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INNOVATION RADAR WITH COEFFICIENT CORRELATION APPLICATION: A CASE STUDY OF MSE IN THE STATE GOIÁS /BRAZIL

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ABSTRACT

This paper seeks to provide a quantitative view of the current level of innovation of Micro and Small Enterprises (MSEs) in the Metropolitan Region of Goiânia (MRG) and other regions of the State of Goiás/ Brazil (RSG).The objective, broadly speaking, is to verify the Global Innovation Degree (GID) of the MSEs distributed among the commercial, industrial, services and agribusiness sectors that compose the sample; and specifically the level of association between the 13 (thirteen) dimensions analyzed. The study on innovations in MSEs can help the development and growth of companies with significant economic and social contribution to the country. For this purpose, this study utilizes the results obtained through the LIA-SEBRAE-CNPq Innovation Radar questionnaires, and correlation analyses among the dimensions evaluated in the project through Pearson's Linear Correlation Coefficient (PLC). The results show higher GID of companies in the services sector, when compared to companies in the industrial and commercial sector, and we identified dependency relationships between the analyzed dimensions. However, despite the greater opening of the services sector to innovation processes in the context of the companies surveyed, there is still great potential for expansion of innovative activities.

INTRODUCTION

More than the Schumpeterian role of providing innovation to the market, the private sector,as represented by the entrepreneur, enables the market process to work in various contexts. Innovative actions may be related to the definition of new production or service processes, or the creation of new products or services available to the market, among others. In general, it should be noted that innovative actions are those responsible for creating value for companies, in a sustainable and permanent manner. In this way, innovative processes become essential to ensure that companies remain in the market as they enable the creation of value for the company, either by adding value to existing products, creating a new product or improving processes and increasing productivity as discussed in Feldmann et al(2019).The uniqueness of companies' structure and its peculiarities regarding location, economic and social characteristics, sector of activity, market and size indicate the need to develop methodologies to

evaluate and measure innovations based on certain characteristics that may influence the suitability of the tools used discussed in Ferrari et al(2019). Thus, studies that aim to focus on the creation of innovative environments and how innovation can be measured in Micro and Small Enterprises (MSEs), are urgently present in the Brazilian research agenda on innovation. The representativeness and role played by these companies in generating income and increasing national economic activity demonstrate the importance of developing tools that assist them in the development of innovative activities and processes in MSEs. The research problem addressed in this study concerns how companies can identify sectors or activities in their business environment where they should direct efforts and resources to promote innovation. The Innovation Radar presents an initial perspective of the essential dimensions for the innovative process, however, it does not provide scientifically based justifications for directing efforts to develop certain dimensions over others. That said, the overall objective of this research is to analyze the GID of 600

(six hundred) MSEs located in MRG and other RSGs, based on the Innovation Radar questionnaire of the Local Innovation Agents (LIA) project led by the Brazilian Support Service to Micro and Small Enterprises (SEBRAE – *Serviço Brasileiro de Apoioàs Micro e Pequenas Empresas*) in partnership with the National Council for Scientific and Technological Development (CNPq - *Conselho Nacional de Desenvolvimento Científico e Tecnológico*). MRG, popularly known as Greater Goiânia, is a conurbation of cities around Goiânia, the capital of the Brazilian state of Goiás. Goiás is one of 27 (twenty-seven) federal units in Brazil. It is located in the Midwest region of the country, in the Brazilian Central Plateau. Its territory is 340,257 km², bordering the states of Mato Grosso do Sul to the southwest, Mato Grosso to the west, Tocantins to the north, Bahia to the northeast, Minas Gerais to the east, southeast and south and the Federal District to the east. The economy in 2016 according to the Brazilian Institute of Geography and Statistics (IBGE - *Instituto Brasileiro de Geografia e Estatística*) has Gross Domestic Product (GDP) of $ 181.692 billion and GDP per capita of $ 27.135.06 (Brazilian Reals). As a specific objective, this study aims to statistically demonstrate the linear correlation between the dimensions of the Innovation Radar in the services market sector, using Pearson's Linear Correlation Coefficient. The correlation seeks to identify possible dependency relationships between the variables and, therefore, groups of key variables that can provide greater impact on the results of the innovative activities of companies.

MATERIALS AND METHODOLOGY

The methodological procedures applied in this article takes two major steps. Initially, the study was conducted based on the application of the Local Innovation Agents (LIA) project, based on the Innovation Radar methodology, also proposed by Sawhney, Wolcott &Arroniz (2006). Subsequently, the data obtained in this first stage were analyzed by estimating Pearson's Linear Correlation Coefficient between the various dimensions obtained through the Innovation Radar. The study was based on essentially quantitative aspects, from data collection and processing that allowed the recognition of innovation indicators in the context of theMSEs in Goiás. The proposal is to implement actions that improve the organizational management, processes, marketing, in addition to the products or services. To achieve this goal, the project goes through six steps, which are described below:

Step 1: Awareness and Adherence. Local innovation agents go to the field to prospect companies, select them and raise awareness to participate in the project. Companies commit to participating in the Project and sign a Term of Adherence, with the purpose of committing to provide all information necessary for the work of Local Innovation Agents (LIA), to help the innovation process of the company. Additionally, the agents commit to maintaining absolute confidentiality regarding the information collected.

Step 2: Business Diagnosis and Innovation Radar. The diagnosis is applied through an electronic form, which aims to learn about and evaluate the organizational structure of the business. The main purpose of the application of this form is to gather information that facilitates the search for solutions to improve management and that provides the diffusion of innovation within the company and consequently finds and

measures which innovative activities are being developed by the company.

Step 3: Feedback and SWOT Matrix. Feedback is provided via a report delivered to business owners based on the information obtained from the business Diagnosis and Innovation Radar. This report identifies the Global Innovation Degree (GID) the company has. The Strengths, Weaknesses, Opportunities and Threats (SWOT) Matrix is built through the entrepreneur's knowledge of the business and the help from the LIA. As it proposes, it aims to analyze strengths and weaknesses, and opportunities and threats in companies.

Step 4: Action Plan. After the SWOT Matrix is built, an action plan is elaborated, which aims to select the actions that prioritize the implementation of an innovation-friendly organizational environment.

Step 5: Action Plan Initiation. Once the actions are selected, the execution of the defined actions starts.

Step 6: Action Plan Monitoring. Monitoring the implementation of the action plan, whose purpose is to evaluate actions against expected results.

The methodology used allows us to identify the companies' GID, based on the Innovation Radar questionnaire of the LIA project. This GID Indicator represents the mean of the individual indicators of the following dimensions analyzed in the questionnaire: (1) supply; (2) platform; (3) brand; (4) customers; (5) solutions; (6) relationship; (7) added value; (8) processes; (9) organization; (10) supply chain; (11) presence; (12) network; and (13) innovative ambience. Dimensions can be defined as presented by Sawhney, Wolcott &Arroniz (2006), Oliveira *et al.,* (2011), and Bachmann and Destafani (2008). The last authors cited presented the definition of the 13th dimension of Radar, the Innovative Ambience. The authors emphasize that this dimension is an essential prerequisite for the establishment of an innovative company, recognizing the importance of the organizational climate in this context. The definitions are described in Table 1 below. The sample of companies surveyed in this study is made up of 600 (six hundred) MSEs located in the State of Goiás. All the companies that make up the sample are distributed among the different market sectors: Industry (6%), Trade (81%), Services (12%) and Agribusiness (1%). The MSEsanalyzed in the study were further grouped into two major groups: Metropolitan Region of Goiânia (MRG), which corresponds to 44% of the total sample and other Regions of the State of Goiás/ Brazil (RSG), which correspond to 56%. The detailed stratification of the sample is described in Table 2.In the development of this study, the results of the diagnoses made by the 25 (twenty five) LIAs under my guidance, from October 2014 to June 2017, were taken. Results are presented by market sector and according to the location of the MSEs.

Correlation Analysis is a statistical method widely used to study the degree of relationship between variables. The linear correlation coefficient is "a more appropriate measure to evaluate the degree of linear relationship between two quantitative variables than covariance" (Mingoti, 2007), and can be defined by a correlation between the ith and jth variables of the vector X:

$$\rho_{ij} = \frac{\sigma_{ij}}{\sqrt{\sigma_{ii}\sigma_{ij}}} = \frac{\sigma_{ij}}{\sigma_i \sigma_j} \qquad (1)$$

Table 1. Definitions of Innovation Radar Dimensions. Source: Adapted by the authors from Sawhney, Wolcott &Arroniz (2006), Oliveira et al. (2011), and Bachmann and Destafani (2008)

Dimensions	Definition
1 - Offer	These are the goods and / or services offered by the company to the market.
2 –Platform	It is a set of common components, assembly methods or technologies that are used in a "modular" way to build a product portfolio.
3 - Brand	It is a set of symbols, words (slogan) or formats by which a company conveys its image or promise to customers.
4 - Customers	These are people or organizations who use or consume products to meet certain needs.
5 –Solutions	It is the customized and integrated combination of goods, services and information that can solve the customer's problem.
6 - Relationship	It takes into account everything the consumer sees, hears, feels or experiences in any way when interacting with the company at all times.
7 - Added Value	The mechanisms by which a company captures part of the value created.
8 –Processes	Activities carried out in a logical sequence, aiming to produce a good or service that has value for a specific group of customers.
9 –Organization	It is the way the MSE is structured, which partnerships are established, and the role and responsibility of employees.
10 - Supply Chain	It is the sequence of activities and agents that move products, services and information from their source to the delivery stage.
11 - Presence (Place)	These are the distribution channels that the company uses to place its products on the market and also the places where these items can be purchased by consumers.
12 –Network	These are aspects related to the Network that connects the company, and its products, to customers.
13 - Innovative Ambience	It is the indicator used to evaluate the "Innovation-Friendly Environment" through the fraction of the team that is made up of professionals who are trained in research.

Table 2. Activities sectors of the Studied Population. Source: The authors

All Regions (MRG + RSG)			MRG			RSG		
Activity sectors	Freq.	%	Activity sectors	Freq.	%	Activity sectors	Freq.	%
Industry	36	6%	Industry	27	10%	Industry	9	3%
Trade	484	81%	Trade	193	73%	Trade	291	87%
Services	74	12%	Services	46	17%	Services	28	8%
Agribusiness	6	1%	Agribusiness	0	0%	Agribusiness	6	2%
Total	600	100%	Total	266	100%	Total	334	100%

When i = j, the expression in (1) converts the value of the correlation coefficient that will always be between the reference values -1 and 1, ie: A correlation coefficient of +1 represents a perfect positive linear relationship between the variables. On the other hand, the closer to -1, the greater the negative linear relationship. However, when the value is zero, there is an indication that there is no relationship between the variables (Mingoti, 2007; Sweeney, 2014). The analysis of the linear correlation coefficient was inserted between the methodological procedures as an alternative for a more adequate analysis of the context of innovation in MSEs. Also, as verified in the literature review by Buchele et al. (2015), Silva et al. (2014) and Carvalho et al. (2015) The Innovation Radar methodology is often used to assess the innovative environment of larger companies. Due to their specificities, MSEs may find it difficult to develop specific dimensions due to their organizational structure and ability to mobilize resources. Identifying correlated dimensions can enable the identification of key dimensions to which companies can direct intensified efforts to promote and stimulate innovative business environments.

RESULTS

Innovation actions impact on multiple dimensions of the Innovation Radar. Regardless of the origin of the innovation, whether it is in the development of new marketing channels or the creation of a new product, there will be a positive impact on the dimensions analyzed. However, it should be noted that the spread of this impact across dimensions will have a distinct impact for each company, especially in MSEs from different sectors. Table 3 presents the statistics of the innovation dimensions of the companies analyzed in the study. It is possible to verify the mean innovation coefficients according to the analyzed dimension and for the GID in the Industrial, Trade and Services sectors in MRG. In relation to the GID for the three activity sectors, it can be seen that the service sector has an advantage in terms of global innovation, when

compared to the other sectors analyzed. Each GID average represents the arithmetic mean of the 13 dimensions analyzed. The observed values were: 2.4 for the trade sector, 2.5 for the industry sector, and 2.8 for the service sector. Individual dimensions can be analyzed according to the definitions described in Table 1 presented in the methodological procedures section. Each of these dimensions and their respective results will be presented in the subsequent tables. The individual dimensions analyzed are highlighted with colored markers in the tables presented. When considering each of the dimensions individually, it appears that for the platform and brand dimensions the observed means for the sectors are satisfactory, as can be seen by the green highlight in Table 3. This dimension represents the adaptability of the production system of the company with regard to the demanded product diversity. That is, the company's ability to adapt its production structure to the production of new products / services demanded by the market. The brand, a prominent dimension in the industrial sector, represents the way companies convey their values to their customers. The other dimensions whose means are highlighted in yellow, as a warning sign, presented average results. Among the three sectors of activity, the supply and relationship dimensions stood out. For the trade and services sectors, the brand and customer dimensions. The offering represents the development of products with innovative features, while the relationship dimension seeks to demonstrate how the company relates to the customer experience in relation to its service / product.

The other dimensions whose means were highlighted in red showed unsatisfactory results. These dimensions need to be worked out with the utmost care for a satisfactory development of innovative business activities. Among the three sectors, we can highlight the solutions dimension that represents the development of systems or mechanisms that seek to simplify the clients' difficulties; added value, as the best way to capture the value of products perceived by customers; processes, which represents the design of production processes in order to

allow increased operational efficiency; organization, with the improvement of the company's structure; presence and innovative ambience, which represent the relationship of the professionals who make up the company and the collaboration with the innovation culture. It is noteworthy that among the three activity sectors analyzed for MRG, the service sector presented a smaller number of dimensions with unsatisfactory results, which significantly impacts the GID. The vast majority of the dimensions analyzed for this sector presented good prospects for GID improvement, which would allow the strengthening of these companies in the market through the correct development of innovative actions. The innovation radar represented by Table 4 below shows the dimensions of the three sectors simultaneously. All sectors of activity have broad possibilities for expanding innovative activity in almost all of the dimensions considered.In line with the results for the MRG results, the mean GID of the three sectors in other RSGs showed lower values for the trade sector, with 2.1 and higher values for the industry with 2.2, and a highlight for the service sector with a 2.5 GID average, as shown in Table 4. When considering the dimensions that stood out, it is possible to verify that the platform and brand dimensions presented the best performances. However, with coefficients lower than those verified for the same dimensions in MRG companies.

Individual analysis of the dimensions, highlighting the green color markers, it is possible to observe that the same dimensions with satisfactory performance, in the analysis of the MSEs in MRG, also presented satisfactory results in the context of the companies analyzed in other RSGs. As observed in MRG, the service sector stands out for its lower incidence of unsatisfactory results in relation to the individual dimensions of innovation analysis. Most of the dimensions analyzed present average result coefficients, a warning sign for companies to continue with innovative actions in relation to the offer, brand, customers, solutions, relationship, added value and network dimensions, thus ensuring continued innovation and the improvement of the GID of the sector. Other sectors have an even longer way to go to improve the level of innovation of companies.Table 5 shows the innovation radar dimensions means for the trade sector, comparing the means of the studied companies located in other RSGs with those of companies' located in MRG. It can be identified that the innovation dimensions meansanalyzed are mostly better for MRG, except for the solutions and added value dimensions. For MRG trade, the strongest dimensions in the context of the MSEs studied are platform and brand. Based on the maximum and minimum values for the regions, it appears that several companies have presented maximum

Table 3. Innovation Radar by Sector -MRG

DIMENSIONS	MAX	MIN	TRADE SECTOR MEAN		MAX	MIN	INDUSTRIAL SECTOR MEAN		MAX	MIN	SERVICE SECTOR MEAN	
1 - Offer	5.0	1.0		3,3	4.3	1,4		3,0	5.0	1.0		3,0
2 - Platform	5.0	1.0		4,7	5.0	4,0		4,9	5.0	1.0		4,5
3 - Brand	5.0	1.0		3,3	5.0	1,0		4,0	5.0	2.0		3,7
4 - Customers	5.0	1.0		2,5	4.3	1,0		2,4	5.0	1.0		3,2
5 - Solutions	5.0	1.0		1,9	4.0	1,0		1,8	5.0	1.0		2,5
6 - Relationship	5.0	1.0		2,5	4.0	1,0		2,7	5.0	1.0		3,2
7 - Added value	5.0	1.0		1,5	2.0	1,0		1,4	4.0	1.0		1,8
8 - Processes	2.7	1.0		1,7	3.0	1,0		1,9	4.7	1.0		2,1
9 - Organization	4.5	1.0		1,9	2.5	1,0		1,8	4.5	1.0		2,4
10 - Supply chain	5.0	1.0		2,2	3.2	1,0		1,8	5.0	1.0		2,8
11 - Presence	5.0	1.0		1,5	5.0	1,0		2,4	5.0	1.0		1,9
12 - Network	5.0	1.0		1,8	3.0	1,0		2,1	5.0	1.0		3,3
13 - Innovative Ambience	3.0	1.0		1,7	2.8	1,0		2,1	4.3	1.3		2,2
Global Innovation Degree	Global Innovation Degree Mean		2.4		Global Innovation Degree Mean		2.5		Global Innovation Degree Mean		2.8	

Source: The authors

Table 4. Innovation Radar by Sector - RSG.

	MAX	MIN			MAX	MIN			MAX	MIN		
1 - Offer	5.0	1.0		3,1	3.0	1.0		2,4	5.0	1.0		2,6
2 - Platform	5.0	1.0		4,4	5.0	3.0		3,9	5.0	1.0		4,1
3 - Brand	5.0	1.0		2,7	5.0	3.0		3,6	4.0	2.0		3,1
4 - Customers	4.3	1.0		2,2	3.7	1.0		2,5	4.3	1.0		2,4
5 - Solutions	5.0	1.0		2,0	3.0	1.0		1,9	5.0	1.0		2,8
6 - Relationship	5.0	1.0		2,0	3.0	1.0		1,4	5.0	1.0		2,5
7 - Added value	5.0	1.0		1,8	2.0	1.0		1,6	5.0	1.0		2,6
8 - Processes	3.0	1.0		1,6	2.3	1.0		1,6	3.3	1.0		1,7
9 - Organization	4.5	1.0		1,8	2.5	1.0		1,6	4.0	1.0		2,2
10 - Supply chain	5.0	1.0		1,9	3.0	1.0		2,1	5.0	1.0		1,9
11 - Presence	4.0	1.0		1,3	4.0	1.0		2,1	5.0	1.0		2,1
12 - Network	5.0	1.0		1,5	3.0	1.0		1,9	5.0	1.0		2,5
13 - Innovative Ambience	3.6	1.0		1,7	3.3	1.6		2,2	3.3	1.0		1,8
Global Innovation Degree	Global Innovation Degree Mean		2.1		Global Innovation Degree Mean		2.2		Global Innovation Degree Mean		2.5	

Source: The authors

coefficients, in which case they are considered innovative for the dimension in question, and also, in a less satisfactory way, minimum coefficients that classify them as non-innovative or poorly innovative for the evaluated item. We highlight in magnitude the dimensions related to the offer of products with innovative features, platform and brand. As in the trade sector, in the industrial sector, the dimensions that stand out in magnitude are platform and brand, with the highest values presented by MRG companies. However, some dimensions analyzed in the companies of other RSGs for the industrial sector had more satisfactory results. As can be pointed out in Table 6, the dimensions that stand out in other RSGs for this sector are: customers, solutions, added value, supply chain and innovative ambience. Also, as can be analyzed in Figure 7, the behaviors of companies in the industrial sector with regard to innovation, in other RSGs and MRG, are more heterogeneous among themselves than those presented by the trade sector. It is worth mentioning that the presented radar still allows to identify a greater opening of the industrial sector to the innovation, in comparison to the commercial sector, however, still with significant space for the expansion of the innovative activities in several dimensions.

presented in Table 7, only three innovation dimensions presented for MRG presented lower mean coefficients than those found for companies located in other RSGs. The maximum coefficients of the dimensions evaluated between the regions demonstrate a closer proximity to the ideal condition in which companies are classified as innovative. In general, the maximum coefficients observed indicate that companies in the service sector are more often dedicated to activities that aim to promote innovative actions in their organizational structure. The greater performance in relation to innovative activities can be corroborated by Figure 8, which shows a greater openness of the services sector to innovative activities, when compared to the commercial sector and industry. However, despite the fact that its innovative perspective presents more satisfactory results, there is still room to reach the maximum innovation level allowed to the sector. Innovation activities can be expanded in the two regions analyzed, in companies located in MRG and in companies located in other RSGs. The best results demonstrate a greater openness of the service sector to innovative processes with great potential for development and expansion.

Table 5. Radar of Innovation Regarding the Trade sector - MRG verses RSG

Dimension	Mean RSG	Mean MRG	Maximum RSG	Maximum MRG	Minimum RSG	Minimum MRG
1 - Offer	3.1	3.3	5.0	5.0	1.0	1.0
2 - Platform	4.4	4.7	5.0	5.0	1.0	1.0
3 - Brand	2.7	3.3	5.0	5.0	1.0	1.0
4 - Customers	2.2	2.5	4.3	5.0	1.0	1.0
5 - Solutions	2.0	1.9	5.0	5.0	1.0	1.0
6 - Relationship	2.0	2.5	5.0	5.0	1.0	1.0
7 - Added value	1.8	1.5	5.0	5.0	1.0	1.0
8 - Processes	1.6	1.7	3.0	2.7	1.0	1.0
9 - Organization	1.8	1.9	4.5	4.5	1.0	1.0
10 - Supply chain	1.9	2.2	5.0	5.0	1.0	1.0
11 - Presence	1.3	1.5	4.0	5.0	1.0	1.0
12 - Network	1.5	1.8	5.0	5.0	1.0	1.0
13 - Innovative ambience	1.7	1.7	3.6	3.0	1.0	1.0

Source: The authors.

Table 6. Innovation Radar for the Industry sector - MRG verses RSG

Dimension	Mean RSG	Mean MRG	Maximum RSG	Maximum MRG	Minimum RSG	Minimum MRG
1 - Offer	2.4	3.0	3.0	4.2	1.0	1.4
2 - Platform	3.9	4.9	5.0	5.0	3.0	4.0
3 - Brand	3.6	4.0	5.0	5.0	3.0	1.0
4 - Customers	2.5	2.4	3.7	4.3	1.0	1.0
5 - Solutions	1.9	1.8	3.0	4.0	1.0	1.0
6 - Relationship	1.4	2.7	3.0	4.0	1.0	1.0
7 - Added value	1.6	1.4	2.0	2.0	1.0	1.0
8 - Processes	1.6	1.9	2.3	3.0	1.0	1.0
9 - Organization	1.6	1.8	2.5	2.5	1.0	1.0
10 - Supply chain	2.1	1.8	3.0	3.2	1.0	1.0
11 - Presence	2.1	2.4	4.0	5.0	1.0	1.0
12 - Network	1.9	2.1	3,0	3.0	1.0	1.0
13 - Innovative ambience	2.2	2.1	3.3	2.8	1.6	1.0

Source: The authors.

Regarding the last sector of activity evaluated, the services sector, the perspective of innovation presents more favorable conditions for the two regions analyzed. With higher mean magnitudes for the analyzed dimensions, a more innovative business environment can be observed. According to data

To broaden the analysis of innovation radar dimensions, correlation analyses were performed between the 13 dimensions studied. The analysis highlighted the dimensions whose correlation coefficient presented values equal to and / or greater than 0.6.

Table 7. Innovation Radar for Services sector - MRG verses RSG

| Dimension	Mean RSG	Mean MRG	Maximum RSG	Maximum MRG	Minimum RSG	Minimum RMG
1 - Offer	2.6	3.0	5.0	5.0	1.0	1.0
2 - Platform	4.1	4.5	5.0	5.0	1.0	1.0
3 - Brand	3.1	3.7	4.0	5.0	2.0	2.0
4 - Customers	2.4	3.2	4.3	5.0	1.0	1.0
5 - Solutions	2.8	2.5	5.0	5.0	1.0	1.0
6 - Relationship	2.5	3.2	5.0	5.0	1.0	1.0
7 - Added value	2.6	1.8	5.0	4.0	1.0	1.0
8 - Processes	1.7	2.1	3.3	4.7	1.0	1.0
9 - Organization	2.2	2.4	4.0	4.5	1.0	1.0
10 - Supply chain	1.9	2.8	5.0	5.0	1.0	1.0
11 - Presence	2.1	1.9	5.0	5.0	1.0	1.0
12 - Network	2.5	3.3	5.0	5.0	1.0	1.0
13 - Innovative ambience	1.8	2.2	3.3	4.3	1.0	1.3

Source: The authors.
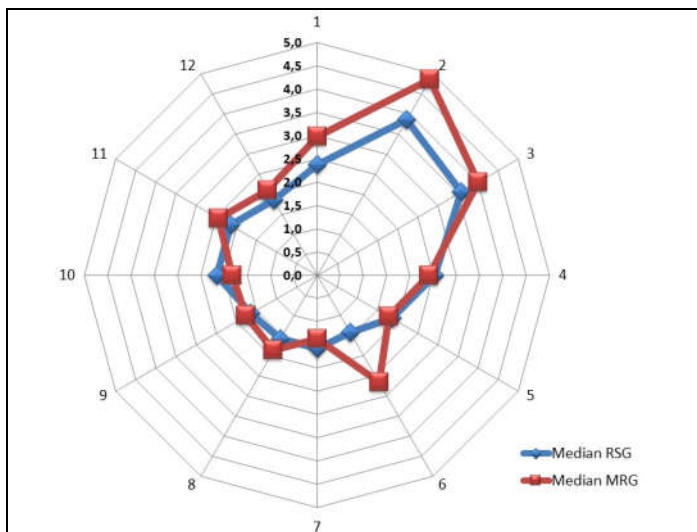
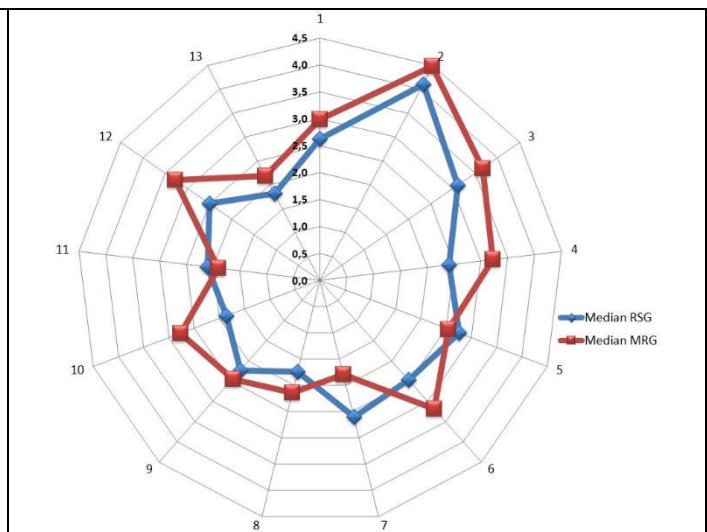| Figure 7. Median Score of Innovation in the Industry sector - RGM versus RSG. Source: The authors	Figure 8. Median Score of Innovation in the Services sector - MRG versus RSG. Source: The authors

This pattern was established to emphasize dimensions that had at least medium correlations with each other. Correlation analyses allow measuring the strength of association between two variables. Based on the information described in Table 8, where the correlation coefficients are presented for the services sector in MRG, we can highlight a greater association between the study dimensions: supply and relationship, customers and organization, relationships and network, processes and innovative ambience, and organization and innovative ambience. These more significant correlations may be justified as the probability of greater benefits to the supply dimension, which represents the development of products with innovative characteristics, provided by a good relationship between companies, and customers, the customer experience with the company. This proximity helps the identification of customer demands and the adaptation of products and services to their needs and consumption desires.The correlation between the customers and organization dimension makes explicit the importance of continuous improvement of the company structure for a correct customer service, which will allow the identification of their needs or new market niches. Regarding the association between the relationship and network dimension, it should be emphasized the importance of good communication between the supply chain links with the highest probability of adequate customer service and, consequently, an improvement in the customer's experience with the company through the adequate supply of their needs.

In turn, the variations in the process and innovative ambience dimensions allow us to observe the importance of the innovative ambience, represented in the context of companies by the performance of professionals who make up the company and collaborate with the culture of innovation for the development of production processes in order to allow increased efficiency and achieve process innovations. The innovative ambience also contributes to the improvement of the company's structure, represented in the study by the organization dimension. Regarding the correlations analyzed between the dimensions of the services sector in other RSGs, described in Table 9, we can highlight the correlations between the dimensions customer and organization, organization and added value, solutions and value aggregation, and relationship and network. These correlations may explain the importance of the association of actions related to the correlated dimensions. Regarding the clients and organization dimension, it is possible to observe the importance of a better company structure in order to adequately meet the clients' needs in the market. This condition allows the identification of new opportunities to undertake by identifying new market niches for the operation. The correlation between organization and added value reflects the importance of a better corporate structure in the implementation of ways to capture the value of products perceived by customers and suppliers, and thus adjust their business actions in relation to the consumer and supplier market.

Table 8. Dimensions Correlation Coefficient in the MRG Services sector

Dimensions	Offer	Platform	Brand	Customers	Solutions	Relationship	Added value	Processes	Organization	Supply chain	Presence	Network	Innovative ambience
Offer	1,00												
Platform	0,44	1,00											
Brand	0,47	0,33	1,00										
Customers	0,54	0,50	0,37	1,00									
Solutions	0,41	0,21	0,21	0,33	1,00								
Relationship	0,62	0,29	0,33	0,32	0,42	1,00							
Added value	0,36	0,01	0,29	0,16	0,51	0,23	1,00						
Processes	0,59	0,26	0,46	0,36	0,44	0,46	0,32	1,00					
Organization	0,42	0,46	0,45	0,60	0,49	0,50	0,27	0,54	1,00				
Supply chain	0,48	0,27	0,20	0,33	0,24	0,34	- 0,13	0,41	0,24	1,00			
Presence	0,37	0,13	0,41	0,34	0,35	0,41	0,29	0,55	0,50	0,45	1,00		
Network	0,59	0,28	0,22	0,44	0,44	0,71	0,26	0,49	0,49	0,46	0,55	1,00	
Innovative ambience	0,54	0,20	0,40	0,46	0,55	0,48	0,45	0,62	0,61	0,26	0,41	0,37	1,00

Source: The authors

Table 9. Dimensions Correlation Coefficient in the Services sector RSG

Dimensions	Offer	Platform	Brand	Customers	Solutions	Relationship	Added value	Processes	Organization	Supply chain	Presence	Network	Innovative ambience
Offer	1,00												
Platform	0,40	1,00											
Brand	0,43	0,18	1,00										
Customers	0,20	0,21	0,10	1,00									
Solutions	0,29	0,17	0,50	0,48	1,00								
Relationship	0,34	0,18	0,29	0,32	0,22	1,00							
Added value	0,21	0,25	0,41	0,44	0,67	0,28	1,00						
Processes	0,21	- 0,01	0,39	0,30	0,56	0,44	0,39	1,00					
Organization	0,19	0,20	0,36	0,64	0,44	0,48	0,64	0,44	1,00				
Supply chain	0,00	- 0,02	- 0,12	0,12	0,10	- 0,03	- 0,23	0,29	0,02	1,00			
Presence	0,02	- 0,05	0,46	- 0,04	0,21	0,49	0,33	0,34	0,40	0,03	1,00		
Network	0,41	0,22	0,44	0,25	0,34	0,70	0,54	0,53	0,52	- 0,18	0,42	1,00	
Innovative ambience	0,30	0,08	0,37	0,42	0,34	0,02	0,23	0,32	0,32	- 0,05	- 0,20	0,12	

Source: The authors

The correlation between the added value dimension and the solutions dimension makes it evident the importance of developing systems or mechanisms to simplify customer difficulties, so that the company can add value to the services provided. Finally, the correlation verified between the relationship and network dimensions, as well as the one observed in the correlations analysis for MRG companies stand out among the correlations presented in this study. This can be explained given the importance of proper communication between the supply chain links for proper customer service and the consequent improvement of their perceived experience with the company.

Conclusion

The GID analysis of companies located in other RSGs and MRG, based on the individual dimensions captured by the LIA Innovation Radar, allowed the identification of a greater opening of the services sector to actions that enable innovations in the business context. The innovation perspective presents more favorable conditions for the two regions analyzed in the services sector when compared to the commercial and industrial sectors. The coefficients indicate that companies in the service sectors are more often dedicated to activities that result in the promotion of innovative actions in their organizational structure. However, despite the more satisfactory results in relation to the other sectors, it is necessary to highlight the need for the continuous development of these actions in order to achieve better innovation levels. Despite its greater openness, the service sector still has great potential for the development and expansion of innovative activities and processes, as observed for the commerce and industrial sectors.Regarding the correlations between innovative actions, it was found that there is an association between the development of several actions that lead to an innovative environment in the context of companies. The interrelationships between these dimensions may allow an increase in the results of activities, as certain actions may enhance the satisfactory results of the others.It is also worth mentioning that the adequacy of the use of the Innovation Radar methodology for the evaluation of the innovation level of the MSEs should be questioned through more detailed studies. Despite the correlations found between some radar dimensions, the correlation strength between these variables did not show coefficients expressing good or optimal correlations. Thus, part of these dimensions may not provide a synergistic effect, as some of the variables did not cooperate with each other to promote an innovative environment in the context of MSEs. The ability of these dimensions to identify innovative behaviors and thereby enhance them should be evaluated in future studies.

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