

ANALYSIS OF PUBLICATIONS ON INNOVATION IN JOURNALS OF OPERATIONS MANAGEMENT IN BRAZIL

ANÁLISE DE PUBLICAÇÕES SOBRE INOVAÇÃO EM PERIÓDICOS BRASILEIROS DE GESTÃO DE OPERAÇÕES

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Abstract

Innovation management is a critical activity for all companies because it supports the strategic direction, guides the resources allocation, provide sustainability to business, create new capabilities and generate new knowledge, and making enterprises more competitive. As a consequence, research and development towards innovation has becoming an important issue for companies which aims at achieving better results and competitiveness, especially in emerging markets, e.g. in Brazil. In this context, this paper analyses publications on innovation that were outlet of ten Brazilian operations management journals. It aims to understand and point out some papers' characteristics and identifies research opportunities in the subject by verifying what has been studied in the innovation context in Brazil. The paper consists of a theoretical-conceptual study to achieve a better understand regarding innovation based on a literature analysis focused in a sample of publications in Brazil. The results show that although the innovation concept was expanded, most papers still address the technological innovation perspective, especially focused on products. Another dominant aspect concerns studies that identify and analyze innovation characteristics in a particular industry, such as automotive, energy, ceramics, construction, etc. Additionally, comparative studies among sectors or companies have been developed. Thus, it can be concluded that there are opportunities for future research in other innovation perspectives, such as in processes, services, marketing and organizational processes. Other research gaps and perspectives in this bibliographic sample are also discussed.

Keywords: Innovation, Innovation Management, Literature Review, Brazil.

1. Introduction

Innovation has become a key concept in recent years, since helps to create truly innovative products and/or services that add value to consumers and consequently generate higher profit margins and better company's image. Organizations that seek the best results are managing their businesses in a context of constant changes. As some authors state, innovation is a prerequisite to survival, success and corporate continuity, especially in markets where competition is stronger (Pinheiro, 2002). Therefore, research and development towards innovation has becoming a relevant concern for companies and industrial sectors that aim improved results and competitiveness, particularly in emerging markets, e.g. in Brazil, where economy has been growing and improving and consumers have particular needs and expectations. In addition, aspects such as technological changes, numerous pressures for lifecycle reduction and tough global competition make innovation management an important tool for organizations survival (Cooper *et al.*, 2001). Moreover, the previous cited authors state that innovation management is a critical activity for all companies because it supports the strategic direction, guides the resources allocation, provide sustainability to business, create new capabilities and generate new knowledge, making enterprises more competitive. In addition, Zhang *et al.* (2012) claim that firms need to examine how to manage customer assets more effectively when making innovation strategies.

Costa and Nascimento (2011) claim that competitive innovation is more than just good ideas, because each innovation project involves many decisions, being necessary planning a decision process design. Innovation complexity has increased quickly, especially in recent years. As major forces that influence the competitive search for speed, efficiency and quality in innovation development are (Rozenfeld *et al.*, 2006): the increased market internationalization as well as product diversity and variety, current products lifecycle reduction, competition patterns change between organizations and consumer expectations concerning quality and technology. In this sense, Scholtissek (2012) mentions that many excellent ideas fail due to failures during the implementation. Other ideas initially considered as "great" fail because they not impress the customers. The previous author (Scholtissek, 2012) adds that Joseph A. Schumpeter already told: "Innovation is the process of finding economic applications for inventions". In other words, an invention is only an innovation when it reaches the commercial success.

In this context, this paper aims at analyzing publications on innovation in ten Brazilian operations management journals. The purpose is also to understand and point out common characteristics, innovation perspectives approached and research opportunities in the subject by verifying what has been studied in the Brazilian innovation context. Besides this introduction, the paper is structured as follows. Next section outlines the literature on innovation management and

the third section describes the research methods as well as the characteristics observed in the retrieved publications. The fourth section presents the results and discussion with regard to the literature analysis. Finally, the fifty section points out some conclusive points in addition to opportunities for future studies.

2. Literature on Innovation

According to management scholars, innovation capability is the most important determinant of firm performance (Mone *et al.*, 1998). Innovation is widely regarded as a critical source of competitive advantage in an increasingly changing environment (Crossan and Apaydin, 2010; Dess and Picken, 2000; Tushman and O'Reilly, 1996). Over the past years, researchers and industrialists have recognized the need for and the importance of developing approaches to enhance competitive advantage in new product development (Cormican and O'Sullivan, 2004). Developing new products and innovate are central questions also to mature industries, which have long lifecycle products, mature technology and solid billings (Costa and Nascimento, 2011).

Afuah (2003) considers that innovation is based on the use of a new technological or market knowledge to offer new products or services to customers. According to the same author, a product can be considered new when its features are improved or novel. In addition, innovation is something broad and can be understood as the process which aims to turn opportunities in new ideas and put them into practice widely. Therefore, innovation is important to turn technological potential (technological resources) into succeeded goods and services, because it is insufficient to associate technology and competitive edge, since there is no direct connection between them. This essential process consists of dominate adapted technologies to support innovation capability and develop innovation to build competitive edge through applications which correspond to customers' needs (Gomes and Kruglianskas, 2009).

The development of an innovation strategy includes setting goals, desirable domains and products. For this, it is necessary to define the internal and external sources which will be monitored and the key principles of sources management that will guide decisions in order to ensure that strategic objectives were attended (Gomes and Kruglianskas, 2009). In this sense, one of the main difficulties to innovate is that although companies can look to other firms to innovate, they hardly ever do this in a systematically manner and under an explicit strategy perspective, often limited to a unique source, in an isolated way. Few enterprises have a source information management strategy towards innovation, managing in an integrated approach several sources to obtain more results (Gomes and Kruglianskas, 2009). Most innovative companies manage different sets of innovation channels, incorporating not only sets of sources, but also management approaches to the interfaces.

They maintain multiple external sources and explain a clear strategy for using information sources to innovation (Linder *et al.*, 2003).

In Brazil, national companies initially imitated foreigners and then adapted the products to the local market (Nascimento *et al.*, 2008). Nowadays, after decades of imitation and innovation oriented to affluent groups, many of the competitive innovation opportunities are available in the market. Hence, products designed for the low income population are needed (Nascimento *et al.*, 2008).

Even though innovation definition and innovation management are tightly related each other, there are significant differences between those concepts. Innovation, as mentioned before, deals with products/processes/services which bring successful novelty to the market. On the other hand, innovation management regards the processes, activities and tasks which try to establish a culture towards the constant generation of innovation in a firm environment, since nowadays this is a key factor for the survival of a company.

Finally, although innovation has been widely studied in recent years and an unrestricted search of academic publications using the keyword *innovation* generates thousands of articles, yet reviews and meta-analyses are rare and narrowly focused, either around the level of analysis (individual, group, firm, industry, consumer group, region and nation) or the type of innovation (product, process, organizational and marketing) (Crossan and Apaydin, 2010), in addition to the level of innovation (radical and/or incremental). Therefore, this paper investigates the innovation topic through a literature review and analysis of publications in Brazilian operations management journals, using the research methods described in the following section.

3. Research Methods

This paper is a theoretical-conceptual study, based on the classification of Cauchick Miguel (2010) and Berto and Nakano (2000). It aims to achieve a better understanding of the innovation topic based on a literature review and analysis. The analysis was conducted in ten operations management journals published in Brazil: "*Produção*", "*Gestão & Produção*", "*Produto & Produção*", "*Revista Produção Online*", "*Gestão Industrial*", "*Revista de Administração e Inovação (RAI)*", "*Revista de Administração Contemporânea (RAC)*", "*Revista de Administração da USP (RAUSP)*", "*Revista Eletrônica de Administração (REAd)*", and "*Revista de Administração Mackenzie (RAM)*". It was a search using the keyword "innovation" (and "inovação" – a correlate term in Portuguese) in the title field. Next, an abstract analysis was carried out to verify if the paper were within the context of the study. An analysis of the types of innovation stated in the papers was

conducted. It was considered the typology described by the Oslo Manual (OECD, 2005, pp. 16-17, 48-49; Coral *et al.*, 2011), namely:

a) **Product (goods or services) innovation:** introduction of a new or significantly improved good or service, relative to its features. Includes considerable improvements in technical specifications, parts and materials, software, user interface or another functional characteristics;

b) **Process innovation:** implementation of a new or significantly improved production process (involves techniques, equipment and software used to produce benefits or services) or delivery (interest in enterprise logistics and packaging equipment, software and techniques to provide materials, allocate supplies in the company, or finished products delivery methods). This includes significant changes in techniques, equipment and/or software;

c) **Organizational innovation:** refer to the implementation of new organizational methods and may be changes in business practices, in organization of the workplace or in external relations of the company;

d) **Marketing innovation:** involve the implementation of new marketing methods. May include changes in product appearance and its packaging, product dissemination and distribution and methods for setting prices of goods and services.

The innovation intensity (incremental or radical) was also considered in the publications. The evaluation was conducted based on the following definitions (HBE, 2003; Coral *et al.*, 2011):

a) **Incremental innovation:** normally understood as the improvement of existing product or process whose performance has been significantly improved or reconfiguration of an existing technology for other purposes. Commonly, incremental innovation is safer than radical innovation besides bringing return on investment easily in a reasonable time, because typically are made inside companies;

b) **Radical innovation:** product or process whose characteristics, attributes or use differ significantly when compared to existing products and processes. Such innovations can involve radically new technologies or can be based on a combination of existing technologies to new uses. Radical innovation brings a technological revolution, leading to the extinction what existed before it.

Besides the innovation types and intensity, the industrial economy sectors, which were the aim of the studies, were checked, as well as the classification of the journals in Webqualis (Qualis-CAPES) journal evaluation system. The research methods adopted in the publications as well as the paper's objective were also considered (to assess what innovation approach was used). All the results concerning those issues are presented next.

4. Results and Discussion

In this section, the obtained results are discussed after the analysis of publications regarding innovation in Brazilian operations management journals. Innovation level (radical and/or incremental), types (product/service, process, organizational and/or marketing), and general framework are then discussed in the subsections 4.1, 4.2 and 4.3.

4.1. General publications demographics

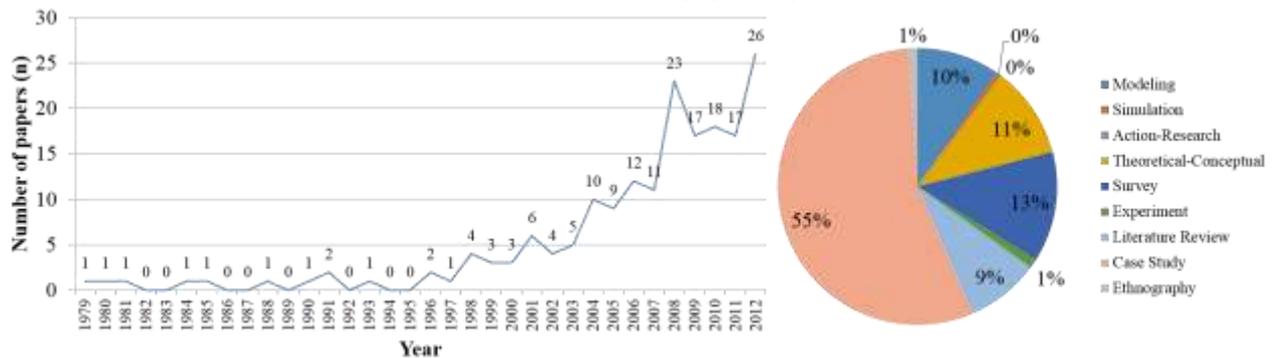
One hundred eighty two articles were identified in the ten journals mentioned in Section 3. Those articles have innovation as the central topic. It is important to point out that articles investigating aspects of innovation outside Brazil were eliminated, since the main interest was to understand how innovation management have been studied in the country. The journal “RAI – *Revista de Administração e Inovação*” was the one with has the highest number of published articles (66 papers), what could be expected due to the fact that this is one of the journal subjects. RAI is followed by “RAUSP – *Revista de Administração da USP*” (24 papers), “RAC – *Revista de Administração Contemporânea*” (23 papers) and “REAd – *Revista de Administração da UFRGS*”. In addition, it was observed that journals focused on the managerial viewpoint have more publications about innovation than journals more related to production and operations management. For example, “*Gestão Industrial*”, a more focused production and operations management journal and the most highlighted in terms of papers regarding innovation, has 17 papers, which is lower than the previous journals (more focused on managerial aspects).

Figure 1 shows the number of papers published by year and the most used research methods in the publication portfolio. It is possible to notice that publications on innovation issue began to emerge in 1979. However, by 2000 the issue was not yet intensively studied, a fact that started from the following year (2001), the first peak of publications. Since then, the number of studies has grown until 2009, the year with the highest number of investigations on the topic, stabilizing thereafter. It is important to mention that until 1990, only RAUSP papers were analyzed since the other journals did not existed in the period from 1979 to 1990.

Regarding methodological aspects, case studies (single or multiple) have been largely the most adopted research method (55% of the portfolio) in Brazilian publications. In general, the studies investigate innovation characteristics in certain companies or clusters to identify the existence of these features as well as the influence degree in the innovation development in these locations. It is worth stressing that a large amount of case studies are not rigorous in terms of methodological research. Other research methods include: surveys (13%), where scholars normally

aim to show a current picture of a given subject or to test hypothesis; theoretical-conceptual studies (11%), where authors try to create new theories and/or concepts that contribute to the knowledge; and theoretical modeling (10%), where usually authors create a conceptual model towards the creation of a better innovation management culture.

Figure 1 – Papers/year about innovation in Brazilian operations management journals (left) and research methods used in Brazilian innovation papers (right).



Source: developed by the authors.

Another analysis was about which economy sectors are of greater interest in innovation studies. Most papers deal with the topic considering companies and sectors in a general manner, not focusing in a specific industrial segment. On the other hand, there is a significant number of articles which study sectors that have been important technological advances, such as food industry (Rodrigues et al., 2012; Macêdo et al., 2011; Cabral, 2007), oil and gas (Antunes Júnior et al., 2011; Silvestre and Dalcol, 2008; Pellegrin et al., 2007; Leite et al., 2006), computing (Diegues and Roselino, 2012; Moreira and Vargas, 2012; Malachias and Meireles, 2009), electrical (Pinto and Maisonnave, 2012), and electronics (Zen and Fracasso, 2012; Perin et al., 2004).

During the content analysis, it was observed a great variety of approaches within the subject (innovation) in another less addressed areas, such as: NASA (Quinello, 2009) in a longitudinal case study; ceramics (Assunção and Sicsú, 2001; Scur and Garcia, 2008); flowers delivery (Costa et al., 2012); personal hygiene, perfumery and cosmetics (Vilha and Quadros, 2012); prepared desserts (Moretti et al., 2010) etc. There is also another area in publications, which comprises the studies about government policies (national, regional or even municipal) (França Junior and Frasson, 2010; Dudziak and Plonski, 2008; Pereira and Kruglianskas, 2006; Calligaris and Torkomian, 2003; Marcovitch et al., 1991). In general, those studies aims to provide incentives for the generation of innovative projects.

Although the innovation concept was expanded in recent years (as mentioned in this paper's introduction), the technological aspect still remains stronger. This is corroborated analysing that the main specific sectors exposed before were all related to technological features (oil and gas,

electronics, computing and electrical industry). Yanez *et al.* (2010) corroborate this stating that as the interest in Technology and Innovation Management (TIM) have been grown so did the journal outlets and the number of professional associations dedicated to the research and education in the field. The cited authors mention ten journals specialized in the subject and some associations and conferences focused on TIM (such as IAMOT and PICMET), due to the growing interest about the subject of innovation. Furthermore, a substantial amount of articles studies the university-company cooperation relationship and cooperation networks. The majority of these papers considers the investigation of features that contribute to the innovation prospection and generation as well as the variables influencing the benefits and/or problems in the relationship between private companies and universities.

Another emerging approach concerning innovation deals with environmental issues that companies have been facing in the last years. It was found that especially product and process innovation contribute to a better use and disposal of natural resources, starting from the product and/or process design. Nevertheless, Gonçalves-Dias *et al.* (2012) state that there is a high level of complexity on the integration of *green competences* in product development activities. Although this is a difficult process, the improvement of environmental features brings technical, social, cultural and financial benefits to firms and the surrounding communities.

4.2. Innovation level

Table 1 shows the results about the innovation level by journal. It is worth mentioning that if a given paper talks about two types (radical and incremental innovation), both types were considered in the counting. Most articles do not specify the innovation level studied. This occurs because a great amount of papers gives preference to discuss the topic in a broad sense, such as the influence of organizational learning, culture, clusters, etc. on innovation or innovation management as well as how laws and other methods to support innovation contributes in this process. RAI is the journal with more studies in radical or incremental innovation, since it has the highest amount of papers published. This may be due to it is a specialized journal on the subject.

Table 1 – Innovation levels by journal.

	Qualis- CAPES (Eng. III)	Not Specified	Radical Innovation	Incremental Innovation	Total innovation level per journal
<i>Revista Produção Online</i>	B4	7	2	2	4
<i>Produto & Produção</i>	B4	-	3	1	4
<i>Produção</i>	B2	4	2	1	3
<i>Gestão & Produção</i>	B2	4	3	3	9
<i>Gestão Industrial</i>	B5	14	2	2	4
<i>Revista de Administração e Inovação (RAI)</i>	B4	11	35	30	65
<i>Revista de Administração Contemporânea (RAC)</i>	B4	14	5	9	14
<i>Revista Eletrônica de Administração (REAd)</i>	B4	17	3	4	7
<i>Revista de Administração da USP (RAUSP)</i>	B5	15	7	5	12
<i>Revista de Administração Mackenzie (RAM)</i>	B4	1	2	2	4
Total	-	87	64	59	127

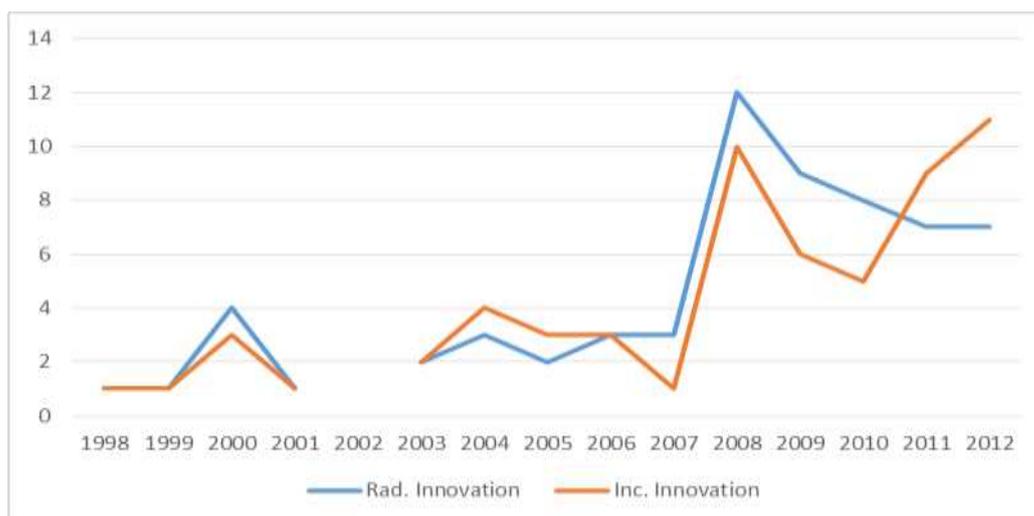
Source: developed by the authors from journal databases.

Analysing the Qualis-CAPES classification, one can observe that the journals *Produção* and *Gestão & Produção* are the most qualified in the portfolio considered. In addition, these journals are the only that have impact factor registered in Scimago Journal Rank (SJR, 2014): 0,177 (*Produção*) and 0,200 (*Gestão & Produção*). However, they have fewer numbers of papers in the innovation topic due to the fact of having a higher variety of other topics (besides innovation) regarding production engineering and operations management.

Furthermore, it was perceived that most publications in Brazil deals with current products instead of the development of new goods and services, i.e. investigate an already existing product/service/process/business model and their improvements or possibility of improvements towards innovation. Nevertheless, some exceptions could be found. For example, Aranda et al. (2008) used design of experiments (DOE) to search for improvements in a portable grill, which according to the authors has a new and innovative design. Almeida and Barbosa (2012) report the development of a sachet opener, named *Khort*, which was exposed at Invention & New Product Exposition (INPEX) in 2010 at USA and won the Best America's Invention award.

In addition, it was analysed the trends regarding the innovation level interest in publications since 1998, which are shown in Figure 2. It was considered the last 15 years because in this period There is the highest volume of papers. Moreover, it is important to point out that the papers not specifying the innovation levels were not considered in this analysis by year.

Figure 2 – Innovation levels by year (since 1998)



Source: developed by the authors from journal data bases.

Considering the last 5 years, one can observe that incremental innovation has a growing interest in publications comparing to radical innovation (with a decrease interest in the last 5 years). Types of innovation and approaches are presented and discussed the following subsection.

4.3. Types of innovation and approaches discussed

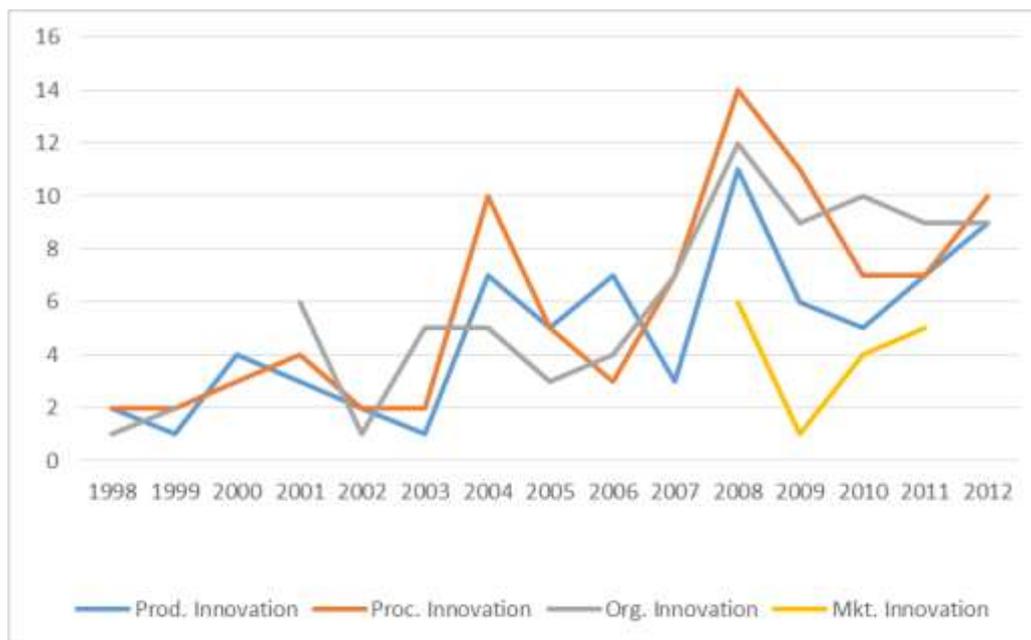
It was also verified how often product innovations consequently give rise to process innovations, since new procedures and methods are needed to enable product manufacturing. Once again it is important to point out that if a paper mentions more than one innovation approach (i.e. product and process innovation), all approaches were considered, as shown in Table 2, followed by Figure 3, that shows the innovation approaches by year since 1998.

Table 2 – Innovation approaches by journal

	Not Specified	Prod. Innovation	Proc. Innovation	Org. Innovation	MKT Innovation	Total approaches/journal
<i>Revista Produção Online</i>	4	2	5	5	1	13
<i>Produto & Produção</i>	1	1	1	-	1	3
<i>Produção</i>	3	3	2	1	-	6
<i>Gestão & Produção</i>	4	4	2	1	2	9
<i>Gestão Industrial</i>	4	9	7	5	-	21
<i>Revista de Administração e Inovação (RAI)</i>	1	26	31	39	13	101
<i>Revista de Administração Contemporânea (RAC)</i>	2	13	11	7	0	31
<i>Revista Eletrônica de Administração (REAd)</i>	8	4	9	9	1	24
<i>Revista de Administração da USP (RAUSP)</i>	6	9	10	8	0	27
<i>Revista de Administração Mackenzie (RAM)</i>	-	3	2	2	1	8
Total	33	74	80	77	19	243

Source: developed by the authors from journal data bases.

Figure 3 – Types of innovation by year (since 1998)



Source: developed by the authors from journal data bases.

From Table 2, it is observed that 4 of the 10 journals have more studies in process innovation, while 5 have more product innovation approaches. However, process innovation appears to be the most innovation approach studied in the analyzed papers. An emerging and recent interest on organizational innovation was noticed. Especially in more focused business and management journals, papers that deal with the importance of new business models, contributions of the organizational learning, innovation systems, etc. have been published, showing that this is an approach with growing importance to develop an innovation culture that aims to generate better products and processes constantly. In addition, RAI has more organizational innovation approach in its publications, corroborating this growing importance.

It is possible to observe in Figure 3 that the trends regarding each type of innovation are similar. Product, process and organisational innovation have these similarities because many papers consider the innovation management as the central issue, which consequently regards various innovation approaches. Thus, one can infer that the interest in innovation topic has increased in Brazil in a similar way (considering each innovation approach separately) except marketing innovation.

Finally, it was observed that marketing innovation is the approach which has not much attention in publications in Brazil (19 occurrences). This might be an opportunity for future research, since product and process innovation are more studied in the country. Hence, approaches to conduct new ways of disseminate and promote innovations made by companies can be developed

to enhance their image and reputation. Having presented the results, the next section presents the main conclusive points of this study as well as future research opportunities.

5. Conclusions

This study analyzed papers regarding innovation in ten Brazilian operations management journals, aiming to find the main characteristics of the studies and what have been studied in the subject in the country. Firstly, it was found that although the concept of innovation has been wide expanded, the majority of the studies still considering the technological innovation concept. This might be explained because of the recent expansion of the concept, in 2005, through the Oslo Manual. However, even the studies developed after this change of innovation definition still give priority to technological characteristics of innovation. In addition, it was observed that a major quantity of the papers deals with product, process and organizational innovation instead of marketing innovation. Additionally, organizational innovation has been growing in the latest years, considering the emergence of new business models and changes in labor relations among companies such as the automotive industry in recent years, for example.

In general, most publications in Brazil investigates the importance of managerial aspects of innovation, such as organizational learning, knowledge management, culture, cooperation networks, local productive arrangements, etc. From the methodological point of view, case studies are the preferred method, followed by survey, modeling and theoretical-conceptual articles. Case studies are more popular because most authors investigated single or multiple companies in their research, pointing out how innovation occurs in the cases considered. Nevertheless, it is worth stressing that a large amount of case studies are not rigorous in terms of methodological research. Furthermore, during the sector analysis, it was discovered that most papers study the industry altogether, without specify an area or type of industry. However, in other articles, oil and gas, informatics, food industry, petrochemical and even government (incentive laws for innovation projects) were the most investigated sectors in Brazil.

Moreover, another important finding was the high growth interest regarding the topic in the last decade. It was identified that the great majority of the studies was developed from 2001 and, since then, a considerable amount of papers have been published in Brazilian operations management journals. This growing interest can be justified with the increasing need to expose what is new and can bring financial benefits, besides environmental, technical and social advantages, considering the innovation concept expansion.

The main limitation that is important to highlight is that this work is part of an ongoing study, which will generate more results and contributions to the innovation topic, with the main

objective of present evolutionary aspects of the Brazilian literature about innovation. As opportunities for future research, a separate investigation of each innovation approach (product/process/organizational/marketing) in Brazil is intended to be conducted, finding common and particular characteristics among them. Besides, an extension of the analysis of articles about innovation published worldwide is suggested. This for instance could investigate the topic specifically in other emerging markets, such as Russia, India, or China. In addition, the main characteristics and constructs that impact on innovation management in Brazil are going to be analyzed, to find out what are the most impactful features regarding the subject.

Finally, another possibility is the comparison between innovation studies in Brazil and other developed country, such as USA, Germany, Japan, etc. Additionally, studies about innovation characteristics and advances in the energy and natural resources and renewable energies sectors are another opportunities, since it was noticed few studies (in Brazil) regarding both subjects.

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