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Information, knowledge and innovation: contemporary brazilian[1] production and united nations sustainable development goals

Información, conocimiento e innovación: producción brasilera contemporanea y las metas sostenibles de las naciones unidas

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Abstract

This work aims to analyze recent Brazilian literature on innovation in the search for studies related to the United Nations' ninth Sustainable Development Goal (SDG) Industry, Innovation and Infrastructure: "build resilient infrastructure, promote sustainable industrialization and foster innovation'. The theoretical framework on innovation is based on classic authors from the field such as Freeman (1995); Lundvall (1985, 1996, 2009); Hippel (2007); Nelson and Winter (2002); Srivas and Sutz (2008). The paper is developed as a literature review with a comparative study to analyze data collected from a Brazilian journal on business and innovation: Revista de Administração e Inovação (RAI). Due to the topicality of the subject, the period between 2014 -2015 was chosen for the sample. During this time, 73 articles were published in five numbers of RAI. Among them, 48 articles were selected according to the established criteria to determine the identification with the theme of SDG9 Industry, Innovation and Infrastructure. These 48 articles were stratified and analyzed. The results indicate the need to stimulate research in the area of innovation in line with SDG9 approach.

Keywords: information, knowledge, innovation; scientific communication; Sustainable Development Goals (SDG).

Resumen

El objetivo de este trabajo es verificar si existe en la literatura brasilera contemporánea en innovación, elementos que caractericen las investigaciones que tengan como propósito el objetivo No. 9 de desarrollo sostenible de la ONU: 'construir una infraestructura resiliente, promoviendo una industrialización inclusiva, sostenible y que fomente la innovación", para lo cual se seleccionaron obras de autores reconocidos internacionalmente tales como Freeman (1995); Nelson & Winter (2002); Lundvall (1985, 1996, 2009); Hippel (2007); Srivas & Sutz (2008). Para corroborar con esta propuesta, se optó por la investigación bibliográfica y el método de estudio comparativo, escogiendo la Revista de Administración e Innovación (RAI). Para caracterizar la actualidad del estudio, fueron seleccionados un total de 73 artículos de un total de cinco números de la RAI entre el período de enero/marzo de 2014 a enero/marzo de 2015. De estos, 48 artículos fueron seleccionados por presentar algún grado de identificación con los temas escogidos, estratificados y analizados posteriormente. Los resultados del estudio, apuntan hacia una necesidad de estimular la investigación en el ámbito de la innovación con enfoque sustentable dentro de las directrices ODS9.

Palabras clave: información conocimiento y innovación; divulgación científica; Objetivos de Desarrollo Sostenible (ODS).

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Introduction

Oslo Manual (OECD, 1997) categorizes innovation as: (i) introduction of a new product or change an existing product; (ii) new process of innovation in industry; (iii) opening a new market; (iv) new sources development of supply for raw materials; (v) changes in industrial organization. However, it is necessary to look beyond these definitions, trying to give a new direction to reflect on how to encourage developing nations to find their own means to innovate without depleting their natural resources. Innovation policies, in general, encourage competitiveness and economic growth but do not consider environmental and socially sustainable aspects.

New technologies can unlock opportunities for sustainable development. Innovation and sustainable practices are increasingly part of current debates particularly in public policy guidelines of international programs. However, access to environmentally sustainable technologies is uneven, both in developing and in underdeveloped countries. Trying to find solutions to reduce this technological inequality, some international organizations continuously promote studies and actions encouraging governments to integrate their actions and strategic planning for the development of innovation. United Nations (UN), for example, has developed 'The 17 Sustainable Development Goals of the 2030 Agenda for Sustainable Development', adopted by world leaders in September 2015 which officially came into force on January 1st 2016. Among other targets, the Sustainable Development Goals (SDG) aim to make industries sustainable "with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes", in a context where innovation will play a relevant role.

Thus, this study aims to analyze recent Brazilian literature on innovation in the search for studies related to SDG9 'Industry, Innovation and Infrastructure: build resilient infrastructure, promote sustainable industrialization and foster innovation'. It aims to check if Brazilian recent studies on innovation are being developed in line with SDG9 approach.

Therefore, this study is limited to the literature directly related to sustainability in order to identify other innovation topics. The choice was made to promote sustainability concept embedded in contexts in which it was not considered previously as analysis unit or main theme. Thus, checking the presence of this subject recurrently as a secondary element may characterize a growing concern of the issue and recognition of its importance, in a complementary way.

A Brazilian journal on business and innovation: 'Revista de Administração e Inovação (RAI)', ISSN 1809-2039, was selected for data collection. RAI was created in 2004 by the Policy Center and Technology Management at São Paulo University (PGT/USP) in order to 'run a scientific communication vehicle in digital media, studies and research focused on innovation policy, economics and management'. The journal included in Administration, Accounting and Tourism area by CAPES (Brazilian Government Higher Education Personnel Improvement Coordination) is assessed as level B1[6]. RAI was chosen as it is considered a relevant Brazilian journal on innovation studies, evaluated in blind review by peers.

The paper is organized as follows: first it introduces the theoretical framework on innovation concepts developed by main classical authors. Then, a brief presentation of United Nations' Sustainable Development Goals (SDG) and targets to 2030 are described. Method and analysis comes next. Finally, results are presented pointing to a greater need for reflection and research on innovation and sustainability.

Theoretical framework

National System of Innovation & Public Policies

Freeman (1995) reminds historical major differences among countries in the manner they organized and sustained introduction, development, improvement and dissemination of new products and processes within their national economies.

Thus, among relevant changes reported by Freeman (1995) are: (i) the transition from a domestic 'importer' system to a new manufactory system of production; (ii) new forms of management and financing companies; (iii) interactive learning amongst new companies and industries using new materials and other inputs, as well as new equipment; (iv) removal of old restrictions on trade and industry, as well as new markets growth; (v) new transportation infrastructure; (vi) a hospitable cultural environment for new theories and scientific inventions; (vii) dissemination and widespread acceptance of economic and political theories facilitating all these changes.

Lundvall contribution is introduced by the recognized Brazilian economist Paulo Bastos Tigre introducing the Danish author article 'Innovation of an interactive process: user-producer interaction to the national system of innovation' in 2009. This year, there was record of 1,512 Lundvall papers quotes by Google Scholar. Today, after nearly six years of this presenta-

6. CAPES provides a list to assess journals classifying them in 8 categories: A1, A2, B1, B2, B3, B4, B5 and C. A1 is assigned to the highest level and C to the lowest.

tion, the work continues to be accessed by researchers worldwide, increased to 3.701 quotations (average growth of approximately 24% per year) held on the same basis of Google Scholar (on June 28, 2015).

In this work, Lundvall presents a new perspective of the development process when considering local capacity to learn and innovate in different areas of knowledge as key factor for development enterprise centers creation instead of only industrial chains. Thus, its social character is recognized not only by local technological capability, but also strongly influenced by socio-cultural aspects of agents involved - no company could innovate completely in isolation.

Investing in training and interactive learning as Lundvall calls, requires well-established government policies providing support for institutions required to technological development, as well as answering local problems which are not highly regarded by market demand. Thus, when analyzing the original text:

> The need for social innovations and institutional change is even more urgent at the world level. The enormous and growing gaps between rich and poor countries reflect that the international transmission of knowledge and technology is not working as assumed by standard economy theory. In so far as specific technological capabilities are rooted in national networks of user-producer relationships, 'technology transfer' can only solve part of the problem, however. There is a need for strengthening the whole national system of innovation, including science, industry and final users (Lundvall, 2009, p.31).

In this sense, it has been observed an opportunity of integrating Lundvall ideas to SDG9 purposes that will be compared to contemporary national surveys.

Innovation in organizations

Nelson and Winter (2002) consider that one should no longer think how firm innovation as 'gradually groping or evolving into more profitable ways of doing things' because it has become very difficult to theorize only looking at competition in this dynamic process.

Thus, Nelson and Winter (2002) develop their ideas based on Economic Evolutionary theory: when technology is new, there is uncertainty both regarding how technology can improve and what customers really want. Different companies and inventors bet in different ways. Innovative entrepreneurs and innovative companies continue to start a new business, trying new things; those who have tried and failed, ended up going bankrupt and leaving the market. Therefore, accumulated time and effort, turns out to be more efficient, making products of this new technology more attractive to significant demand.

Nevertheless, variety remains, at most, in early stages of industry history where new ideas are the main issue in technology and design industry. They exemplify natural economic selection at work - destroying their variety afterwards. These industry dynamics include self-strengthening mechanisms creating path dependence, making it impossible for system to return to previous status and it helps 'rethinking old standards'.

Henceforth, it is due to this logic that allows us to recognize difficulties faced by developing countries. In addition, a major challenge to be considered is the environmental issue, the motivation chosen to develop this work.

Innovation, networks and new collaborative practices

Networks of innovation development, production, distribution and consumption that are distributed horizontally among many software users exists in the domain of projects known as "free" software "open source". In order to build innovation vocabulary, the author presents the definition of some elements, such as (HIPPEL, 2007):

- "Economic agents" are defined in terms of how they expect to get benefits from a given innovation.
- By "network user" means nodes (user modules) interconnected by information transfer links that may also involve face-to-face relations.

Thus, fully functional innovation networks can be built horizontally - consisting with only innovation users as players. Therefore, users act in network design and build innovative products for their own use, this means they can also freely reveal their design information to others. Thus, 'non-users' also contribute to what we call 'user innovation networks'. Bearing in mind Hippel (2007) concepts and his collaborative practice, as it will be seen further, this issue is also present in works published in Brazil.

Social innovation and inclusive development

According to Srinivas & Sutz (2008), in order to innovate and solve problems in technological realm characterized by scarcity, it is required skills development - learning by doing; learning by searching; learning by interacting; learning by solving. These skills are idiosyncratic and are known as 'capacity to innovate in scarcity conditions'. The planning and policy of 'capacity to innovate in scarcity conditions' suggest that:

I. In order to solve problems in developing countries is necessary the development of endogenous problems solving skills;

II. Although difficult to model, the ability to solve problems is an important part of national self-esteem;

III. They are critical for solving problems in contexts where simple things available anywhere in the advanced industrialized world are missing or are too expensive to be part of a solution;

IV. The creativity required to innovate in conditions of scarcity must be recognized, studied, praised and gain theoretical status;

V. Some specific policies are needed to encourage this kind of creativity. National models may not work isolated, so effective local policies are needed;

VI. The identification, relevance and prioritization of such innovations is itself a collaborative planning process that should deploy best aspects of institutional change.

This theory recognizes several forms of learning based on experience, leading to innovation. Therefore, Scarcity-Induced Innovation (SII) is in fact a form of innovation. Such approach if applied to local needs also allows a scholar to speak in a more systematic way with innovative status. For instance, regardless if this person is a low-income worker, a farmer or a corporate laboratory scientist.

Many current frameworks continue to consider low-income people, mainly as potential consumers, but not producers of innovations. The SII model allow greater reflection on institutional, labor market and human capital approaches to economical development. The Scarcity-Induced Innovations relates to:

- problems which have been identified as important worldwide but without any real solution (they still not feasible);
- problems which posed and identified in industrialization but do not drive the world's attention;
- problems which had been solved, but the adopted solution needs to change so it can be adopted as innovation in a given context;
- problems which had already resolution, but the solution found was for different reasons other than the currently problem;
- replacement problems: how to build a known device replacing some of its components; or how to replace equipment by other components or instruments, obtaining similar performance.

The ability to innovate in conditions of scarcity (Scarcity-Induced Innovations model) has important implications for social equity, industrial structure and technological expertise. In this sense, the aforementioned concepts offer an alternative to the reflection in the study of innovation in Latin America and Brazil.

Learning dynamics

User-producer relationship amidst industries involves two different steps in a vertical integration of production. The user-producer perspective introduces the need for qualitative information on new use values as inputs, as well as users needs. Internal user-producer relationships may show different framework within different companies. The internal organization capacity to transform internal and external user innovation needs, may reflect different organizational arrangements, different incentive systems and different cultural characteristics (Lundvall, 1985).

From social relations importance concept in user-producer relationship, Lundvall (1996) presents a new study on learning economy social dimension. The author presents a new study on Learning Economy and its main features. First, it presents a particular theoretical perspective on economy, emphasizing explanation and understanding the process of change in technology, skills, preferences and institutions. Secondly, it refers to specific historical trends which transforms learning & knowledge increasingly important on all levels of economy. Thus, learning economy is perceived where change is dynamic and where the rate of skills obsolescence is high, as well as demand for new knowledge.

Sustainable development goals (SDG)

Recently presented by United Nations General Secretary, Ban Ki-moon, the summary report on post-2015 negotiation agenda includes the Sustainable Development Goals (SDGs), which will guide global development after Millennium Development Goals (MDGs) expired. Titled 'Road to dignity by 2030: ending poverty, turning every life and protecting the planet', the report addresses post-2015 challenges and post-MDG and building new development agenda to be followed by UN.

In total, 17 objectives and 169 targets over sustainable development issues are deployed in this document supporting United Nations new drivers:

- SDG1. End poverty in all its forms everywhere;
- SDG2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
- SDG3. Ensure healthy lives and promote well-being for all at all ages;

- SDG4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all;
- SDG5. Achieve gender equality and empower all women and girls;
- SDG6. Ensure availability and sustainable management of water and sanitation for all;
- SDG7. Ensure access to affordable, reliable, sustainable and modern energy for all;
- SDG8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
- SDG9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
- SDG10. Reduce inequality within and among countries;
- SDG11. Make cities and human settlements inclusive, safe, resilient and sustainable;
- SDG12. Ensure sustainable consumption and production patterns;
- SDG13. Take urgent action to combat climate change and its impacts;
- SDG14. Conserve and sustainability use the oceans, seas and marine resources for sustainable development;
- SDG15. Protect, restores and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;
- SDG16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
- SDG17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Amongst 17 object ives, SDG9, *"Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"*, it was chosen to be analyzed in this study, presenting the following targets:

- SDG 9.1. Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
- SDG 9.2. Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries
- SDG 9.3. Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
- SDG 9.4. By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
- SDG 9.5. Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Besides, the SDG 9 brings three complementary targets as follows:

- 9.a. Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States
- 9.b. Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities
- 9.c. Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.

Once presenting the aforementioned SDG9 structure, innovation literature is analyzed with research trends. The following sections present the development of our work.

Method

From classical theoretical study it was carried out a comparative analysis of Brazilian literature with contemporary themes collected in the Journal of Business and Innovation *(Revista de Administração e Inovação* - RAI). Since its foundation RAI has the support of research teams which belongs Scientific Committee. Thus, this journal was chosen by presenting three key strategic positions:

› **Journal Theme:** establishment of scientific field journal focused on innovation, open to different theoretical and methodological concepts. Usually Brazilian Management Journals had multi-thematic scope and they were managed by specific academic departments in Brazil.

› **Collective Inter-institutional governance:** although settled by PGT/USP (São Paulo State University Technology Policy and Management Department), it was created a governance structure consisting of research groups active in this thematic area in research centers recommended by CAPES (Brazilian Government Higher Education Personnel Improvement Coordination). The composition of the Editorial Board and the Scientific Committee is diverse and representative of innovation area.

› **Best Practices Editorials:** RAI pursues best editorial practices of scientific journals in Brazil, from Editorial Policy requirements. The RAI indexation in RedALyC and EBSCO is an indication of editorial procedures quality.

From the journal choice, a time frame of one year was defined (from 2014 to 2015). Total of 73 papers in two volumes (v.11 and v.12), five Journal of Business and Innovation (RAI) issues between January/March 2014 to January/March 2015. Out of these, 48 articles were selected to present some degree of identification with the chosen innovation themes, and stratified as represented by Figure 1:

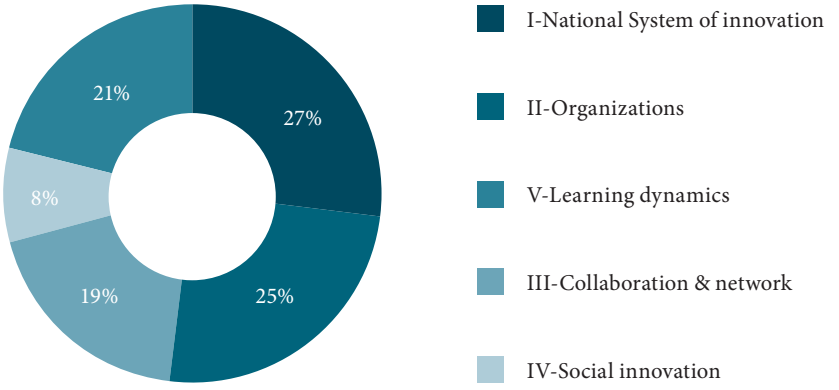

Figura 1. RAI Journal SDG compatibility index (2014-2015)
Fonte: Made by authors
After stratifying categories, review and analysis results started, introducing next section

Results

The papers were then selected, identified by innovation subject and stratified in categories (I- National System of Innovation & Public Policy; II- Innovation in organizations; III- Innovation, network & new collaborative practices; IV- Social innovation & inclusive development; V- Learning dynamics) used for analysis.

Innovation themes from Brazilian & international literature		
Theme	**Classic authors**	**RAI Journal**
National system of innovation & public policy	Freeman (1995) Lundvall (2009)	Oliveira et al (2014); Camio et al (2014); Jacoski et al (2014); Sobrinho et al (2014); Theiss et al (2014); Silva de Souza et al (2014); Gusberti et al (2014); Milagres (2014); Serra e Fernandez (2014); Pereira e Silveira (2014);Bueno e Torkomian (2014); Montovani e Santos (2014); Cruz e Souza (2014).
Innovation in organizations	Nelson & Winter (2002)	França et al (2014); Ferigotti e Fernandes (2014); Fagundes et al (2014); Zartha Sossa et al (2014); Mainetti Jr et al (2014); Gomes et al (2014); Garcez et al (2014); Valent et al (2014); Souza et al (2014); Quadros et al (2014);Costa e Porto (2014); Utzig e Beuren (2014)
Innovation, network & new collaborative practices	Hippel (2007)	Oliveira e Alves (2014); Stal et al (2014); Gammarano e Arruda Filho (2014); Schmidt e Balestrin (2014);Barbosa e Arruda Filho (2014); Rodrigues et al (2014); Centurión et al (2015); Matias et al (2015); Damião e Graça (2014);
Social innovation & inclusivedevelopment	Srivas & Sutz (2008)	Lucena et al (2014); Brito e Aguiar (2014); Coelho (2015); Santos et al (2015)
Learning dynamics	Lundvall (1985) Lundvall (1996)	Borchardt e dos Santos (2014); Sala e Trevisan (2014); Bruno Faria e Fonseca (2014); Quandt et al (2014); Mazza et al (2014);Santos e Zilber (2014); Dias e Pedrozo (2014); Scarpin e Machado (2015); Panizzon et al (2015); Ramos e Zilber (2015)

Table 1 – Innovation themes from Brazilian & international literature
Fonte: Made by authors.

Regarding innovation process, although initially classified by portraying a group of Argentine SMEs (Small and Medium Enterprises), Camio et al (2014) present the idea of consumers acting and influencing the social process of innovation, as is shown by Lundvall (1996):

> El grupo con mejor performance en innovación presenta fuertes coincidencias en el modelo de comportamiento innovador, empresas pequeñas, con origen propio de las tecnologías empleadas en los procesos, con innovaciones de producto que responden a un aumento de prestaciones a partir de las sugerencias de los clientes (Camio et al, 2014, p. 47).

In primary division of materials, it can be observed that in one year of data collection during this research it was not found many studies related to 'social innovation and inclusive development'. The next step was to analyze papers classified in other categories, if there was any adherence to SDG9 "Building resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation". In this quest, the authors main ideas were used to facilitate comparison analysis.

International and Brazilian authors thinking in Innovation themes		
Theme	**Classical authors**	**RAI + SDG9 Authors**
National system of innovation & public policy	From viewpoint of developing countries, catch up national policies to technology remain crucial (Freeman, 1995). The need for social innovations and institutional change is more urgent worldwide. The huge and growing gaps between rich and poor countries reflect that international transmission of knowledge and technology is not working as assumed by Economical theory standard. There is a need to strengthen the entire National Innovation System, including science, industry and end users (Lundvall, 2009)	Given this perspective in the Brazilian energy market, wind industry becomes an economically viable alternative for the sector, as well as its supporting feature to environmental issues (Silva de Souza, 2014). Clinics and hospitals using electromedical devices are not prepared to rule properly such equipment at the end of its useful life (Pereira, 2014)
Innovation in organizations	Industry dynamics include self-strengthening mechanisms creating path dependence, which makes it impossible for the system to return to previous branch points and 'reconsidering old standards "(Nelson and Winter, 2002).	Not applicable
Innovation, network & new collaborative practices	Network users design and built innovative products for their own use – they also freely reveal their design information to others (Hippel, 2007).	It was found that some consumers are afraid of and have a great deal of risk perception in buying green products, but analyzing green value is also product appeal and not something within it (Barbosa, 2014).
Social innovation & inclusive development	Many current frameworks continue to see low-income people, mainly as potential consumers, not producers of innovations. The SII model can allow greater reflection on institutional, labor market and human capital approaches to development (Srinivas & Sutz, 2008).	Company's case study results assessed also provided evidence that adoption of environmental strategies is an important support for green products development (Brito & Aguiar, 2014).
Learning dynamics	Learning economy is verified in environment where change is rapid and where skills obsolescence rate and demand for new knowledge is high (Lundvall, 1996).	Respondents were unanimous in stating that the implementation of ISO 14001 is an economically viable project. However, it is noteworthy that this action demanded large amounts of initial investment and economic returns come from intangible results, work optimization, culture change, image enhancement, new business partnerships and agreements (Mazza et al, 2014).

Table 2 – International and Brazilian authors thinking in Innovation themes
Fonte: Made by authors.

From this framework, based on theory, it highlights a few points about Brazilian innovation literature and its focus on environmental sustainability: (I) There is inclusive and sustainable industrialization disregardance in analyze review authors on marketing practices developed in Latin America by high-tech products manufacturers:

> In Latin American environment analysis, it is clear that technological products are being marketed in these countries at unfair price. Nevertheless, marketeers stimuli can emotionally influence consumers, driven to consume products even costing a non-consistent price with local reality (Gammarano & Arruda Filho, 2014, p. 106).

(II) For its economic importance, steel and petrochemical industry represents a significant portion of Research & Development (R&D) stimulation and promotion in Brazil focusing on innovation. This can be seen in reading Centurión et al (2015), Costa & Porto (2014), Fagundes (2014) and Garcez (2014) papers.

Although these researches already began to present investment for eco-innovative projects also contrast with many proposals indicating intention to increase productivity within sectors that are major offenders to the environment.

(III) Another case presents Brazil as one of paper and pulp leading producers in globally industry recognized as competitive. Thus, companies in this segment should invest continuously to survival and grow. Souza et al (2014) point out 'the Brazilian pulp and paper industry will invest $ 20 billion over the next seven years in forest base and new plants construction. [...] Pulp and paper companies invest massively in production capacity expansion'. Featuring over business inconsistency (forest basis versus new plants building) compared to SDG9 environmental issues.

(IV) Moreover, it was observed that consumer himself, because his ignorance or carelessness, end up contributing to waste:

> Potential competitiveness gains for customer service differentiation, made possible by adaptation to REEEs good management practices are evident in consumers survey. It was shown that clinics and hospitals using electromedical are not prepared to rule properly such equipment at the end of its useful life. These facilities, as well as underutilized in many cases, become debris in these establishments (Pereira, 2014, p.106).

> innovative technologies users of Latin American countries surveyed (Argentina, Chile, Colombia, Mexico and Brazil) behave similarly to each other regarding the variables studied as hedonism, utilitarianism, devotion and social positioning (Gammarano et al, 2014, p.106-107).

> It was found that some consumers still fear risk with green products purchase, but green value is product marketing appeal and not exactly something embedded to it (Barbosa, 2014).

(V) However, other studies shed light on opportunities in Brazilian scenario, presenting itself as a favorable investment to sustainable innovation-based clean energy:

> Given this Brazilian energy market perspective, wind industry becomes an economically viable alternative for the sector, as well as its supporting feature to environmental issues. This shows that wind power price formation study as energy management process, is necessary to complement dissemination and use of renewable energy and promote policies leading the planet to innovation technology reducing environmental impacts but also associated with economic interests (Silva de Souza, 2014, p.275).

(VI) the existence of companies which already invested in eco-innovations whether in process or service should encourage Brazilian entrepreneurs to develop new techniques and improvements to more feasible ecologically approaches:

> Results are presented in business context and production process. Eco-innovation form and main eco-innovations (product, process and social) adopted are analyzed. The conclusions point to adequacy of innovations in products and processes developed by firm and presented literature. With this in mind, Omega company can be considered as strategic eco-innovator (Coelho, 2014, p.123).

(VII) The same applies to the adoption of certification processes which validate environmental governance, adoption of good practices and process changes. As shown in Table 2, people interviewed by Mazza et al (2014) indicate the investment for ISO 14001 was offset and currently:

> [...] environmental programs adopted by Sabin Laboratory include eleven environmental practices with own organization and unique processes: (1) selective collection; (2) plan for environmental contingencies; (3) treatment of solid waste and effluents; (4) management of the vehicle fleet; (5) energy monitoring; (6) monitoring of paper and printing; (7) monitoring of water; (8) monitoring of fuel; (9) control use of plastics; (10) control of fluorescent lamps; and (11) disposal of electronic waste (Mazza et al, 2014, p.356).

> The presentation of contemporary Brazilian literature and it comparing analysis to classical authors of international literature is now concluded.

Final considerations

This study aimed to determine whether there is in Brazilian contemporary literature elements that characterize research towards United Nations Sustainable Development Goal n.9: 'build a resilient infrastructure, promoting inclusive industrialization, sustainable and encouraging innovation'. Therefore, in addition based on classical authors, we sought to analyze Brazilian literature to update the proposed discussions. Thus, the indexed journal RAI was chosen to represent perspectives and innovation experts on the national scene, considering all publications from January/March 2014 to January/March 2015.

During the research 73 articles were collected, 48 of which were identified as belonging to the selected innovation categories. After stratifying items in these categories, it was observed that only 8 of the 48 selected articles (16%) entail environmental sustainability inclusive innovation. The results by categories were: National Innovation System and Public Policy (3 SDG9 articles from a total of 13); Innovation in Organizations (no SDG9 paper out of 12); Innovation, Networks and New Collaboration Practice (1 SDG9 paper out of 9); Social and Inclusive Development Innovation (3 SDG9 papers in 4); Learning dynamics (1 SDG9 paper in 10).

Although a few papers were selected during 2014-2015 period, it was observed that 'Social and Inclusive Development Innovation' category is the one which really represents greater adherence to eco-innovation and environmental sustainability. Then, 'National System of Innovation and Public Policy' category provides an indication of a new phase in scientific dissemination and discussion of regulations on innovation in the framework of environmental sustainability.

Final remarks are associated with this study relevance and also to future research recommendation: during a period of intense concern for environmental issues and the launch of United Nations Sustainable Development Goals, it should invest in further research on eco-innovations in Brazilian scientific community. Also, It is important, in future surveys, to amplify the sample to different journals and countries for analyze if the main outcome of the study, invest on research on eco-innovations, have similar results in other contexts.

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