scopus.

Introduction

The current organizational context elucidates its complexity, in which organizations are embedded in environments influenced by several factors, whether internal or external, that power constant changing. Given this complexity, organizations and their managers are encouraged to formulate and implement strategies, seeking to adapt quickly to the scenario and keeping up with a level of competition in marketing.

The process of design and strategy formulation requires that organizations consider the aspects of innovation for both products and the service operations. Innovation is an essential element in the strategic framework and modus operandi for organizations, which presupposes that they continually develop tangible and intangible resources to innovate either incrementally or radically, and permanently seeking their sustainability.

The literature points out that despite the potential benefits, to consider issues related to sustainability is a challenge for most organizations. Among these new theoretical and practical concepts emerges the "eco-innovation", a relatively new concept inserted in environmental management, which has been widely discussed at the global level mainly because of many the positive contributions it that can provide. Besides that, organizations, regions and even countries are increasingly becoming aware of their eco-innovation capacity due to the increase in goods production costs and waste management as well, and competitiveness in markets.

When a reference is made to the strategy scoped in eco-innovation, organizations are increasingly concerned, regardless of their focus to this concept, either crave recognition as an environmentally sustainable and responsible organization for brand protection, either by political interests or pressure of a portion of the stakeholders.

Considering all these assumptions, it becomes important to increase the knowledge regarding the theme Eco-innovation in the scope of Corporate Strategy. Facing this evident importance, this study aims to analyze the characteristics of publications about "Eco-innovation" within "Strategy" in the databases Web of Science (WoS) and Scopus. There is a set of specific objectives: identify the hot topics related to these two issues, and identify the main publications that have been considered important as references to this theme.

Eco-innovation and Organizational strategy

Organizational Strategy

The definition of a strategy provides organizations with the ability to predict or to be prepared about the problems that can arise and how these may have already been explored in advance by them or by competitors. "A strategy is the pattern or plan that integrates the major goals, policies and action sequences of the organization in a cohesive whole". (Quinn, 2006, p. 29).

In the view of Hoskisson et al. (2009), the concepts of strategy derived from the pioneering work of Alfred Chandler, published in 1962, followed by the study of Igor Ansoff, 1965. Cunha and Maçaneiro (2014) emphasize the publication of the classic book about the process of strategy by Edmund Learned, C. Ronald Christensen, Kenneth Andrews and William Guth in 1965, at the Harvard Business School, in which the

authors defined the strategy as being the standard of goals, objectives or targets and key policies and plans to achieve these goals, which are clearly defined in which branch the organization operates or wishes to act as well as what it intends to be and where it wants to reach. However, it is worth noting that since the first design strategy for today several more approaches and strategic theories have been created.

It is also important to highlight the complexity in organizational strategy, which can be defined as the number of areas of competence or skills guided by intentional strategy and the interaction between these competencies (Tamara et al., 2008; Drago, 1999; Hewitt-Dundas and Roper, 2001; Rivkin, 2000). The strategic intent can be directed in different spheres with different competences in every sphere.

Amara et al. (2008) state that because of aggressive globalization, that every day brings news of innovation, it not only improves the competitive advantage, but also creates opportunities for organizations to access new and different markets. This forces organizations to continuously keep investing in research as a way to follow such innovations, as well as to create innovations, if they intend to be ahead of their competitors. The challenge faced by organizations is, therefore, not to increase the number of innovations produced, but increase their degree of novelty. In this way, the diversity of innovation means a wider range of skills that could be related to the increase of competitiveness.

Organizations that use complex strategies tend to do business in complex turbulent environments. (Korn et al., 1996) and involved in strategies characterized by exploitation, absorption and adaptation to discover new techniques and purposes. (Melo Junior et al., 2012). The authors emphasize that organizations with complex strategies stand out better financially than those with simple strategies, and are more likely to improvise and quickly relate to the influence of any kind of turbulence as well.

Yet about the definitions of strategy, it is important to highlight the VBR approach (vision based on the company's resources) that relies on the firm's resources, or a set of them, as the main source of competitive advantage. Barney (1991) and Wernerfelt (1984) emphasize that these resources must be valuable, rare, inimitable and irreplaceable to ensure a sustainable competitive advantage.

Acedo et al. (2006) point out that a sustainable competitive advantage cannot be countered by competitors, but only by "unexpected changes in the economic structure of an industry." (Barney, 1991, p. 103). So, for this approach, the changes are exogenous to the industry, and there should be a stability of competitive advantage for companies that have acquired or developed a set of resources and barriers to imitation.

Seeking to explain the competitive advantage in contexts of rapid changes, Teece et al. (1997) introduce the concept of dynamic capabilities, defined as "the firm's ability to integrate, build and reconfigure internal and external competences to cope with environments that change rapidly" (Teece et al, 1997, p. 516). Such a definition is further borne out by Eisenhardt and Martin (2000) by arguing that the dynamic capability should not be seen as an ability to change capacity, but as specific skills that change the resources of a company in a dynamic way (Melo Junior et al., 2012).

This way, the process by which a company develops an understanding of the changes in the environment in order to be able to anticipate opportunities and threats, as well as develop strategic planning to allow decisions on key technologies to be developed by the company, can be understood as a dynamic capacity. Such concept is

particularly important for high-tech companies, for several reasons: (a) the company's ability to make timely changes in resources to take advantage of new opportunities will depend on this process. (Eisenhardt and Martin, 2000); (b) from this process, a company could decide what is necessary to change other processes in need to be adapted to a constant changing environment. (Teece et al., 1997); (c) and finally, if properly conducted, this process will allow the company to invest in a set of technologies important in the future, reducing the restriction "path dependence" that would arise if the organization had invested in not valued by the market technologies (Melo Junior et al., 2012).

The alignment of the organizational strategy has been and continues to be, a challenge for many organizations, even with large investments in innovation. In some cases, they develop products or services that never go to market, or worse, fail, while on the other hand, they do not invest in the development of products and services that are important to stay competitive in the market. This way, a correct identification of technological opportunities and threats is important for the organization to be able to reevaluate its project and portfolio of technology products (Vasconcellos et al., 2007).

Usually, companies do not take into account environmental management programs as a business strategy as a way to improve their competitiveness, as they consider environmental management as just a cost, that could do some damage on their reputation, sales and business growth. (Foxon and Andersen, 2009; Lustosa, 1999; Nidumolu et al. 2009; Palmer and Salles Filho, 1996; Young, et al., 2009). The authors highlight that there is a belief by companies that environmental management costs are high, resulting in reduced competitiveness. However, environmental management should be considered instead as a strategic value, since it is characterized by gains in reduced resources, costs, productivity and competitiveness (Cunha and Maçaneiro, 2014).

In this environment, of fierce competition and the necessity of seeking competitive strategies, arises a growing awareness of sustainable development, which gives place to high demand in activities of research and development (R&D) from organizations. The focus of this process is a search for the development of strategies able to maintain or increase their competitiveness, but also be friendly towards the environment and society (Barbieri et al., 2010).

On the other hand, there is also a increased government pressure to sustainable actions by companies, as well as awareness of them and the stakeholders in relation to the importance of preservation and rational use of natural resources. A wide range of subjects, from the mitigation of the negative impact of technologies and human actions over nature, as well as ethical and responsible role in the management of human resources and, more recently, concerns with socioenvironmental variables began to appear on the agendas of organizations (Porter and Linde, 1995; Hart, 2006). The result is the emerging of a field of research: the relationship between strategy and eco-innovation.

Eco-innovation

Organizations in general, regardless of their size, develop their activities in a competitive way to ensure their survival in the market. In the current economic context, they compete globally, no longer just in the region where they are located geographically. There is a set of alternates strategies to use for increase competitiveness

and differentiation in the face of the competition. According to Maçaneiro and Cunha (2014) in this context, one can cite the environmental management, which is replaced by strategic value, since it is characterized by gains of resource reduction, costs, increased productivity and competitiveness.

Klewitz and Hansen (2014) point out that, despite the potential benefits, dealing with issues related to sustainability is still a challenge for most organizations. Eco-innovation is still a relatively new concept, enclosed in environmental management, but nevertheless, has been widely discussed at the global level due to the benefits it could provide. Besides that, organizations, regions and even countries are increasingly aware of their eco-innovation capacity due to increased production costs of goods and waste management, and the very competitiveness of enterprises (Arundel and Kemp, 2009).

It is emphasized that eco-innovation is the innovation for sustainability, differing from innovation itself. Innovation is defined by the Oslo Manual (2005) as the implementation of a product, good or service, whether new or significantly improved, or a process, or a new marketing method, or a new organizational method in business practices in the organization of the workplace or in external relations is what is called Innovation.

Eco-innovation are defined as innovations with emphasis on sustainable development, resulting in their entire life cycle, in the reduction of environmental risks, pollution and other negative impacts of resource use, compared with the existing alternatives (Arundel and Kemp, 2009).

According to the Organization for Economic Cooperation and Development of the European Community (OECD, 2009) eco-innovation represents an innovation that results in a reduction of the environmental impact, whether this effect is intentional or not. The scope of eco-innovation can go beyond the conventional limits of businesses to innovate and involve a social regime more widely, which causes changes in the socio-cultural norms and institutional structures standards.

In the vision of Klewitz and Hansen (2014) the eco-innovation can be applied to all types of innovation: to the process, to the product and to organizational form (reorganization of structures or implementation of new management tools).

Eco-innovation in an organization could be promoted across different aspects, such as: direct reduction of production costs due to new regulations and sanctions of the sector; government incentives; pressure from society for a greater care for the environment; competitive strategy, etc, and it does not only occur in a complex way. According to the Oslo Manual (2005), a company could eco-innovate by buying cleaner production technology from a vendor and starting to implement this technology in its production line.

Arundel and Kemp (2009) emphasize that eco-innovation is not limited to environmentally motivated innovations but includes "unintended environmental innovations" such as recycling heavy materials to reduce cost. This would ultimately help to reduce the degradation of the environment. According to the authors eco-innovation helps to deal with the tradeoffs between economic growth and environmental protection.

In accordance with Klewitz and Hansen (2014) the eco-innovation can occur in both large and small companies and medium-sized enterprises (SME). According to the

authors, the SME work the eco-innovation most often reactively, due to several factors, such as lack of time and skilled workforce for the deployment of the process. However, it should be emphasized, that the eco-innovation could be a starting point, feasible for SME to commence the process of organizational sustainability (Klewitz and Hansen, 2014).

With regard to the strategies with scope in eco-innovation, organizations are increasingly aware, regardless of its focus to such, whether by craving recognition as an organization that is environmentally sustainable and responsible for brand protection, either by political interests or by pressure from a portion of interested parties.

Study Method

Type of Study

This study was developed from a bibliometric research, aiming to increase knowledge related to publications associated to Eco-innovation and Strategy themes, in the databases Web of Science and Scopus. According to Silva (2004) the bibliometrics has as aim to analyze the scientific activity or technique through the quantitative study of publications. Rostaing (1997) adds that the bibliometric study consists in the application of statistical or mathematical methods on the set of bibliographical references. For Macedo, Casa Nova, and Almeida (2007) the bibliometrics can contribute to demonstrate the stage in which an area or topic of study is in the scientific field. This way, this study has a quantitative approach in order that sought to quantify some variables related to scientific production on Eco-innovation and strategy.

Sample Definition

Data for this research were collected from the databases Web of Science (WoS) from Thomson Reuteurs and Scopus from Elsevier Research Intelligence. The Web of Science consists of a multidisciplinary basis that indexes the most cited journals in their respective fields. Currently it is composed by the bases: Science Citation Index Expanded (1945-present); Social Sciences Citation Index (1956-present); Arts & Humanities Citation Index (1975-present); Conference Proceedings Citation Index (1990-present); Conference Proceedings Citation Index - Social Science & Humanities (1990-present) and Emerging Sources Citation Index (2015-present).

The Web of Science is also a citation index provider on the web, where in addition to identifying the citations received, used references and related records, one can analyze the scientific production with calculation of bibliometric indices and the percentage of self-citations, as well as creating rankings by numerous parameters. Currently it has about 12,000 journals indexed (Capes, 2016).

References of all indexed items are extracted and the interface of the cited references show all work citations to works of an author, regardless of the above items are indexed by the Web of Science or not (Bar-Ilan, 2008).

The Scopus basis consists in a database of the areas of Biological Sciences, Health Sciences, Physical Sciences, Social Sciences and Technology. This base belongs to Elsevier, indexes academic titles reviewed by peers, open access titles, conference proceedings, trade publications, book series, scientific content of web pages (gathered in Scirus) and patent offices. It has features to support the analysis of results (bibliomet-

rics) as identification of authors and affiliations, citation analysis, analysis of publications and index H. Indexes more than 19,000 journals, about 265 million web pages, 18 million patents, and other documents (Capes, 2016).

Therefore, from the search engines of the Web of Science and Scopus, was used as a key term in the title, in the keywords and in abstract: "Eco-innovation" combined with "Strategy", delimiting the search for the period 2001-2015 (15 years), being this the cut in time defined for this bibliometric analysis.

Conceptual Model

To proceed with the bibliometric analysis, the study aimed to identify the variables set forth in Table 1, so that from the features of each of the databases were defined the characteristics to be investigated in WoS and Scopus.

Table 1 – Conceptual Model for bibliometric analysis

General characteristics of publications	WoS 2001-2015	SCOPUS 2001-2015
✓ Total publications	X	X
✓ Thematic areas	X	X
✓ Types of documents	X	X
✓ Year of publication	X	X
✓ Authors	X	X
✓ Title of the sources	X	X
✓ Institutions	X	X
✓ Countries	X	X
✓ Languages	X	X
✓ Index h-b	X	
✓ Index m	X	
✓ Authors versus quote	X	X

Source: Prepared by the Authors (2015)

In the WoS database the h-b and m indexes were analyzed to further carry out the analysis of hot topics. The h-index was proposed by Hirsch (2005) in his research called "An index to quantify an individual's scientific research output" as a way to characterize the scientific output of a researcher. Hirsch (2005) assumes that the quantification of the impact and relevance of individual scientific production are often necessary for the evaluation of researchers and comparison purposes.

Subsequently, Banks (2006) proposed the index h-b an extension of the h-index, which is obtained by the number of citations of a topic or combination in a given period, listed in descending order of citations. The h-b index is found in publications that have obtained a number of citations equal or greater to its position in the ranking. Banks (2006) also explains the calculation of the index "m", which is obtained by dividing the index "h-b" by the period of years which is desired to obtain information (n). For the analysis of the indexes h-b and m were used the definitions of Banks (2006) demonstrated in Table 2.

Table 2 – Definitions for hot topics rating

Index "m"	Topic / combination
0 < m ≤ 0,5	✓ It may be of interest to researchers in a specific field of research, which includes a small community;
0,5 < m ≤ 2	✓ Probably can become a "hot topic" as research area, in which the community is too large or the topic / combination presents very interesting features;
m ≥ 2	✓ It is considered a "hot topic", exclusive topic with scope not only in their own area of research, and is likely to have the purposes and unique features.

Source: Banks (2006)

From the definitions of Banks (2006) in this study will be considered hot topics as the combinations with index m ≥ 2.

Steps for data collection

The research was divided into five stages. Initially the words Eco-innovation and Strategy were typed as title, keyword or abstract in the search fields of the Web of Science and Scopus databases delimiting the period from 2001 to 2015.

Following, in the bases WoS and Scopus were raised the information: thematic areas, types of documents, year of publication, authors, title of the sources, institutions, countries, languages and authors versus quotes. And only in the WoS were searched the index h-b and m for subsequent definition of hot topics.

In the second step were identified topics to be combined with the topics: Eco-innovation and Strategy. From an analysis of the publications found in the first phase were listed 20 topics related to management to be combined with the terms Eco-innovation and Strategy. For the selection of topics was used as the main criterion the relationship with the search terms.

In the third step, there was the second search to system, combining each of the topics related to the terms Eco-innovation and Strategy during the period of 15 years (2001 to 2015). Then in the fourth step, the "hot topics" were identified by calculating the h-b and m indexes. In the fifth stage, it was performed a comparison between the most cited publications and authors who have published more on the same period.

Analysis and discussion of the results

The survey results show the main features of scientific production related to the combination of the terms Eco-Innovation and Strategy. First it was researched the terms in the search in Web of Science (2001 to 2015) and was found 96 publications, then it held research in the Scopus database, being found in the same period 109 publications.

Following will be presented the general characteristics of publications related to the topic according to the following categories: thematic areas, type of documents, year of publication, authors, title of the sources, institutions, countries and languages.

Thematic areas of publications

Table 3 presents the ten key thematic areas related to the theme according to the number of publications.

Table 3 – Thematic areas in the study of Eco-innovation and Strategy

Thematic areas – WoS	Nº publications	Thematic areas – Scopus	Nº publications
1. Environmental Sciences Ecology	45	Business, Management and Accounting	52
2. Business Economics	39	Environmental Science	48
3. Engineering	36	Engineering	39
4. Science Technology other topics	24	Social Sciences	25
5. Public Administration	10	Energy	23
6. Operations Research Management Science	05	Economics, Econometrics and Finance	16
7. Materials Science	04	Decision Sciences	7
8. Social Sciences other topics	03	Computer Science	6
9. Urban Studies	03	Agricultural and Biological Sciences	3
10. Transportation	02	Mathematics	3

Source: WoS and Scopus (2016)

The diversity of thematic areas related to the theme "Eco-Innovation and Strategy" extracted from the respective bases can be seen in Table 3.

Types of documents

Table 4 shows the types of documents related to the publications found in WoS and Scopus.

Types of Publications – Basis WoS			Types of Publications – Basis Scopus		
Types of Publications	Frequency	%	Types of Publications	Frequency	%
Article	66	71,94	Article	73	66,97
Proceedings Paper	27	25,59	Conference Paper	23	21,10
Review	03	4,31	Review	06	5,50
			Book Chapter	03	2,75
			Book	02	1,83
			Conference Review	01	0,92
			Article in Press	01	0,92
Total	96	100	Total	109	100

Source: WoS and Scopus (2016)

In both databases, the most found publications are articles corresponding to 71.9% of publications in the the WoS basis, and 66.9% in Scopus. This percentage shows that the issues are still processed and published by scientific texts in the academic field.

Publications per year

In the period 2001-2015 in WoS database performing the search with the Eco-Innovation and Strategy topics were found 96 publications. In the Scopus basis, the combination resulted in 109 publications. Figure 1 shows the distribution of articles published per year related to Eco-Innovation and Strategy issues in the surveyed bases.

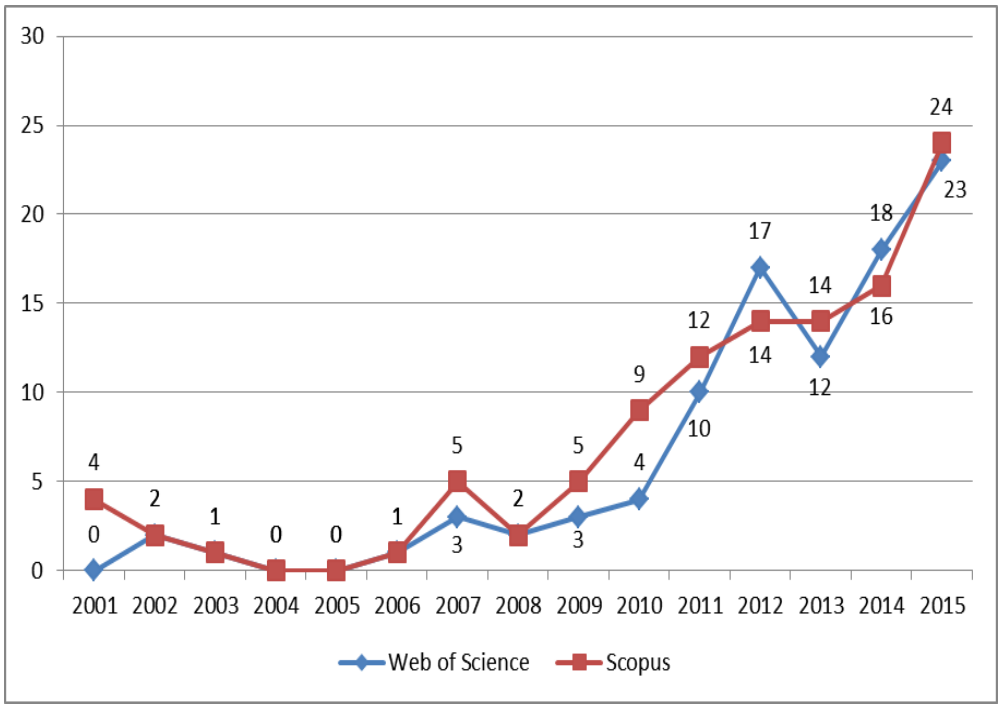

Figure 1 – Publications per year in WoS and Scopus basis
Source: WoS and Scopus (2016)

Comparing the number of publications in the period surveyed in the two bases, it is evident that the number of publications related to the subject is greater in Scopus. The results show the growth in the number of publications in the past six years in both databases. This fact highlights the emergence of the theme Eco-innovation associated with the Strategy in the field of scientific research.

Major Authors

As verified the authorship that have published more about the theme Eco-innovation associated to Strategy, disregarding the publications do not signed, were listed the five authors who have published more about the themes researched, both in WoS, as in Scopus, as shown in Table 5.

Table 5 - Number of articles published by author

Basis WOS		Basis Scopus	
Author	Published articles	Author	Published articles
1. PEIRO-SIGNES A.	7	1. MAZZANTI, M.	3
2. DE MARCHI V.	4	2. MILLET, D.	3
3. SEGARRA-ONA MD.	4	3. ALLADA, V.	2
4. MONDEJAR-JIMENEZ J.	3	4. AROZAMENA, E. R.	2
5. SEGARRA-ONA M.	3	5. BROUILLAT, E.	2/

Source: WoS and Scopus (2016)

There was a multiplicity and diversity as to the authorship of the work, since a small portion of these authors published a significant number of texts on the subjects combined. The author with a focus on publications on WoS is Angel Peiro-Signes,

researcher at the Department of Management linked to Polytechnic University of Valencia in Spain. The authors with more publications in the Scopus basis are Massimiliano Mazzanti, professor in the Department of Economics and Management at the University of Ferrara in Italy, and the professor Dominique Millet, a researcher from the University of Sud Toulon, in Var La Garde, located in France.

Titles sources

Table 6 shows the main sources of publications related the thematic Eco-Innovation and Strategy.

Table 6 – Key Sources

Basis – WOS		Basis - Scopus	
Source Title	Articles	Source Title	Articles
1. Journal of Cleaner Production	16	1. Journal of Cleaner Production	16
2. Ecological Economics	4	2. Business Strategy and the Environment	4
3. Sustainability	4	3. Ecological Economics	4
4. Business strategy and the Environment	3	4. Research Policy	3
5. Environmental Engineering and Management Journal	3	5. Sustainability Switzerland	3
6. Research Policy	3	6. Environmental Engineering and Management Journal	2
7. IFKAD KCWS 2012 7th International Forum on Knowledge Asset Dynamics 5th Knowledge Cities World Summit	2	7. International Journal of Automotive Technology And Management	2
8. Innovation Management Policy Practice	2	8. Quality Access to Success	2
9. Innovation Vision 2020 from Regional Development Sustainability to Global Economic Growth	2	9. SAE Technical Papers	2
10. Procedia Social and Behavioral Sciences	2	10. Shengtai Xuebao Acta Ecologica Sinica	2

Source: WoS and Scopus (2016)

In the survey conducted on WoS the publications found are in their majority in the following journals: Journal of Cleaner Production, Ecological Economics and Sustainability on the basis of WoS, and Journal of Cleaner Production, Business Strategy and the Environment, and Ecological Economics on the basis of Scopus. Among the journals with the highest number of publications in both basis consulted three journals are highlights featuring periodicals that are contributing to the availability of contents related to the topics studied.

Major institutions

The analytical treatment process of the data allowed the identification in the the WoS and Scopus basis the institutions that have published more works related to Eco-Innovation and Strategy themes. Table 7 shows the institutions linked to the said bases publications.

Table 7 – Major institutions

Basis – WOS		Basis - Scopus	
Instituition	Articles	Instituition	Articles
1. Universitat Politecnica de Valencia	8	1. Universidad de Castilla-La Mancha	4
2. Universidad de Castilla La Mancha	6	2. University of Ferrara	4
3. University of Padua	4	3. Consiglio Nazionale delle Ricerche	3
4. Autonomous University of Barcelona	2	4. Universita Cattolica del Sacro Cuore	3
5. Bucharest Academy of Economic Studies	2	5. Universidad de Santiago de Compostela	3
6. Catholic University of the Sacred Heart	2	6. University of Cambridge	3
7. Ceris CNR - Consiglio Nazionale delle Ricerche	2	7. Institut de Ciencia i Tecnologia Ambientals - ICTA-UAB	3
8. Consejo Superior de Investigaciones Cientificas CSIC	2	8. Universidade Federal do Rio de Janeiro	2
9. Ecoserv Consulting Ltd.	2	9. Universita degli Studi di Padova	2
10. Faculty of Economics and Business Administration	2	10. Chalmers University of Technology	2

Source: WoS and Scopus (2016)

Among the institutions that stood out for its publications in the WoS basis was the Polytechnic University of Valencia, located in Spain, already in Scopus basis were University of Castilla-La Mancha, also located in Spain and University of Ferrara, located in Italy. The institutions that indicate the origins of publications converge with the findings inherent to authors who have published more in the period analyzed.

Languages and countries

As for the language of the publications, in the research conducted in both bases the English language excels with approximately 98% of publications. Table 8 shows the main countries that have publications related to the topic researched.

Table 8 – Major countries

Basis – WoS		Basis – Scopus	
Countries	Publications	Countries	Publications
1. Spain	20	1. Spain	17
2. Italy	14	2. France	15
3. France	08	3. Italy	13
4. United Kingdom	07	4. United Kingdom	11
5. Germany	07	5. Germany	08
6. Romania	06	6. Romania	07
7. Netherlands	05	7. United States of America	06
8. United States of America	04	8. Brazil	05
9. Canada	03	9. Netherlands	05
10. Czech Republic	03	10. Sweden	05

Source: WoS and Scopus (2016)

As to the number of publications by countries, Spain leads the ranking of publications in the two databases. Other European countries - Italy, France and the United

Kingdom - also stand out as countries that have published more in both bases analyzed. It is emphasized that Brazil occupies the 8th position on the basis of Scopus with 5 publications. In the basis of WoS, Brazil does not appear in the ranking considering the first 10 placed for the subjects researched. Table 9 presents the publications with Brazilian origin in the basis of Scopus, and their respective citations.

Table 9 – Publications with Brazilian origin

Nº	Title / Author / Journal / Year	Basis	Nº citations
02	Maçaneiro, M. B., da Cunha, S. K., & Balbinot, Z. (2013). Drivers of the adoption of eco-innovations in the pulp, paper, and paper products industry in brazil. Latin American Business Review, 14(3-4), 179-208.	Scopus	3
01	Xavier, A. F., Naveiro, R. M., & Aoussat, A. (2015). The eco-innovation concepts through a strategic perspective. Paper presented at the IAMOT 2015 - 24th International Association for Management of Technology Conference: Technology, Innovation and Management for Sustainable Growth, Proceedings, 2275-2293.	Scopus	0
03	Bruno, F. S., & Valle, R. A. B. (2014). Hindrances to sustainability-oriented differentiation strategies in the brazilian textile and apparel industry. Journal of Textile and Apparel, Technology and Management, 9 (1).	Scopus	0
04	Bánkuti, S. M. S., & Bánkuti, F. I. (2014). Environmental management and business strategy: A study in a cosmetic company in brazil. Gestão e Produção, 21(1), 171-184.	Scopus	0
05	Maçaneiro, M. B., da Cunha, S. K., da Cunha, J. C., & Kuhl, M. R. (2015). The importance of contextual factors in eco-innovation strategies adoption in the brazilian chemical industry. Espacios, 36 (24).	Scopus	0

Source: WoS and Scopus (2014)

After these observations on the growth of publications, as well as the representativeness of each country, it should be pointed out that the European countries have a significant portion of studies on the search terms and by this study related. As for the Brazilian publications within the scope researched, it appears that they are in a minimum proportion compared with the others, however, the study of Maçaneiro, Cunha & Balbinot (2013), is already a reference and presents quotes from the study at the base searched.

Eco-innovation and Strategy - the “hot topics”

At this stage of the research, were investigated the publications that deal on "Eco-innovation" combined with "Strategy", and the main topics related to this theme that are being studied in the organizational context. Based on a prior analysis of publications found in the base Web of Science, 20 topics related to the theme were selected. After this selection was performed the combination of each topic presented in Table 10 with the terms Eco-innovation and strategy, being calculated the total number of publications for each combination (related topic), the h-b and the coefficient "m".

Table 10 – Hot topics in the study of the topic researched

Topics – Basis Web of Science	Total publications	Index h-b	Coefficient "m"
1. Innovation	96	13	0,867
2. Management	45	9	0,600
3. Research and Development	30	7	0,467
4. Sustainability	34	7	0,467
5. Energy	15	6	0,400
6. Business	27	6	0,400
7. Services	13	4	0,267
8. Information Science	13	4	0,267
9. Economic Development	18	4	0,267
10. Governance	7	3	0,200
11. Environmental Science	5	3	0,200
12. Planning	8	2	0,133
13. Social Science	2	2	0,133
14. Materials Science	2	2	0,133
15. Urbanism	5	2	0,133
16. Engineering	5	1	0,067
17. Entrepreneurship	2	1	0,067
18. Public Administration	1	1	0,067
19. Logistics	2	1	0,067
20. Human Resources	4	1	0,067

Source: WoS (2016)

From the calculation of the indices "h" and "m" it was possible to measure the performance of the topics/combinations surveyed based on the number of citations that they had (Kelly and Jennions, 2006). Following the Banks guidelines (2006), it was not possible to classify as "hot topcis" the combinations of themes Eco-innovation and Strategy, with the themes used, because none of the topics listed in Table 10, presented the coefficient "m" < 2.

Among the topics used for the comparison, Innovation and Management, obtained a coefficient "m" between 0.5 and 2, then they can be considered as "hot topics" emerging in their field of study. As for the topics that presented "m" ≤ 0.5 as Research and Development, Sustainability, Business and Services, etc may be of interest to researchers in a specific field of search.

The results suggest that the themes which link Eco-innovation and Strategy consist in an emerging thematic, having great challenges as regards the development of studies associated to these two themes.

List of publications with more citations

Considering the research on the topic held in the WoS and Scopus bases, ten (10) publications were selected, which obtained the highest number of citations in each basis in the period surveyed. The most cited publications in the scope of this study are presented in Tables 11:12.Considering the research on the topic held in the WoS and Scopus bases, ten (10) publications were selected, which obtained the highest number of citations in each basis in the period surveyed. The most cited publications in the scope of this study are presented in Tables 11:12.

Table 11 – Main articles in numbers of citations

Nº	Title / Author / Journal / Year	Nº Citations 2001 a 2015
01	Pujari, D. (2006). Eco-innovation and new product development: understanding the influences on market performance. Technovation, v. 26, (1), 76-85.	106
02	Jaenicke, Martin. (2008). Ecological modernisation: new perspectives. Journal of Cleaner Production. V. 16, (5), 557-565.	97
03	Van Hemel, C; Cramer, J. (2002). Barriers and stimuli for eco-design in SMEs. Journal of Cleaner Production, v. 10, (5), 439-453.	95
04	Dangelico, Rosa Maria; Pujari, Devashish. (2010). Mainstreaming Green Product Innovation: why and how companies integrate environmental sustainability. Journal of Business Ethics. v. 95, (3), 471-486.	77
05	Triguero, Angela; Moreno-Mondejar, Lourdes; Davia, Maria A. (2013). Drivers of different types of eco-innovation in European SMEs. Ecological Economics, v. 92, Special Edition, 25-33.	35
06	Klewitz, Johanna; Hansen, Erik G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. Journal of Cleaner Production, v. 65, 57-75.	30
07	Jansson, Johan. (2011). Consumer Eco-Innovation Adoption: Assessing Attitudinal Factors and Perceived Product Characteristics. Business Strategy and the Environment, v. 20, (3), 192-210.	26
08	Del Rio, Pablo; Carrillo-Hermosilla, Javier; Konnola, Totti. (2010). Policy Strategies to Promote Eco-Innovation. Journal of Industrial Ecology, v. 14, (4), 541-557.	20
09	Cheng, Colin C. J.; Yang, Chen-Lung; Sheu, Chwen. (2014). The link between eco-innovation and business performance: a Taiwanese industry context. Journal of Cleaner Production, v. 64, 81-90.	18
10	Bocken, N. M. P.; Allwood, J. M.; Willey, A. R.; et al. Development of a tool for rapidly assessing the implementation difficulty and emissions benefits of innovations. Technovation, v. 32, (1), 19-31.	18

Source: WoS (2016)

Table 12 – Main articles in numbers of citations

Nº	Title / Author / Journal / Year	Nº Citations 2001-2015
01	Van Hemel, C., & Cramer, J. (2002). Barriers and stimuli for eco-design in SMEs. Journal of Cleaner Production, 10(5), 439-453. doi:10.1016/S0959-6526(02)00013-6	151
02	Jänicke, M. (2008). Ecological modernisation: New perspectives. Journal of Cleaner Production, 16(5), 557-565. doi:10.1016/j.jclepro.2007.02.011	126
03	Triguero, A., Moreno-Mondéjar, L., & Davia, M. A. (2013). Drivers of different types of eco-innovation in european SMEs. Ecological Economics, 92, 25-33. doi:10.1016/j.ecolecon.2013.04.009	40
04	Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: A systematic review. Journal of Cleaner Production, 65, 57-75. doi:10.1016/j.jclepro.2013.07.017	37
05	Jansson, Johan. (2011). Consumer eco-innovation adoption: Assessing attitudinal factors and perceived product characteristics. Business Strategy and the Environment, 20(3), 192-210. doi:10.1002/bse.690	37
06	De Marchi, V., Di Maria, E., & Micelli, S. (2013). Environmental strategies, upgrading and competitive advantage in global value chains. Business Strategy and the Environment, 22(1), 62-72. doi:10.1002/bse.1738	31

Nº	Title / Author / Journal / Year	Nº Citations 2001-2015
07	Santolaria, M., Oliver-Sol, J., Gasol, C. M., Morales-Pinzón, T., & Rieradevall, J. (2011). Eco-design in innovation driven companies: Perception, predictions and the main drivers of integration, the spanish example. Journal of Cleaner Production, 19(12), 1315-1323. doi:10.1016/j.jclepro.2011.03.009	31
08	Aggeri, F., Elmquist, M., & Pohl, H. (2009). Managing learning in the automotive industry -the innovation race for electric vehicles. International Journal of Automotive Technology and Management, 9(2), 123-147. doi:10.1504/IJATM.2009.026394	28
09	Del Río, P., Carrillo-Hermosilla, J., & Könnölä, T. (2010). Policy strategies to promote eco-innovation: An integrated framewor. Journal of Industrial Ecology, 14(4), 541-557. doi:10.1111/j.1530-9290.2010.00259.x	27
10	Blum-Kusterer, M., & Hussain, S. S. (2001). Innovation and corporate sustainability: An investigation into the process of change in the pharmaceuticals industry. Business Strategy and the Environment, 10(5), 300-316. doi:10.1002/bse.300	26

Source: Scopus (2016)

The research regarding the work with highest number of citations made in WoS and Scopus aimed to associate the most cited publications with the authors who have published most in the same period. In the face of evidence resulting in both databases, the authors of the most cited and expressive publications are not among the authors who have published more over the period. Only the work of De Marchi, Di Maria and Micelli (2013) published in the journal Environmental Strategies with 31 citations in the Scopus basis, belongs to authors who have published most, as shown in Table 5.

Still, it is clear that the publications with the largest number of citations are linked to the journal Journal of Cleaner Production and Technovation. The Journal of Cleaner Production journal has as scope to be an interdisciplinary forum, international for the exchange of concepts of information and research, policies and technologies that are designed to help to ensure the progress toward making the societies and regions more sustainable. It is intended to encourage innovation and creativity, new and improved products, and the implementation of new structures, cleaner, systems, processes, products and services (Elsevier, 2016).

The journal presents SJR reputation indicators (SCImago Journal Rank) 2016 = 1,721; IPP (Impact per Publication) in 2016 = 4,954; SNIP (Source Normalized Impact per Paper) with 2,272 in 2016, and 5-Year Impact Factor of 5.315 indicator.

The other highlighted journal of this analysis is Technovation, which focuses on publishing studies on technological innovation, entrepreneurship and technology management. (Elsevier, 2016). The said journal got SJR reputation indicators (SCImago Journal Rank) in 2015 = 1,794; IPP (Impact per Publication) in 2016 = 2,243; SNIP (Source Normalized Impact per Paper) with 2,169 in 2016 and indicator 5-Year Impact Factor of 3.833. These characteristics show that these journals have been a reference to the main publications on topics such as "Eco-innovation" associated with "Strategy".

It was noted that six publications appear among the most cited in both databases, with some of these studies have similar highlights in both databases. The study "Eco-innovation and new product development: understanding the influences on market performance", published in the journal Technovation had the highest number of citations (106) in the WoS basis on the analyzed period. The said text belongs to Pro-

fessor PhD. Devashish Pujari, who is currently assistant professor at McMaster University, Hamilton, Canada. His areas of research are developing new products and services, environmental innovation and technology services.

Two other studies published in the Journal of Cleaner Production journal are also highlights and are among the most cited in the two research bases. The first "Ecological modernization: new perspectives" with 97 citations in the WoS basis and 126 in the Scopusbasis, has Professor Dr. Martin Jänicke as its author, who is a researcher and founding director of the Research Center for Environmental Policy, at the Freie Universitaet Berlin in Germany, Jänicke is a renowned researcher and politician, having been a member of the Berlin parliament.

The second highlighted study "Barriers and stimuli for eco-design in SMEs", with 91 citations in the WoS basis and 151 in the Scopus has as authors, Carolien van Hemel and Jacqueline Cramer. Van Hamel is a professor and director of the Utrecht Sustainability Institute at the University of Utrecht, Netherlands, dedicating her studies in renewable resources and environment. Jacqueline Cramer is a professor and researcher in sustainable innovation area at the University of Utrecht, a consultant at the Institute of Sustainability Strategy at the University of Utrecht, is also a member of the Economic Council of Amsterdam.

Final Considerations

The analysis of publications on Eco-innovation and Strategy from 2001 to 2015, found 96 publications in the Web of Science and 109 in Scopus. Comparing both surveyed bases it is found that the number of publications increased dramatically mainly in the last 6 years.

Among the journals with the highest number of publications in WoS, stand out: Journal of Cleaner Production, Ecological Economics and Sustainability in WoS basis and Journal of Cleaner Production, Business Strategy and the Environment and Ecological Economics in the Scopus basis.

The European countries lead the ranking of countries that most publish on the subject in the two bases. In both the searched bases Spain, Italy, France and the United Kingdom have the origin of the publications analyzed. It is emphasized that Brazil occupies the 8th position on the basis of Scopus with 5 publications. Although some Brazilian works contribute to this ranking, they do not present a significant number of citations as reference texts in both studied bases.

Following the guidelines of Banks (2006) it was possible to classify as "hot topics", the combinations of the themes the topics Innovation and Management, they obtained a coefficient "m" between 0.5 and 2, so that they can be considered as "hot topics" emerging in their areas of study. As for the topics that presented "m" ≤ 0.5 as Research and Development, Sustainability, Business and Services, etc may be of interest to researchers in a specific field search. The results suggest that the themes which link Eco-innovation and Strategy consist in an emerging thematic, having great challenges as regards the development of studies associated to these two themes.

In search of a table comparing the most cited publications versus the authors who published in the period surveyed, it was possible to check that the publications with the largest number of citations do not belong to authors who publish more on the same subject. It was observed that the publications with the highest number of cita-

tions are linked to the journals Journal of Cleaner Production and Technovation, these being able to be considered as a reference for the combination of subjects researched.

During this study, it was possible to verify the utility of search engines in search of bases such as Web of Science and Scopus for conducting academic researches that serve as tools for the academic community to access the contents in publications in broad and specific issues, as well as, seek information about the evolution of topics of interest.

In front of the study presented about the themes "Eco-innovation" and "Strategy", it was found the growth of studies related to these issues, because of their importance to the teaching and research fields as well as to expand the knowledge about this approach that supports the strategic decisions based on the use of the available resources for the organizations.

Moreover, as a limiting factor of the study, it highlights its realization using two specific databases. For this reason, it is suggested that future studies of this nature have a greater range, covering, for example, national and international academic events, scientific journals or other significant scientific databases.

References

ACEDO, F; BARROSO, C; GALAN, J. L. (2006). The Resource-Based Theory: Dissemination and Main Trends. **Strategic Management Journal**, 27(7), 621-636.

ANDERSEN, M. M (2010). **On the faces and phases of eco-innovation**: on the dynamics of the greening of the economy. In: Druid Summer Conference. London. Opening up innovation: strategy, organization and technology, London, Imperial College London Business School, 16-18 jun.

ANSOFF , I; STEWART, J. (1967). Strategies for a technology-based business. **Harvard Business Review**. 45(6), Nov-Dec, 1967.

ANSOFF, I; McDONNELL, E. (1993). **Implantando a administração estratégica**. São Paulo: Atlas.

ARUNDEL, A; KEMP, R (2009). **Measuring eco-innovation**. UNU-MERIT, Working Paper Series, Available in: <http://www.merit.unu.edu/publications/ wppdf/2009/wp2009-017.pdf>. Access on: 20 jul.

BANKS, M. G (2006). **An extension of the Hirsch index: indexing scientific topics and compounds**. Available in: <http://www.arxiv.org/abs/physics/0604216>. Access on: Jul. 2010.

BARBIERI, J. C; VASCONCELOS, I. F. G; ANDREASSI, T; VASCONCELOS, F. C (2010). Inovação e sustentabilidade: novos modelos e proposições. **Revista de Administração de Empresas**. São Paulo, (50), 146-154.

Bar-Ilan J (2008). **Which h-index**? A comparison of WoS, Scopus and Google Scholar. Scientometrics, 74(2), 257–271.

BARNEY, J (1991). Firm resources a sustained competitive advantage. **Journal of Management**, 17(1), 99-120.

Capes – Coordenação de Aperfeiçoamento de pessoal de nível superior (2012). **Acervo**. Available in: <http://www.periodicos.capes.gov.br.ez47. periodicos.capes.gov.br/index.php?option=com_pcollection&mn=70&smn=79>. Access on: Dec, 2014.

CUNHA, S. K; MAÇANEIRO, M. M (2014). Modelo teórico de análise de adoção de estratégias reativas e proativas de eco inovação: a influência contextual dos fatores internos e externos para as organizações. **Brazilian Business Review**. 11(5), 1-24.

EISENHARDT, K; MARTIN, J (2000). Dynamic capabilities: what are they? **Strategic Management Journal**, 21(10/11), 1105-1121.

HART, S. L (2006). **O capitalismo na encruzilhada: as inúmeras oportunidades de negócios na solução dos problemas mais difíceis do mundo**. Porto Alegre: Bookman.

HIRSCH, J. E (2005). **An index to quantify an individual's scientific research output**. Proceedings of the National Academy of Sciences of the United States of America, (102)46, 16569-16572.

HOSKISSON, R. E (2009). **Estratégia competitiva**. São Paulo: Cengage Leraning.

KELLY, C. D, JENNIONS, M. D (2006). **The h index and career assessment by numbers**. Trends in Ecology and Evolution, 21(4), 167-170.

MACEDO, M; CASA NOVA, S. P; ALMEIDA, K (1999). **Mapeamento e análise bibliométrica da utilização da análise envoltória de dados (DEA) em estudos das áreas de contabilidade e administração**. In: ENANPAD, 23, Foz do Iguaçu. Anais. ANPAD.

MAÇANEIRO, M. B; CUNHA, S. K (2014). Contextual factors as drivers of eco-innovation strategies: the definition of an organizational taxonomy in the Brazilian Cellulose, Paper, and Paper Products Industry. In: AZEVEDO, S. G. et al. (Eds.). **Eco-Innovation and the Development of Business Models**: Lessons from Experience and New Frontiers in Theory and Practice. New York: Springer, 137-162.

MELO, A. C. B; OZAKIL, A.M; SBRAGIA, R; VASCONCELLOS, E. P (2012). **Technological Innovation Strategy:** A Case Study in Brazilian Subsidiaries of MNCs. Journal Globalization, Competitiveness & Governability. GCG Georgetown University – Universia. September-December, 6(3), 16-33.

NOBEL, R; BIRKINSHAW, J (1998). Innovation in Multinational Corporations: Control and Communication Patterns in International R&D Operations. **Strategic Management Journal**, 19(5), 479-496.

OCDE (2009). **Manufacturing Sustentável e Ecoinovação. Políticas. Governo para a promoção da ecoinovação**: Um levantamento de dez países da OCDE. DSTI / IND, OECD, Paris.

PORTER, M. E; LINDE, C (1995). Green and Competitive: Ending the Stalemate. **Harvard Business Review, Boston**, 120-134.

QUINN, J. B (2006). **Estratégias para mudança**. In: Mintzberg, H. et al. O processo da estratégia: conceitos, contextos e casos selecionados. Porto Alegre: Bookman.

ROSTAING, H (1997). **La bibliométrie et sés techniques**. Toulouse: Sciences de la Société; Marseille: Centre de Recherche Rétrospective de Marseille.

SILVA, M. R (2004). **Análise bibliométrica da produção científica docente do programa de pós-graduação em educação especial/UFSCar**: 1998-2003. Dissertação (Mestrado em Educação Especial) - Universidade Federal de São Carlos, São Carlos.

TEECE, D; PISANO, G; SHUEN, A (1997). Dynamic capabilities and strategic management, **Strategic Management Journal**, 18(7), 509-533.

VASCONCELLOS, E. P. G, MONTEROSSI, J. O; BRUNO, M. A. C (2007). **Identification of technological threats and opportunities**: conceptual framework and application in an Autoparts Company", In: 16th International Conference on Management of Technology, Florida: IAMOT.

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