MEASUREMENT OF INNOVATIONS IN SME: EXPLORATORY STUDY WITH EMPHASIS ON MANUFACTURING PROCESSES IN THE SOUTH OF SÃO PAULO

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Brazilian Small & Medium Enterprises (SMEs) represent over 96% of all active companies in the country. The view that the role of innovation in processes must receive special attention leads us to write this article, in order to measure the Level of Innovation in companies today. The Radar of Innovation was used to support the model of the diagnostic method tool, which was established to perform a data analysis with the needs of each organization. Through this methodology, a sample of 33 SMEs in the manufacturing segment, in the south region of São Paulo was used for the research fieldwork, in loco. The role was to promote recommendations and collaboration, in order to improve the opportunities to be replicated in other organizations with similar challenges. The focus of the contributions of this work was related to the dimension Processes, since most participants had results in common.

Palavras-chave: innovation, SME, Industry, Level of Innovation, Process

1. Introduction

In the years 2015 and 2016, the Brazilian industries suffered most during the economic crisis, amounting to a decrease of 6.2% from January 2015 to December 2016, the largest downturn in history, according to the Brazilian Institute of Geography and Statistics (IBGE; 2017). Currently, the economic environment remains unfavourable, which encourages firms to opt for a line of lean production and reduced costs (Sebrae, 2018).

Even with a drastic decline in sales, the domestic industry is still the second largest industry in America (SABATINO; TALAMO, 2017; EVERTON JUNIOR, 2017) ranging from steel, automotive, air, and computers, to consumer durables. Amid an uncertain climate of urgency and risk, it is necessary to innovate to generate long-term economic value. Thus, it is becoming something fundamental to the survival of businesses in the competitive current market.

Per the neo-Schumpeterian approach, innovation is essential for the survival of a company, especially in highly competitive markets. Thus, the current world economic crisis, generate a culture of innovation, become a challenge for small industries (Sebrae, 2018).

The work defined in this article studied and applied a diagnostic tool (survey) to measure the degree of innovation in Small & Medium Enterprises (SME), in order to disseminate and contribute to the innovation as an alternative to mitigate the effects of the world economic crisis.

In the universe of SME, innovation is a challenge on small budgets. According to the Oslo Manual, produced by the Organization for Economic Cooperation and Development (OECD, 2005), the innovation process is assisted by a variety of sources of information:

(a) internal sources (within the firm), (b) external market sources, (c) educational and research institutions, and generally (d) available information;

Innovation may be hampered by:

(i) economic factors, ones relating to (ii) the enterprise, and with a (iii) miscellany of others.

The general goal of this article is to understand the influences related to improvement and innovation in the dimension processes in SME of the sample. The specific objective is to diagnose and contribute with recommendations for the processes of thirty-three SME in the manufacturing segment of the southern area of the capital São Paulo in Brazil.

1.1 Innovation

According to the Oslo Manual (2005), the minimum entry is that the product or process should be new (or significantly improved) for the company (it does not have to be new to the world).

The OECD (2005) states that innovation aims to improve the performance of an organization by enhancing its competitive edge, or for maintaining their competitiveness. It can occur through improvements in the product mix or through new markets and/or customers. Alternatively, innovation may occur through a reduction of unit costs in production, purchasing, distribution, or transactions. The company may also opt for the improvement of its innovative capacity, increasing its ability to develop products to acquire and create knowledge.

Each company is a customized system, with its attributes and characteristics specific to their own needs. Thus, undertaken innovations should strengthen these differentials. They need to seek efficiencies compatible with their products, their customers, and the environment in which they operate. They need to better short-term results, tangible in nature, or most desirably, intangible. These innovations should be most apparent in the medium and long-term development of their organizations.

2. Methodology

The Innovation Radar used in this work was created by Sawhney, Wolcorr and Arroniz (2006), later adapted by Bachmann and Destefani (2014), and evaluates, via a questionnaire, a SME innovation in that moment. The choice of tool was made considering the features that have been compared both in SME and in bigger organizations. In the context of the SME, it would be inappropriate to measure innovation with aspects like the number of patents and investments in research and development (R&D), as it is used in the Oslo Manual, since it does not distinguish the size of the organizations.

Innovation in SME occurs in different forms from large companies, and therefore the method of measuring the degree of innovation should be distinct (EVERTON JUNIOR, 2017). Several studies conclude that the process of innovation management has a physical dimension, with favourable organizational structures and an intangible dimension related to behaviour, freedom of communication, risk-taking culture and the practice of creative techniques (Bachmann; Destefani, 2014). The model adopted, in addition to the measurement, aims to recommend

improvements with action plans, along with the monitoring of continuous and personalized learning for each company.

The authors mapped and scheduled visits to the SME and then entrepreneurs with suitable profiles were chosen for the study. The chosen SME allowed the survey to be conducted within the following parameters: the enterprises were framed by the annual revenues from R$360.000,00 to R$3.6 million per year, they were from the manufacturing segment and were located in the southern region of São Paulo. The notion that regional factors can influence the innovative capacity of firms has led to increasing interest in analysing innovation at the regional level (OECD, 2005).

The application of the questionnaire, called the Innovation Radar, was completed on-site, at each company. The collected data have been analysed in this article. The measurement within this diagnosis is not absolute, but a reference to the improvement opportunities and the potential to innovate existing in the analysed organization.

The Innovation Radar also tests how the environment of a business is conducive to innovation, after all, the concept is that an innovative company trains its employees to solve problems and fosters creativity as part of the organizational culture.

To expand on Sawney's original Twelve Dimensions of Innovation (2006), established his perspective in an additional new dimension: the inclusion of the "Innovative Ambience" dimension that directly relates to influencers' services as an external source of innovation (BACHMANN; DESTEFANI, 2014). The Innovative Ambiance dimension consists of external consulting, development agencies, free advisory, universities, research centres, etc.

The questionnaire uses the Likert scale, which consists of three levels and scores from one to five, in order to identify and rank companies quantitatively. The first level denotes companies with "Little or No Innovation", corresponding to the score of 1; the second level defines the "Occasionally Innovative" companies, and the corresponding score of 3; and the third level indicates the "Systemic Innovative" companies, with a corresponding score of 5 (SAWHNEY et. al., 2006; BACHMANN; DESTEFANI, 2014). When administering the questionnaire, only the last three years of the companies' operations were taken into account. Hence, the questionnaire measured the current situation of the organizations, as actions taken before this period do not meet the criteria for present-day innovation.

The Innovation Radar was administered through formal interviews, on the spot, and done individually or with a group of decision makers in the participating organizations. After

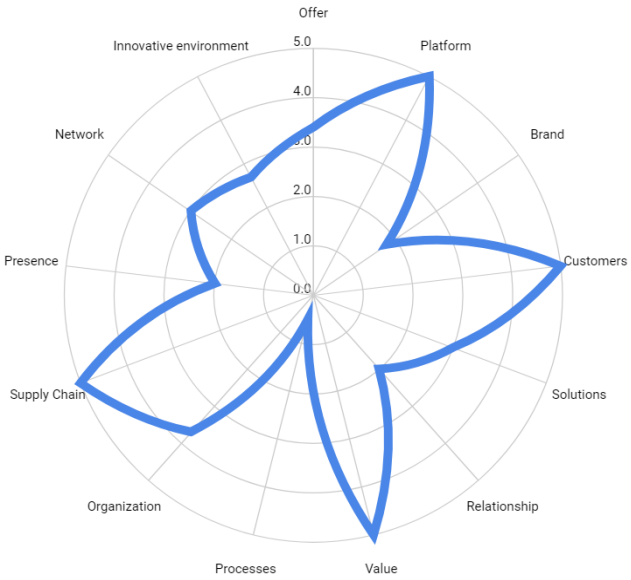
application of this tool, data was tabulated to generate charts and graphs, showing the degree of innovation for each of the thirteen radar dimensions. The result was the overall index of the companies' innovation.

Feedback was later given to the heads of each organization, and the points of greatest relevance were explained in detail, in a personalized manner to each company. Table 1 exemplifies a sample table for each company and Figure 1, a sample graph generated by the questionnaire. Observing the graph below, the ends correspond to the dimensions' highest scores in the company and the closest points on the graph's centre correspond to the least developed dimensions. These opportunities for improvement were offered to the companies' leadership teams, expecting they would improve on the dimensions creating a great impact for their companies.

Table 1. Table generated by the Innovation Radar to a particular organization.

Fig. 1. Graph Radar of Innovation by a SME.

Level of innovation	Average
A - Offer	3.0
B - Platform	2.0
C - Brand	3.0
D - Customers	1.7
E - Solutions	1.0
F - Relationship	2.0
G - Value	1.0
H - Processes	1.0
I - Organization	3.7
J - Supply Chain	1.3
K - Presence	2.0
L - Network	2.0
M - Innovative environment	1.3
Level of Global Innovation	1.9



Sources: Freitas et al., 2017.

Observing the averages of the set of 33 sample companies, the dimension Process shows the lowest score, corresponding to the letter H (see Table 1 and Fig. 1). Therefore, it can be considered a potential opportunity for innovation within each company. It was noticed that the dimension Process corresponds to the reality of the current Brazilian economic crisis. This dimension is relevant to SME in the industry sector, since the decrease of production may be, in many cases, an alternative to reduce operating costs. The limited production may also lead to a climate of employment insecurity, less prone to innovation. Case in point, a printing industry, observed in the sample, lost a customer that demanded 60% of its production. This resulted in highly skilled employees with high wages being dismissed. The company then

lacked skilled labour finishing techniques, which generated additional problems. This snowball effect for the company could possibly have been prevented, if innovative steps were taken before the economic crisis, to increase their customer base. Another aspect noted in the crisis was the elimination of external services, such as consulting or training.

3. Results

Business owners found it difficult to obtain long-term loans at reasonable rates to finance innovation, leading them to pursue innovations out of necessity, and therefore reactively. By analysing the companies in the sample, it was possible to define improvement opportunities in their processes:

- **A.** People Management: Entrepreneurs mostly showed dissatisfaction with employees in the relationships and cultural aspects of the company. For example, behaviour, attendance, delegation of tasks, and commitment to the company's rules were all elements they mentioned;
- **B.** Financial Management: The main problems related were the misuse of cash flows, mismanagement or lack of planning and financial education;
- **C.** Marketing Management: There were deficiencies in grouping customers according to their needs, loyalty, prospecting, distribution, and after-sales;
- **D.** Organizational Management: There were insufficient definitions of roles and tasks, role delegation, and identification of employee responsibilities;
- **E.** Planning and Process Control: In severe cases, a lack of tracking or alignment of inventory, production, quality control, shipping was found.

As the companies` owners prioritized the above obstacles, suggestions were made to generate a common groundwork, with the purpose of improving those companies. Then, action were took to resolve the aggravating management processes.

This premise shows that an aligned and consolidated management is the first step to creating a steady, innovative culture in search of significant results (OECD, 2005).

There are challenges observed in the companies, like neglect; lack of monitoring and of method to maintain the organization's processes, warehouses, manufacturing industry, and offices. Moreover, waste should be avoided and analysed strategically.

Some factors aggravated the management and restructuring of SME in the sample, the main cause of the manufacturing industry's production decline was the reduction of investments, especially in machinery and equipment, seen in both private and governmental companies

(Sebrae, 2018). Another difficulty identified was to find skilled labour or reach new target markets, which highlights weaknesses in the strategies or investments, limiting use of productive capacity and generating idleness. Table 2 shows the scores reached for the SME sample in each dimension.

Table 2. Score obtained from the Innovation Radar from the sample firms.

	Dimension	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33
1	Offer	3.4	3.4	2.6	2.2	1.4	3.4	4.2	4.6	3.0	2.2	3.4	3.4	1.8	4.6	1.4	1.4	1.8	1.8	2.6	1.4	3.0	4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	2.0	3.0	3.1	5.0
2	Platform	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	5.0	3.0	5.0	2.0	1.0	5.0	4.0	4.0	3.0	2.0	1.0	4.0	2.0	3.0	4.0	2.0
3	Brand	2.0	5.0	2.0	3.0	1.0	1.8	5.0	4.0	3.0	4.0	3.0	5.0	1.0	5.0	1.0	5.0	1.0	1.0	3.0	1.0	3.0	3.0	4.0	2.0	3.0	3.0	3.0	3.0	2.0	3.0	1.0	3.0	4.0
4	Customers	2.3	4.3	4.3	3.7	3.0	5.0	3.7	3.7	3.0	4.3	4.3	4.3	3.0	3.0	1.0	1.7	3.0	3.0	3.0	2.3	1.7	1.3	4.3	3.1	2.0	2.7	3.7	2.3	2.3	3.7	2.0	2.0	3.0
5	Solutions	3.0	5.0	1.0	3.0	2.0	3.0	1.0	4.0	3.0	1.0	3.0	5.0	1.0	4.0	1.0	3.0	2.0	1.0	1.0	1.0	1.0	3.0	5.0	2.0	3.0	3.0	3.0	4.0	2.0	3.0	4.0	4.0	2.0
6	Relationship	2.0	5.0	1.0	4.0	1.0	2.0	1.0	5.0	2.0	3.0	2.0	5.0	1.0	1.0	3.0	2.0	1.0	2.0	1.0	2.0	2.0	2.0	4.0	4.0	1.0	4.0	5.0	1.0	4.0	4.0	4.0	4.0	2.0
7	Value	3.0	4.0	2.0	2.0	2.0	5.0	1.0	5.0	3.0	1.0	2.0	4.0	1.0	3.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	3.0	3.0	4.0	2.0	2.0	2.0	2.0	2.0
8	Processes	3.7	4.0	2.0	1.3	2.0	0.5	4.0	2.7	1.7	2.0	2.0	4.0	1.7	1.7	2.0	1.3	2.3	1.7	2.3	1.3	1.0	1.0	1.0	2.0	1.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0
9	Organization	2.3	4.3	2.3	1.7	1.0	3.7	3.7	5.0	2.3	1.7	1.7	4.3	1.7	3.0	1.7	1.0	1.7	1.7	3.0	2.3	3.7	2.0	3.1	1.7	3.0	4.0	3.7	3.7	2.3	2.0	4.2	2.0	3.0
10	Supply Chain	3.0	5.0	1.0	1.0	3.0	5.0	1.0	1.0	1.0	3.0	3.0	5.0	3.0	1.0	3.0	1.0	1.0	1.0	3.0	1.0	1.3	2.0	2.0	3.1	4.0	4.0	2.0	2.0	2.0	2.0	4.0	2.0	2.7
11	Presence	2.0	5.0	1.0	1.0	1.0	2.0	1.0	5.0	3.0	2.0	2.0	5.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	2.0	1.3	3.1	3.0	2.0	4.0	2.0	1.7	2.0	2.7	2.3	3.0	3.0
12	Network	1.0	5.0	1.0	3.0	1.0	3.0	1.0	3.0	3.0	1.0	3.0	5.0	1.0	1.0	1.0	1.0	3.0	1.0	3.0	1.0	2.0	1.7	2.1	4.0	2.0	3.0	4.0	2.0	2.0	3.0	2.0	4.0	2.0
13	Innovative environment	1.3	3.6	2.4	1.0	1.6	2.7	2.4	4.1	1.9	1.3	1.3	3.6	1.9	2.7	1.3	3.0	1.9	1.3	1.9	1.0	1.3	2.0	2.0	2.7	2.1	2.7	2.0	2.0	1.3	2.0	2.0	2.0	2.3
	Company average	**2.5**	**4.4**	**2.1**	**2.4**	**1.9**	**3.2**	**2.6**	**4.0**	**2.6**	**2.3**	**2.6**	**4.4**	**1.9**	**2.8**	**1.8**	**2.1**	**1.9**	**1.8**	**2.3**	**1.6**	**1.9**	**2.0**	**3.1**	**2.8**	**2.4**	**3.2**	**2.9**	**2.5**	**2.4**	**2.5**	**2.7**	**2.8**	**2.7**

Source: Authors, 2018.

Companies are identified with the letter "E" at the top of the table; the dimension averages are shown in the far right column, and the companies' totals are listed in the bottom row of the table. As it can be observed, six companies achieved averages above three, and are considered by the methodology, "Occasional Innovative" companies. However, most of the other companies reported not having made significant changes in their processes over the past three years. This resulted in low scores for the dimension Process, receiving a designation of "Little or No Innovation". This shows that, from the perspective of those managers, their processes have not received the focus for desirable innovation. Eighty percent of organizations (27 companies) are, on average, below the score of three, most reached a minimum score in the dimension Process.

The common factor in the companies was business conduct, treating innovation as something specific and not as a continuous process. Of the thirty-three companies surveyed, fifteen scored below half, which places them in the category of "Little or No Innovation". Finally, none of them was the "Systemic Innovative" companies (companies with a score of 5, the maximum overall innovation performance). However, it is important to note that each company is its own entity and faces a different set of challenges, even when a part of the same industrial size and localization.

After an individualized diagnosis for each company, action plans were suggested. They called for improvements in management, to build foundations for the development of cultural innovation. It became clear that most companies made innovations in "emergencies", for

instance, arising from insufficient alternatives, aimed at survival in the market. The dimensions that are more developed in the sample companies, with higher scores on the Innovation Radar, are: Presence, Offer, Brand, and Relationship.

The twelve most implemented actions to improve processes were: (1) attending courses on people management, (2) quality, and (3) finances; (4) consulting and advisory services for cash flow refinement; (5) rebuilding organizational chart; (6) offering marketing workshops; (7) standardizing processes and customer service in order to reduce waste; (8) optimizing resources and increasing customer satisfaction; (9) implementing loyalty programs; (10) expanding the audience with service to new markets, (11) increasing participation in fairs and conferences; and (12) offering new products, or kits assembled with existing products.

Observing Table 2, we note that most organizations had a score of 1 in dimension Process, meaning that, they have "Little or No Innovation". Experience in the field has shown that entrepreneurs were mostly conservative in relation to production, demonstrating hesitation to invest in this dimension. The employees need a period of adjustment for production changes or process of maturation. SME normally have a lack of capital investment, and therefore, seek to work other dimensions that may have more short-term returns, such as reducing costs, or focusing on direct sales.

The authors found that although these companies were framed by their revenues as SME, their management style proved to be closer to micro businesses, with weak administrative operations. The entrepreneurs were focused on productive activities or routines, and struggled to keep qualified employees. This resulted in production bottlenecks and insufficient incentives for innovation.

Managers' greatest difficulty was the delegation of manual, routine duties. Often times, they chose the manual work over the administrative tasks, leaving the later unchecked. It can also be argued that the dimension Process was not regarded as a priority by employers, as current processes, to some level, already worked. In general, entrepreneurs tend to resist changing in their businesses, avoiding risks.

Some of the suggested actions to improve the dimension Process were: the (i) standardization of production processes; (ii) development planning; controlling of production processes; (iii) implementation of quality tools; (iv) cultivation of partnership with other companies and suppliers to streamline inventories; (v) documentation of inventory for finished products; and (vi) management of raw materials and waste.

None of the companies analysed had professionals allocated to develop or deploy innovations. Furthermore, none of them was able to hit a strong overall diagnosis mark. Consequently, they are not considered innovative in the manufacturing segment. Thus, we can see a major deficiency in the processes of SME in the south region of São Paulo.

4. Considerations

This article's main component is to identify opportunities for improvement and innovation in the dimension Processes in the interviewed companies. It can be highlighted that small businesses have a lot in common, for example, most began as micro or family businesses, and after their growth, had financial gain, as well as an increase in the number of employees, etc.

The lack of strategic planning and strong management practices that aligned with the company's values, a context that was addressed in the analysis of the results, greatly limited the potential for innovation in Brazilian SME. A culture of innovation as a continuous process depends on robust management and on skilled and motivated employees, to power innovation as a means of stimulating the development of the organization.

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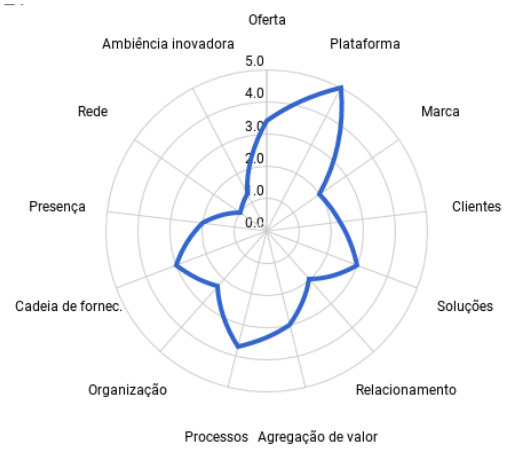
6. ATTACHMENTS

At the end of the collection and tabulation of data from each SME, a precise graphic was structured on the current innovation scenario presented to the company. Following are the graphs generated for each of the 33 companies (E1 to E33) below:



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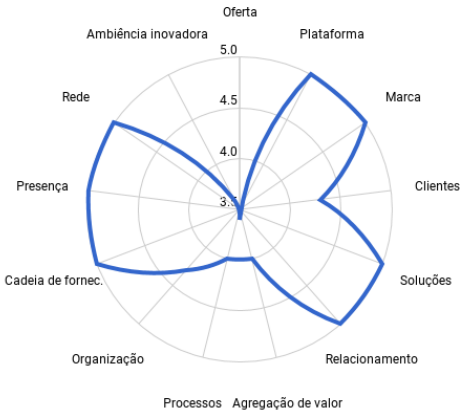

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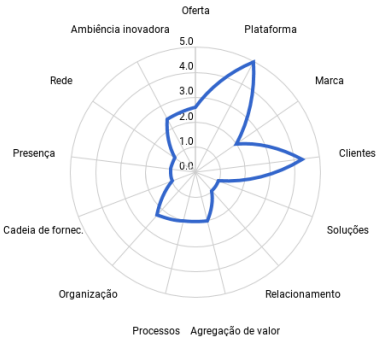

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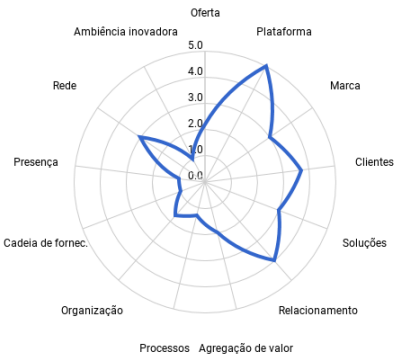
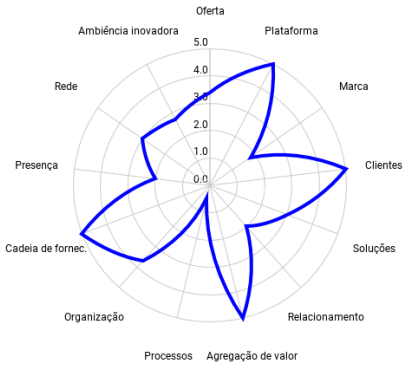


E5

E6



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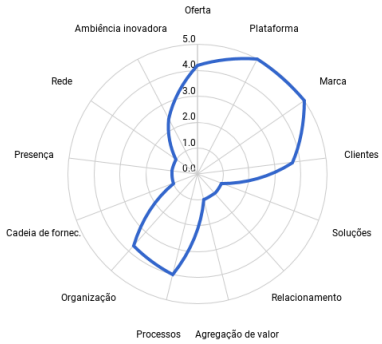

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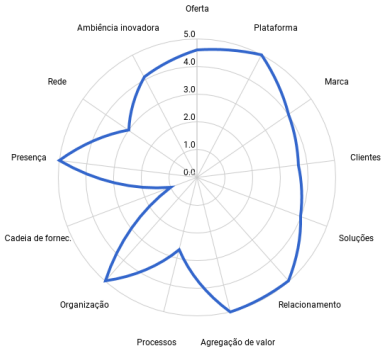

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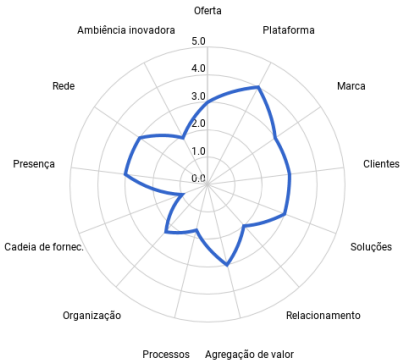
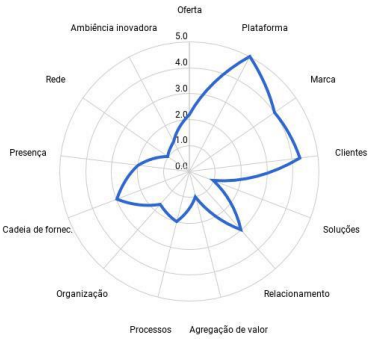
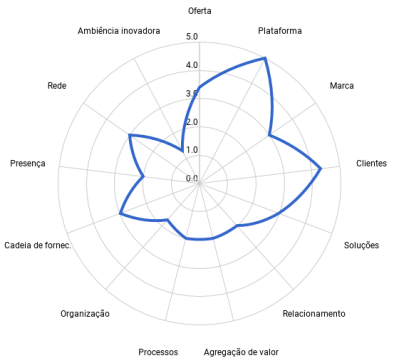


E10



E11



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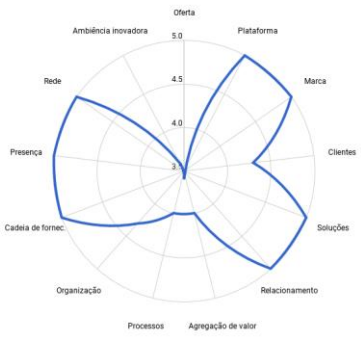

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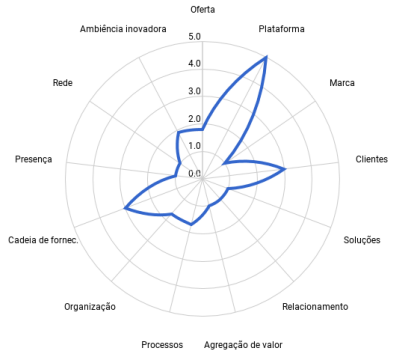

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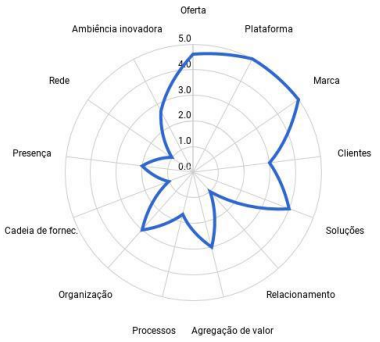

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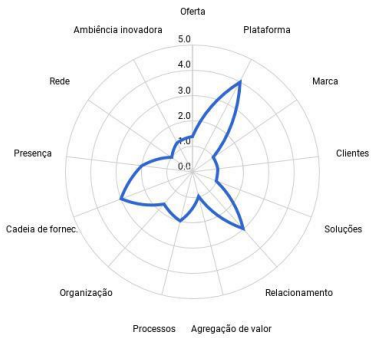

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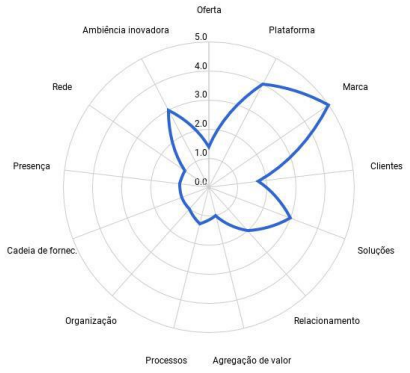

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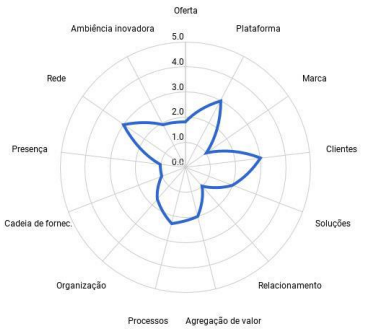

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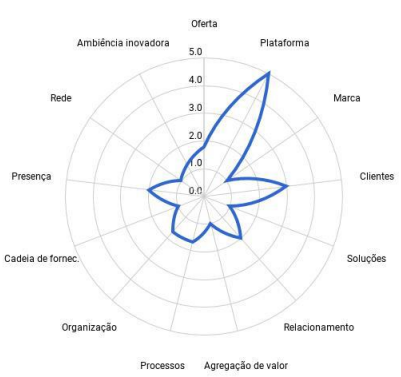

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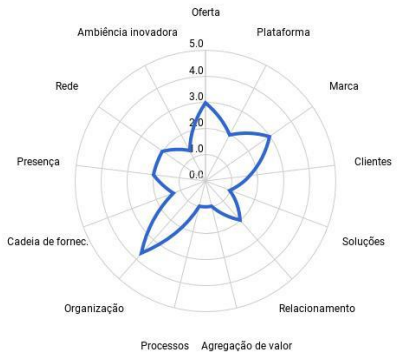

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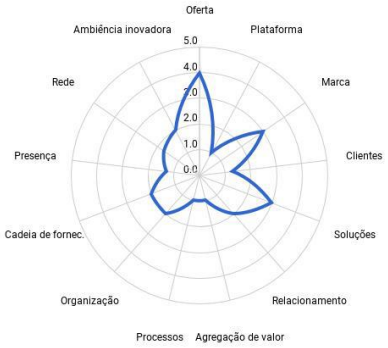

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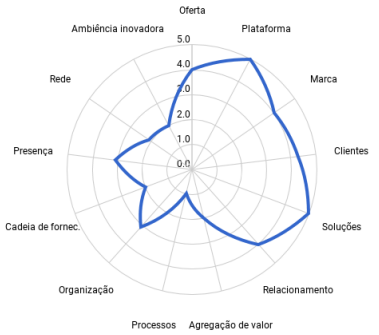

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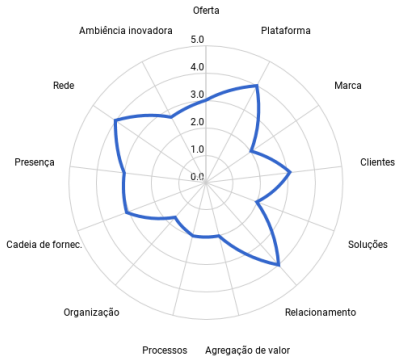

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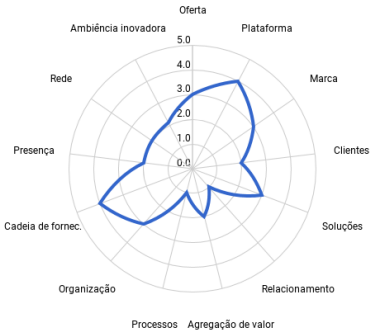

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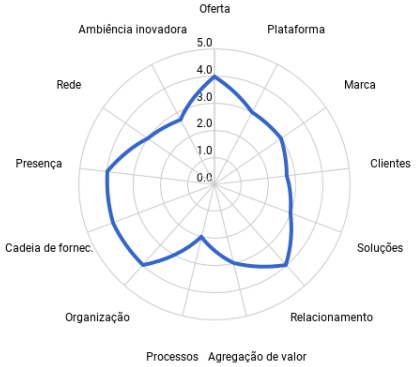

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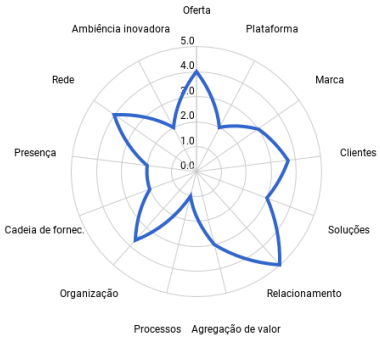

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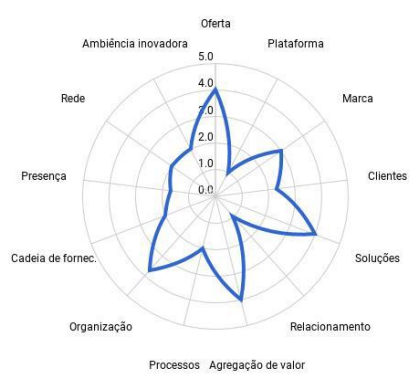

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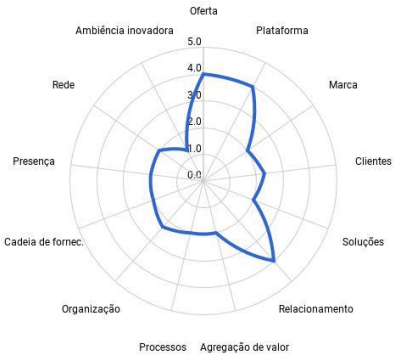

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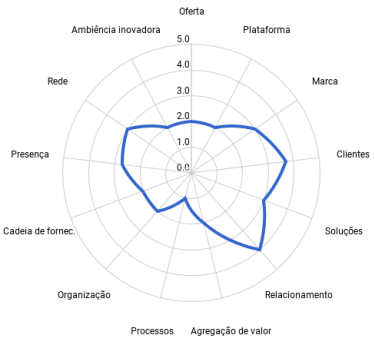

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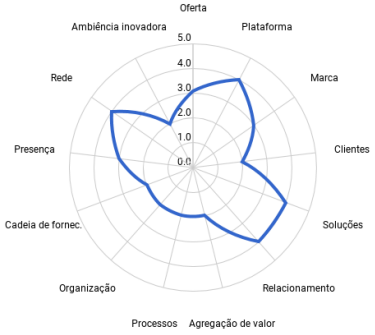

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