

INNOVATION PROCESS IN PUBLICLY TRADED COMPANIES OF SERRA GAÚCHA

PROCESSO DE INOVAÇÃO EM EMPRESAS DE CAPITAL ABERTO DA SERRA GAÚCHA

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ABSTRACT

Purpose - The innovation process is characterized by being continuous and focused mainly on the differentiation of the organizations, aiming at obtaining a competitive advantage. Thus, this study aimed to analyze the innovation process in publicly traded companies of Serra Gaúcha.

Design/methodology/approach - A quantitative study was conducted through a survey with descriptive statistical analysis. The questionnaire was prepared based on the study of Floriani, Beuren and Machado (2013) and sent to seven companies from Serra Gaúcha listed on BM&F Bovespa. The analysis was segmented into organizational capabilities, innovation contexts, innovation focus, and enhanced performance.

Findings - The results showed that there are procedures in the processes in most companies, and the focus of innovation is especially on products and directed to the market. All organizations use their own resources to execute innovations. Most of the registered patents are in the national sphere, and two companies have not registered any patents in the last two years.

Originality/value - Previous studies have not identified any companies from Serra Gaúcha as participants in the innovation process in Brazilian publicly traded companies. Besides, it is impossible to define a profile of the region from the data treatment in previous studies. The proposed study analyzes how the innovation process occurs in publicly traded companies of Serra Gaúcha listed on BM&F Bovespa.

Keywords: Innovation process. Publicly traded companies. BM&FBovespa. Serra Gaúcha.



RESUMO

Objetivo - O processo de inovação caracteriza-se por ser contínuo voltado especialmente a diferenciação das organizações, visando obter vantagem competitiva. Sendo assim, o artigo buscou analisar o processo de inovação em empresas de capital aberto da Serra Gaúcha.

Design/metodologia/abordagem - Foi realizado um estudo quantitativo através de uma survey com análise estatística descritiva. O questionário foi elaborado a partir da proposta de Floriani, Beuren e Machado (2013) e enviado para sete empresas com capital aberto da Serra Gaúcha listadas na BM&F Bovespa. A análise foi segmentada em capacidades organizacionais, contextos da inovação, foco da inovação e performance alcançada.

Resultados - Pode-se perceber que na maioria das empresas há procedimentos nos processos, o foco da inovação é especialmente em produtos e direcionado ao mercado. Todas as organizações utilizam recursos próprios para executar as inovações. A maioria das patentes registradas encontra-se na esfera nacional, e duas empresas não realizaram o registro de patente nos últimos dois anos.

Originalidade/valor - Estudos anteriores não identificaram empresas da Serra Gaúcha como participantes no processo de inovação em empresas brasileiras de capital aberto. Além disso, é impossível definir um perfil da região a partir do tratamento de dados em estudos anteriores. O estudo proposto analisa a forma como o processo de inovação ocorre nas empresas de capital aberto da Serra Gaúcha cotadas na BM&F Bovespa.

Palavras-chave: Processo de inovação. Empresas de capital aberto. BM&FBovespa. Serra Gaúcha.

1 INTRODUCTION

Several industrial segments constitute Serra Gaúcha from drinks, furniture, plastics, textile, and confections. Besides, the region is one of the first metal-mechanic poles of the interior of Rio Grande do Sul, Brazil (Triches, 2015). Therefore, innovation is always present within industries, whether for improving the production process or the launch of new products, to obtain a competitive advantage.

Schumpeter (1961) developed the concept of innovation and described it in three dimensions. Innovation is not merely a solo project but a process in which organizational capabilities and resources must be taken into account, seeking the organization's commitment and motivation.

This study aims to evaluate the innovation process through the Barret and Sexton (2006) model considering aspects related to focus and result, organizational capabilities, context, and process. In a similar study, based on the Barret and Sexton (2006) model, Floriani, Beuren and Machado (2013) analyzed the innovation process in Brazilian publicly traded companies, establishing a ranking of the potentially innovative ones.

Floriani *et al.* (2013) have not identified any companies from Serra Gaúcha as participants. Besides, it is not possible to define a profile of the region from the data treatment. The study aims to analyze how the innovation process occurs in publicly traded companies of Serra Gaúcha listed on BM&F Bovespa.

The first section presents the studies related to the subject and addresses the main aspects of the innovation process. The second section concerns methodological aspects, being a study applied through a survey, with a quantitative approach and descriptive statistical analysis. The third section presents the analyses carried out on the innovation process in publicly traded companies in Serra Gaúcha listed on the BM&F Bovespa. The fourth section concerns the final considerations.



2 THEORETICAL BACKGROUND

The theoretical background addresses the theoretical aspects of the study, including a brief history and concepts related to innovation and how the innovation process occurs in Brazilian publicly traded companies. The primary authors cited are Schumpeter (1961), the Oslo Manual (OECD, 2005), and Floriani *et al.* (2013).

2.1 INNOVATION

Joseph Schumpeter (1961) pioneered the concept of innovation. His theory focused on entrepreneurs' search for the use of technological innovation, a new product or service, or a new process to produce it in order to gain a strategic competitive advantage. Thus, this was the only example of innovation in the market for a specific time, with which the entrepreneur could earn higher profits (Tidd, Bessant, & Pavitt, 2008). In the theory of "creative destruction," Schumpeter (1961) highlighted the role of innovation through entrepreneurs who launched new products and challenged established companies, and continuously interrupted the usual forms of production, organization, and distribution.

Schumpeter (1961) divided the process of technological change into three phases:

- a) invention: as a discovery process, of new technical principles, potentially open for commercial exploitation;
- b) innovation: as a process of developing an invention commercially; and
- c) diffusion: as an expansion stage of innovation in commercial use through new products and/or new processes.

Therefore, it is possible to distinguish innovation from invention. Schumpeter (1961) considered innovation to be the marketing of inventions. Inventions may occur during the innovation process, but not all of them become innovations. As long as inventions are not put into practice, they are economically irrelevant (Schumpeter, 1961). In other words, an invention becomes an innovation when there is commercial and economic value creation (Schumpeter, 1961; Freeman & Soete, 2008).

One can think of innovation as a new product, but it can also mean a new production process, the replacement of a material developed at a lower cost, the reorganization of production, or even the improvement of methods or instruments that make innovation (Kline & Rosenberg, 1986). Innovation requires opening new markets and implementing new ways to serve those already established and mature (Bessant & Tidd, 2009).

The term innovation, in recent decades, has been approached from different perspectives as to the typologies of innovation, commonly using those instituted by the Organization for Economic Cooperation and Development (OECD, 2005) that presented the Oslo Manual. The manual defines concepts, classifications, guidelines, and policies for measuring innovation at the international level. It is an international source of guidelines for collecting and using data on innovative activities in the industry. The Oslo Manual (OECD, 2005, p. 46) defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations."

By definition, the Oslo Manual (OECD, 2005) stated that all innovations must contain some degree of novelty. As a result, three concepts emerge: new for the company, new for the market, and new for the world. The dimensions of the product, process, marketing, and organizational innovations defined by the Oslo Manual are described in Table 1.



Table 1 – Innovation Dimensions

Innovation Dimensions	Definition
Product Innovation	[...] is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.
Process Innovation	[...] is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
Organizational Innovation	[...] is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.
Marketing Innovation	[...] is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.

Source: OECD (2005, p. 48-51).

Companies innovate for different reasons, and their objectives may involve products, markets, efficiency, quality, or the ability to learn and implement change. Such activities lead them to be more competitive and create opportunities to enter new markets. A company's innovation process depends on resources such as the structure of its relationships with sources of information, knowledge, technologies, practices, human and financial resources. Innovation is a continuous process where companies always make product and process changes and seek new knowledge (OECD, 2005).

Another perspective on how to recognize innovation is the novelty degree involved. Updating a product model is not the same as appearing with a completely new product concept, with distinct characteristics and discoveries. Innovation can go through different degrees of novelty, ranging from minor incremental improvements to radical changes according to the different stages of the life cycle of a given product (Schumpeter, 1961).

Incremental innovations occur continuously in any industry, although they may vary by sector or country depending on demand pressure, socio-cultural factors, opportunities, and technological trajectories (Bessant & Tidd, 2009). Innovation is considered radical when it breaks existing trajectories, inaugurating a new technological route. Radical innovation is usually the result of Research and Development (R&D) activities and is discontinuous in time and sectors (Barbieri, 2003). Such innovations may involve radically new technologies, based on the combination of existing technologies without new uses, or may derive from new knowledge (OECD, 2005).

Utterback (1971) stated that the innovative process must consider the characteristics of the company environment as skills and technical knowledge, the relationship between individuals and groups in the organization, and the transfer of knowledge between economic, academic, and social environments. The innovative subprocesses are idea generation, problem-solving, and diffusion.

For Cooper (1990), the creator of the Stage-Gate System, the innovative processes should bring new products to the market in the shortest time possible. This process divides innovation into different stages, each consisting of a group of activities and tools (validation and checklist). Managers occupy each stage-gate and have multidisciplinary skills and authority to approve the resources needed in the project. The Stage-Gate System has an impact on process innovation, as all processes are reviewed at each stage. Its role includes (Cooper, 1990):

- a) review of the quality of entries or deliveries;
- b) evaluating the quality of the project from an economic and commercial point of view; and
- c) approval of the action plan for the next stage and allocate the necessary resources if necessary.

For Chesbrough's Open Innovation model (2006), the innovation process is not static but dynamic. Research is the basis of knowledge, and learning comes with observing the product in

the market, gathering insights. When innovation is closed, it occurs within the company and risks becoming slow and bureaucratic. The internet allows the opening of the innovative process, with the crossing of data and the possibility of thinking through external standards. In this sense, Open Innovation considers that valuable ideas can come from outside the company taking advantage of the diffusion of knowledge through professors, academics, startups, and customers.

2.2 INNOVATION PROCESS IN BRAZILIAN PUBLICLY TRADED COMPANIES

Publicly traded companies, also referred to as publicly-held companies, are those whose capital is divided into shares, and their shares are admitted to trading in the securities market under Articles 1 and 4 of Law 6404 (Brasil, 1976b). Therefore, they are subject to inspection and regulation established by the Securities Commission - CMV (Brasil, 1976a). In Brazil, publicly traded companies trade their shares in the Futures and Commodities Exchange and São Paulo Stock Exchange (BM&F Bovespa).

Floriani *et al.* (2013) conducted a study to identify the innovation process used by Brazilian public traded companies by applying a survey. The survey was sent to 484 companies, with a return of only 22, none of which were located in Serra Gaúcha.

The component elements of the innovation process researched were classified as organizational capabilities, innovation capabilities and/or contexts, innovation context, innovation focus, and enhanced performance (Floriani *et al.*, 2013, p.791). The main results pointed out were:

- a) 95.5% of the companies have activities that encourage innovation;
- b) 86.4% of the leaders encourage people to take initiatives;
- c) 68.2% indicate that the company has procedures for all services;
- d) the majority of the respondents pointed out that the resources allocated to innovation are sufficient;
- e) 52.5% define that the resources to carry out innovations are their own;
- f) the continuous activities related to R&D, are mostly (59.1%) internal;
- g) 86.4% of respondents characterize the economic environment of companies as dynamic or very dynamic;
- h) 37.5% of patents and intellectual property registrations from 2005 to 2007 were national, 12.5% international, and 50% were not registered;
- i) the main external sources for the realization of innovations are suppliers, customers, and competitors;
- j) most of the innovations carried out are related to process and product;
- k) 76% of the organizations reward those involved when the objectives are achieved;
- l) 80% of the respondents consider that the product and process innovations reached the organization's initial expectations to a high degree;
- m) 90.9% recognize the importance of improving the quality of goods and services as high, and 81.8% indicate the importance of market share as high.

3 RESEARCH METHOD AND PROCEDURES

The research is characterized as descriptive through a quantitative approach since the objective is to identify how innovation occurs in publicly traded companies in Serra Gaúcha. The population defined for the study was composed of seven publicly traded companies located in Serra Gaúcha, which traded their shares in the Futures and Commodities Exchange and São Paulo Stock Exchange (BM&F Bovespa) in June 2017. The period for sending and return of the questionnaires oc-



curred from July 2017 to September 2017. The participating companies will not be identified, as we aimed to have a higher return rate in the questionnaires and encourage the answers' spontaneity.

Only one of the companies to which the questionnaire was sent did not reply. In contact with a former employee of the company, we obtained the information that the Research and Development Center had its activities closed in Caxias do Sul. Therefore, we obtained the return of six companies. For each company, ten employees related to the innovation department of the organizations were asked to fill out the questionnaire, and the contact person defined the choice of professionals who would answer it.

The questionnaire was e-mailed to the employees of the six selected companies. Prior contact was also made to confirm the organizations' availability to participate in the survey. It was elaborated based on Floriani *et al.* (2013) and validated with a specialist in the field.

In the end, the sample consisted of thirty-four people and was considered intentionally non-probabilistic. Hair, Page and Brunsveld (2019) clarified that in the non-probabilistic sample, the chances of selection are unknown and the results cannot be generalized. The companies will be identified in the study as C1, C2, C3, C4, C5, and C6. Table 2 demonstrates the return of valid questionnaires.

Table 2 - Questionnaires applied in the study

Company	Number of respondents
C1	7
C2	10
C3	1
C4	5
C5	1
C6	10
Total	34

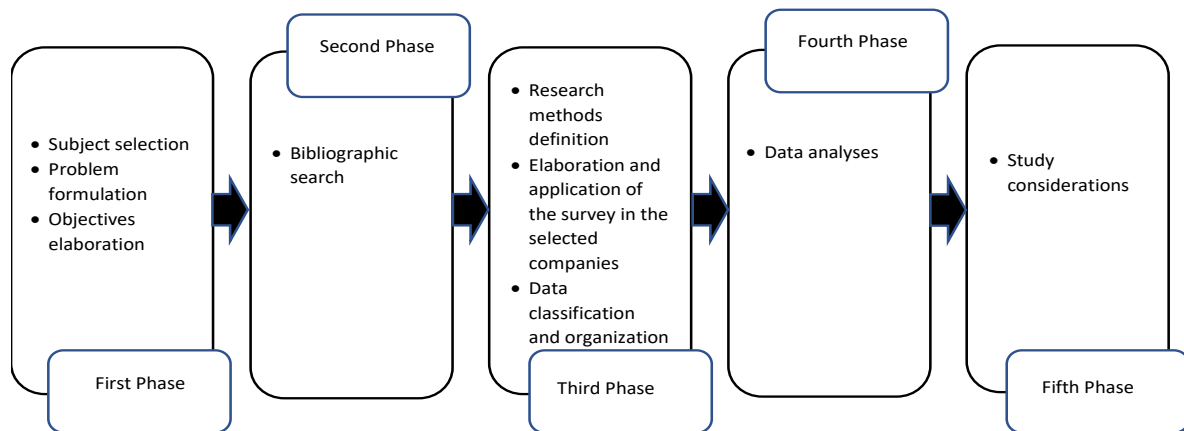
Source: Elaborated by the authors based on the study (2017).

The analysis technique used is classified as descriptive statistical analysis, with frequency analysis. It is possible to establish the relationship between the categories of the subject studied: the process of innovation in public traded companies in Serra Gaúcha, analyzing aspects relating to organizational capabilities, innovation context, innovation focus, and enhanced performance (Vergara, 2010).

In this context, the steps applied can be seen in Figure 1:



Figure 1 – Research phases



Source: Elaborated by the authors based on Barros and Lehfeld (2007, p.96).

The participating companies belong to different segments, according to BM&F Bovespa (2017). Three are from the road material segment, one from the footwear segment, one from the furniture segment, and one from the threads and fabric segment.

4 DATA ANALYSES AND DESCRIPTION

Data analysis and description were carried out with the help of Microsoft Excel, in which the total respondents and the percentage frequency of responses were calculated. In some items, respondents could select more than one option. Therefore, the total number of responses may be higher than the number of respondents.

In cases that respondents did not answer a question, their participation in the item was disregarded, considering the total number of respondents in the question. This justifies that in some questions, the total of respondents was inferior to 34.

As in the study proposed by Floriani *et al.* (2013), the analyses were segmented into four categories: organizational capabilities, innovation contexts, innovation focus, and enhanced performance.

4.1 ORGANIZATIONAL CAPABILITIES

Organizational capabilities involve internal resources and skills related to encouraging the development of innovation, which may or may not be related to financial aspects. Therefore, both the qualification, development, and motivation of the people involved and the procedures and resources involved in the process are considered (Barret & Sexton, 2006; Floriani *et al.*, 2013). Table 3 shows the questions (2, 6, 10 to 16, 19, and 25) and answers related to organizational capabilities.

Table 3 – Organizational capabilities

ORGANIZATIONAL CAPABILITIES									
2. How many professionals work in the Research and Development (R&D) sector according to the level of education/training?	Education				Complete		Ongoing		
					n	%	n	%	
	Doctorate (Ph.D.)				4	4%	3	3%	
	Master				9	8%	7	6%	
	Especialization/MBA				8	7%	1	1%	
	Undergraduate				17	16%	3	3%	
	Technical education				47	44%	0	0%	
High school				9	8%	0	0%		
Elementary school				0	0%	0	0%		
Untrained				0	0%	0	0%		
6. Does the company have activities that encourage the frequent implementation of innovations?	I completely agree		I agree		I disagree		I completely disagree		
	n	%	n	%	n	%	n	%	
8		24%	20		59%	6		18%	
0		0%	0		0%	0		0%	
10. Regarding procedures, the organization:	Has procedures for all services		Has procedures for some services		Has procedures in the implementation phase		Has no procedures		
	n	%	n	%	n	%	n	%	
	22	69%	10		31%	0		0%	
0		0%	0		0%	0		0%	
11. Do leaders encourage people to take the initiative?	Frequently		Occasionally		Rarely		They do not encourage		
	n	%	n	%	n	%	n	%	
	21	62%	13		38%	0		0%	
0		0%	0		0%	0		0%	
12. Do the leaders promote a strong emphasis on maintaining the group's relationship?	Frequently		Occasionally		Rarely		They do not encourage		
	n	%	n	%	n	%	n	%	
	14	42%	16		48%	3		9%	
0		0%	0		0%	0		0%	
13. Does the company value when people take risks, even when failures occur?	I completely agree		I agree		I disagree		I completely disagree		
	n	%	n	%	n	%	n	%	
	2	6%	19		56%	12		35%	
1		3%	1		3%	1		3%	
14. Does the company place high priority on learning and experimenting with new ideas?	I completely agree		I agree		I disagree		I completely disagree		
	n	%	n	%	n	%	n	%	
	5	15%	19		56%	10		29%	
0		0%	0		0%	0		0%	
15. I believe that the amount of each type of resource devoted to innovations is:	Inexistent		Scarce		Sufficient		Abundant		
	n	%	n	%	n	%	n	%	
0		0%	10		30%	20		61%	
3		9%	3		9%	3		9%	
0		0%	9		27%	20		61%	
0		0%	4		12%	27		79%	
0		0%	4		12%	26		76%	
4		12%	4		12%	4		12%	
16. The resources for making innovations are:	Own	Banks	Suppliers	Clients	Research institutes	Government support			
	n								
	34	3	4	1	10	11			
	%								
100%	9%	12%	3%	29%	32%				
19. From 2014 to 2016, were Research and Development (R&D) activities carried out to implement new products or processes?	Yes, they were.							No, they were not.	
	Continuous				Occasional				
	n	%	n	%	n	%	n	%	
30		91%	2		6%	1		3%	
11		33%	9		27%	13		39%	
3		10%	26		87%	1		3%	
25. What is the level of difficulty associated with each of the situations exposed below, faced by the company during the attempt or implementation of innovations?	Level of difficulty								
	High		Medium		Low		Not applied		
Situations	n	%	n	%	n	%	n	%	
Economic risk	13	38%	14	41%	7	21%	0	0%	
High innovation costs	17	52%	8	24%	8	24%	0	0%	
Shortage of appropriate sources of funding	4	12%	22	67%	5	15%	2	6%	
Organizational rigidity	3	9%	15	44%	16	47%	0	0%	
Lack of qualified personnel	1	3%	22	65%	10	29%	1	3%	
Lack of information about the technology	2	6%	13	38%	19	56%	0	0%	
Lack of information about markets	0	0%	9	26%	25	74%	0	0%	
Scarce possibilities for cooperation with other companies/institutions	3	9%	12	36%	17	52%	1	3%	
Difficulty in conforming to standards, norms and regulations	3	9%	5	15%	23	68%	3	9%	
Lack of institutions with the power to validate new technologies	3	9%	17	50%	13	38%	1	3%	
Poor customer response to new products	2	6%	25	74%	6	18%	1	3%	
Scarcity of adequate external technological services	3	9%	8	24%	22	65%	1	3%	



Source: Elaborated by the authors based on the study (2017).

The survey shows that 52% of the Research and Development sector personnel have technical or high school education. Only 7% of the people in this department have a Ph.D. (complete or ongoing), and 14% have a master's degree (complete or ongoing). At C3, the maximum degree of education in this sector was identified as the undergraduate level. C4 did not answer this question.

With 83% of employees involved in the research, they recognize that the company often encourages innovation. Also, 100% point out that leaders encourage people to take the initiative frequently and occasionally, as well as 90% identify that leaders promote an emphasis on maintaining the group's relationship. Only 62% agree that the company values when people take risks, even when failures occur, although 71% point out that the company places a high priority on learning and experimenting with ideas.

Regarding procedures, 100% point out that the company has procedures for all or some services, indicating standardization of processes. Regarding the resources allocated to innovations: 88% consider (sufficient or abundant) management attention and qualified personnel; 73% consider (sufficient or abundant) materials, space, and equipment; and 70% consider (sufficient or abundant) financial resources. Therefore, although there is no unanimity, this research shows the same perceptions as the studies raised by Floriani *et al.* (2013). Overall, the resources are sufficient, the most scarce being the financial resource (30%).

All respondents pointed out that 100% of the resources used to carry out innovations are their own, unlike the study by Floriani *et al.* (2013), which reported that 52.5% of the resources for the development of research are their own. Of the companies, only the employees of the three companies in the segment of road material indicated the use of resources from research institutes and government support.

It is noticeable that the R&D activities developed for the implementation of new products and processes, in their majority (91%), are continuous as well as internal, and for the external R&D activities, this percentage reduces to 33%. It is noteworthy that 39% of external R&D activities were not even developed. Only 10% of respondents state that training activities for innovations are continuous, and 87% identify them as occasional.

As for the level of difficulty faced in attempting or implementing innovations, 52% point to high innovation costs, followed by 38% economic risk and a 12% shortage of appropriate funding sources, meanwhile, the low level of difficulty is related to lack of information about markets (74%), difficulty in adapting to standards, norms, and regulations (68%), and shortage of appropriate external technological services (65%).

4.2 INNOVATION CONTEXTS

The innovation context involves two visions (Barret & Sexton, 2006): market or resource-based. The market-based view identifies market conditions in the face of the ease, restriction, or direction of innovative activities. The resource-based view considers the organization's own resources in developing and planning activities (Barret & Sexton, 2006; Floriani *et al.*, 2013). Table 4 presents the questions (7, 20 to 23) and answers related to innovation contexts.



Table 4 – Innovation contexts

INNOVATION CONTEXTS								
7. How do you characterize the economic environment in which the company is inserted?	Very dynamic		Dynamic		Stable		Very stable	
	n	%	n	%	n	%	n	%
	10	29%	21	62%	2	6%	1	3%
20. In the period from 2014 to 2016, was (were) acquired/developed:	Yes, they were						They were not	
	New			Updates				
	n	%	n	%	n	%	n	%
Softwares	13	34%	24	63%	1	3%	1	3%
Machinery and equipment	29	74%	9	23%	1	3%	1	3%
21. In the period from 2014 to 2016, was (were) acquired/developed:	Yes, they were						They were not	
	National			International				
	n	%	n	%	n	%	n	%
Patents and intellectual property records	20	56%	7	19%	9	25%	9	25%
22. Inform the importance of external sources for the realization of innovations	Degree of importance							
	High		Medium		Low		Irrelevant	
	n	%	n	%	n	%	n	%
External sources								
Suppliers	27	79%	6	18%	1	3%	0	0%
Clients	17	50%	10	29%	7	21%	0	0%
Competitors	11	32%	18	53%	5	15%	0	0%
Consultancies	4	12%	11	33%	16	48%	2	6%
Universities	11	32%	12	35%	8	24%	3	9%
Professional training centers	5	15%	8	24%	7	21%	14	41%
Research institutes	13	38%	4	12%	15	44%	2	6%
Testing, assays and certification companies	15	44%	11	32%	5	15%	3	9%
Fairs/Congresses	11	32%	8	24%	15	44%	0	0%
Technical Journals	5	15%	7	21%	18	53%	4	12%
23. Inform the frequency of use of external sources for the realization of innovations:	Frequency							
	Frequently		Some times		A few times		Never	
	n	%	n	%	n	%	n	%
External sources								
Suppliers	25	74%	7	21%	2	6%	0	0%
Clients	13	38%	14	41%	7	21%	0	0%
Competitors	7	21%	15	44%	6	18%	6	18%
Consultancies	5	15%	6	18%	20	59%	3	9%
Universities	8	24%	14	41%	8	24%	4	12%
Professional training centers	1	3%	4	12%	21	62%	8	24%
Research institutes	5	15%	9	26%	16	47%	4	12%
Testing, assays and certification companies	12	35%	15	44%	5	15%	2	6%
Fairs/Congresses	9	26%	18	53%	7	21%	0	0%
Technical Journals	6	18%	5	15%	20	59%	3	9%

Source: Elaborated by the authors based on the study (2017).



Respondents consider the economic environment of organizations as dynamic or very dynamic (91%). In the last three years (2014 to 2016), most organizations have performed more software updates (63%) than acquired new ones. On the other hand, in machinery and equipment, the acquisition of new ones (74%) is more noticeable than updates of those already existing in the organization (23%).

As for patents and intellectual property registrations, 56% were made in Brazil, only 19% abroad. The companies C1 and C3 had no patents registered in the period. Companies C5 and C6 point out that the patents and registrations of intellectual property were carried out in the national sphere.

Suppliers are pointed out as the primary external source for innovation as well as the most used external source (79%, 74%), followed by clients (50%, 38%) and testing, assay, and certification companies (44%, 35%). Less relevant are technical journals (53%), consultancies (48%) and research institutes (44%), fairs, and congresses (44%). However, this is not reflected in the least used sources, with professional training centers being the least pointed out (62%).

4.3 INNOVATION FOCUS

The process of innovation suggests not only having established procedures but also having continuity. Therefore, in order to innovate, it is necessary that the company as a whole is motivated, that is, that people are guided and motivated to use the available resources to discover, develop and implement innovations focused on problem-solving and competitive idea generation (Barret & Sexton, 2006; Floriani *et al.*, 2013). Table 5 demonstrates the questions (3, 8, 9, 17, and 18) and answers related to the focus of innovation, describing the most accomplished innovations in the companies, incentives as to whether or not to achieve the objectives.

Table 5 – Focus of innovation

FOCUS OF INNOVATION								
3. How do you describe the innovations made by the company? More than one type of innovation can be highlighted.	Product		Process		Organizational		Marketing	
	n	%	n	%	n	%	n	%
	30	88%	28	82%	24	71%	17	50%
8. When the organization's goals are achieved:	Those involved are rewarded		Individuals are rewarded		The awards are symbolic		No prizes are awarded	
	n	%	n	%	n	%	n	%
	1	3%	10	29%	15	44%	8	24%
9. When goals are not achieved or when failures occur:	The group's attention is drawn		The individual's attention is drawn		There are severe penalties		New opportunities are provided	
	n	%	n	%	n	%	n	%
	20	59%	1	3%	0	0%	13	38%
17. In the last two years, the company has introduced innovations:	Innovation type							
	Product		Process		Organizational		Marketing	
	Public		n	%	n	%	n	%
	for companies		18	53%	15	44%	13	38%
	for the market		31	91%	7	21%	7	21%
18. The innovations implemented are:	Innovation type							
	Product		Process		Organizational		Marketing	
	Innovations		n	%	n	%	n	%
	Completely new		22	65%	4	12%	7	21%
	Solution enhancement		28	82%	25	74%	10	29%

Source: Elaborated by the authors based on the study (2017).



It is noticeable that the most accomplished innovations in companies are products (88%) and processes (82%), followed by organizational (71%) and marketing (50%) innovations. In most cases (44%), symbolic awards are made when the organization's objectives are achieved. However, the answers to this question differ in C1, C2, and C4 companies, with some employees pointing out that "no prizes are awarded." Employees of C3 and C5 claim that there are no awards. Besides, 59% of the respondents indicate that when goals are not achieved, or failures occur, the group's attention is drawn, and 38% point out that new opportunities are provided. The study conducted by Floriani *et al.* (2013) indicated that 76% of the organizations reward those involved when the goals are achieved, and most innovations are related to processes and products.

The innovation focus is mainly directed to the market concerning product innovations (91%). When focused on companies, the focus on the product (53%) is highlighted, followed by the process (44%). Both the completely new innovations and the enhancement of solutions are directed to products, representing 65% and 82%, respectively.

4.4 ENHANCED PERFORMANCE

Performance refers to the performance and achievement of organizational objectives under the innovation process. It should be noted that the results may be financial or not and obtained during or after the innovation process, both in the short and medium-term (Barret & Sexton, 2006; Floriani *et al.*, 2013). Table 6 demonstrates the questions (4, 5, and 24) and answers related to enhanced performance, scoring the degree to which innovations have achieved the initial expectations of organizations, the effect of the innovations implemented, and the importance of the impacts generated by the innovations.



Table 6 – Enhanced performance

ENHANCED PERFORMANCE								
4. Based on the innovations pointed out in question 3, please indicate the degree to which these innovations have met the organization's initial expectations.	Exceeded expectations		Acceptable		Almost reached		Has not reached	
Type of innovation	n	%	n	%	n	%	n	%
Product Innovation	7	22%	23	72%	1	3%	1	3%
Process Innovation	1	4%	25	93%	1	4%	0	0%
Organizational Innovation	2	7%	21	78%	4	15%	0	0%
Marketing Innovation	7	35%	10	50%	2	10%	1	5%
5. Still, considering the innovations pointed out in question 3, how would you rate the effectiveness of the implemented innovations?	Very good		Good		Regular		Poor	
Type of innovation	n	%	n	%	n	%	n	%
Product Innovation	18	56%	10	31%	4	13%	0	0%
Process Innovation	9	33%	15	56%	3	11%	0	0%
Organizational Innovation	5	19%	14	54%	6	23%	1	4%
Marketing Innovation	5	28%	10	56%	2	11%	1	6%
24. Point out the degree of importance of each of the impacts generated by innovations in your company.	Importance level							
	High		Medium		Low		Not relevant	
Impacts generated by innovations	n	%	n	%	n	%	n	%
Enhanced quality of goods and services	23	68%	11	32%	0	0%	0	0%
Expansion of goods/services offered	22	69%	8	25%	2	6%	0	0%
Improved aesthetics/design	14	41%	3	9%	7	21%	10	29%
Maintenance of market share	27	79%	6	18%	1	3%	0	0%
Increased market share	26	76%	7	21%	1	3%	0	0%
Opening of new markets	13	38%	16	47%	5	15%	0	0%
Increase in production capacity or services provided	9	26%	22	65%	3	9%	0	0%
Increased flexibility in production or service provision	13	38%	11	32%	10	29%	0	0%
Reduced production costs	22	65%	12	35%	0	0%	0	0%
Reduction of raw material costs	19	56%	8	24%	7	21%	0	0%
Reduction of water and/or energy consumption	7	21%	8	24%	18	53%	1	3%
Reducing impact on environment/health/security	11	32%	10	29%	13	38%	0	0%
Implementation of significant changes in corporate strategy	9	26%	15	44%	10	29%	0	0%
Implementation of advanced management techniques	4	12%	10	29%	18	53%	2	6%
Implementation of significant changes in the organizational structure	5	15%	14	41%	14	41%	1	3%
Significant changes in marketing concepts/strategies	5	15%	11	33%	17	52%	0	0%
Significant changes in architecture/aesthetics/design or subjective changes	8	24%	4	12%	17	52%	4	12%
Implementation of new control and management methods to meet certification standards (ISO9001, ISO14000, QSTS, OSHAS 18001, others)	8	24%	8	24%	14	42%	3	9%

Source: Elaborated by the authors based on the study (2017).

Product innovations exceeded the expectations of organizations according to 22% of participants, with 72% considering them acceptable. In process innovations, 93% of the participants considered acceptable, with 4% indicating that it exceeded the initial expectations of the organizations. Although the respondents consider that the focus on innovations is lower in marketing, 35% consider that it exceeded expectations, and 50% consider them acceptable. Organizational innovations exceeded initial expectations in the opinion of 7% of respondents, with 78% considering them acceptable. Concerning the effect of implemented innovations, product innovations deserve to be highlighted, considered very good for 56% of respondents. However, the percentages are relatively different in the survey by Floriani *et al.* (2013), where 90.9% recognize the importance of improving the quality of goods and services as high.

Regarding the impacts generated by market share, 81.8% indicate as high the importance of market share in the survey of Floriani *et al.* (2013). In this survey, the impacts generated by innovations, 79% of participants indicate the importance of maintenance of market share, followed by the increase in market share (76%), expansion of goods/services offered (69%), and enhancement in the quality of goods/services offered (68%). Low importance impacts were pointed out to reduce water and/or energy consumption and implementation of advanced management techniques, both representing 53% of the answers. Non-relevant impacts were identified as improved aesthetics/design (29%) and significant changes in architecture/aesthetics/design or subjective changes (12%).

5 CONCLUSIONS

The study outlined the innovation process in publicly traded companies of Serra Gaúcha, listed on BM&F Bovespa. To this end, a survey was prepared based on the model proposed by Floriani *et al.* (2013), segmented into organizational capabilities, innovation contexts, innovation focus, and enhanced performance. The questionnaire was sent to the seven publicly traded companies of Serra Gaúcha, corresponding to the survey population, obtaining the return of six of them, representing 85.71% of the study population.

In organizational capabilities, 52% of R&D professionals have only technical or high school education. The incentive for innovations is considered frequent and recognized the leaders' incentive in maintaining the relationship, showing concern with the commitment and motivation of the team. All respondents pointed out that the companies use their own resources to carry out the innovations, and only companies in the road material business use resources from government and research institutes.

In the aspect of capabilities and contexts of innovation, respondents perceive the environment as dynamic or very dynamic. In terms of software, more updates have been made than new acquisitions. However, in equipment, the opposite situation is identified. The majority of patents registered are in the national sphere, and two companies have not registered any patents in the last two years.

Concerning the focus of the innovations, it is noticeable that they are mainly directed to the market and performed in products and processes. Most companies only perform symbolic awards when the goals are achieved and draw the group's attention when they are not achieved, and failures occur. It should be noted that only 38% point out that new opportunities are given, which is considered a low percentage for an environment that requires flexibility and creativity in the case of failure to achieve the objectives or occurrence of failures.

The enhanced performance shows that most companies recognize having achieved their goals. The main impacts generated by the innovations demonstrate the focus on the market, especially in the maintenance and expansion of market share and improvement in the quality of goods/services offered.



Perhaps one of the answers that organizations may find in this survey regarding the difficulty of implementing innovation within companies is related to schooling, with 56 people working in R&D not having a degree. Relativizing with the degree of difficulty of implementing innovation, 23 respondents consider the lack of personnel qualification the degree of difficulty between medium and high.

The low number of respondents in some organizations and the different markets of their activities make it difficult to compare the segments. Besides, the research is limited because it is only conducted through the survey without on-site observation and personal interviews. For future studies, a new survey is suggested, with qualitative information from the organizations, also using the observation technique, to triangulate data. Moreover, it is suggested for future studies to carry out an organizational climate survey comparing the productivity of employees of companies with awards related to innovations and those that do not.

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2. Development of hypotheses or research questions (empirical studies)	√	√	√		
3. Development of theoretical propositions (theoretical work)					
4. Theoretical foundation / Literature review	√	√	√		
5. Definition of methodological procedures	√		√	√	√
6. Data collection	√	√	√		
7. Statistical analysis	√			√	
8. Analysis and interpretation of data			√	√	√
9. Critical revision of the manuscript	√			√	√
10. Manuscript writing	√	√	√	√	√
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