

Innovation of Micro and Small Enterprises: Measuring the Degree of Innovation of Companies Participating in the Local Innovation Agents Project

Ana Teresa Silva Néto[†]
SEBRAE-Sergipe

Rivanda Meira Teixeira^Ω
Universidade Federal de Sergipe - UFS

ABSTRACT

The objective of this study was to measure the degree of innovation of micro and small enterprises (MSEs) in the state of Sergipe. For this purpose, we conducted a survey of 1,260 MSEs that participate in the Local Innovation Agents Project of SEBRAE (Brazilian Service to Support Micro and Small Enterprises) in Sergipe, among firms in the food, civil construction, lumber and furniture, health, and textile and apparel sectors. The tool used to measure innovation was the innovation radar, developed by Sawhney, Wolcott & Arroniz (2006), which uses 12 dimensions: offerings, platform, customers, solutions, relationship, value capture, processes, organization, supply chain, presence, networking and brand. This tool was complemented by the innovation ambience dimension of Bachmann & Destefani (2008), because an organizational climate propitious to innovation is a prerequisite in companies. Among the results were that the average degree of innovation of the MSEs in Sergipe was 2.01, which indicates still incipient innovation in the sample of firms analyzed.

Keywords: Innovation. Micro and small businesses. Measuring innovation.

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***Author for correspondence:**

[†]Master's in Economics from Sergipe Federal University
Institution: SEBRAE-Sergipe
Address: Rua Tancredo Neves, Bairro América
Aracaju – SE - Brazil
E-mail: anateresa.neto@se.sebrae.com.br
Telephone: (79) 21067763

^ΩDoctorate in Administration from Cranfield Management School, Cranfield University, England
Institution: Professor in the Master's in Administration Program of Sergipe Federal University
Address: Av. Prof. José Aloísio de Campos s/n Jardim Rosa-São Cristóvão – SE - Brazil
E-mail: rivandateixeira@gmail.com
Telephone: (79) 2105-6354

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1 INTRODUCTION

The interest of academics and policymakers in micro and small enterprises (MSEs) is growing in many countries because of their important role in generating jobs and income. A study performed by Ortigara (2006) showed that these firms account for high percentages of jobs in various countries, such as Chile (80%), Spain (80%), Switzerland (75%), Australia (71%) and the United States (51%).

In Brazil, micro and small businesses represent 99% of existing firms and generate 51.63% of the jobs in the formal economy (SEBRAE; DIEESE, 2011). The importance of MSEs in generating jobs in the country is further demonstrated by the *Anuário do Trabalho*, or Labor Yearbook (SEBRAE; DIEESE, 2011), according to which in 2009 and 2010, 154,157 new companies were created, of which 96.2% were MSEs. The commerce sector accounted for the greatest share of establishments (51.5%) and jobs (41.3%), followed by the service sector, with 33.3% of the establishments and 27.1% of formal jobs, the industrial sector, with 10.7% of the establishments and 23.3% of the jobs, and the civil construction sector, accounting for 4.5% of the establishments and 8.2% of the jobs. According to Caloête (2009), firms in this stratum are currently the most active economic agents in the country.

The fact that Brazil has millions of small businesses is also shown by the results of the Global Entrepreneurship Monitor survey conducted in 2011, which analyzed the level of entrepreneurial activity in 54 countries, representing 95% of global GDP and containing two-thirds of the world's population. According to the total early-stage entrepreneurial activity (TEA) index, one of the main metrics in the study, Brazil's TEA (14.89%) is above the average of the countries studied (10.95%). However, when analyzing the innovation in business of Brazilian entrepreneurs in the initial stage, through the novelty of the product for consumers and the level of competition faced, Brazil is below the average of the 54 countries included in the survey. Overall, the survey shows that innovation is still incipient in small Brazilian firms, with a low level of innovative content (GEM, 2011).

Despite the enactment of two federal laws (Law 10,973 and Law 11,487) and local laws in nearly all Brazilian states to stimulate innovation and cooperation between universities and companies, as well as tax incentives and subsidies for innovation, many small business owners are unaware of these stimuli or have difficulty qualifying for them. This fact is borne out by the Technological Innovation Survey (PINTEC), considered the largest nationwide

study on innovation, conducted by the Brazilian Institute of Geography and Statistics (IBGE, the census bureau), which computes innovation indicators regarding Brazilian companies. The results demonstrate that these governmental instrument to support innovation are underutilized by firms. The least used instruments in the industrial sector were: direct subsidies (0.5%); low-cost financing of R&D and technological innovation projects carried out in partnership with universities or research institutions (0.8%); the benefits offered by the Law on R&D and Innovation (1.1%). The percentage of small industrial firms using the benefits available under this was only 0.5%, while the percentage of large companies was 16.2%. Overall, large companies were the main beneficiaries of these instruments (IBGE, 2010).

Brazilian Service to Support Micro and Small Enterprises (SEBRAE), concerned over the question of innovation, has established promotion of innovation in micro and small businesses as one of its main strategic objectives (SEBRAE, 2008). The Local Innovation Agents Project (ALI) was created by SEBRAE to stimulate innovation among these firms, improve their competitiveness promote partnerships with science and technology institutions or firms with specific expertise that can be transferred through joint research or implementation of innovative solutions.

The assumption adopted here is that the degree of innovation of MSEs can be measured by applying the 13 dimensions adopted in the models of Sawhney, Wolcott & Arroniz (2006) and Bachmann & Destefani (2008). For this purpose, we analyzed the innovation degree of MSEs of the productive chains of the food, civil construction, lumber and furniture, health, and textile and apparel sectors located in the state of Sergipe, all of them participants in the Local Innovation Agents Project.

2 MICRO AND SMALL ENTERPRISES

In Brazil, despite the importance of MSEs to the nation's economy, there is no consensus on classifying these companies. There are basically two criteria used, which are not mutually exclusive: number of people occupied (including owners) and annual revenue. The entities representing the sector and research institutions variously use the number of people occupied and/or gross annual revenue, while financial institutions, such as the National Bank for Economic and Social Development (BNDES) and Banco do Nordeste do Brasil (BNB), use only the revenue yardstick.

Table 1 summarizes the criteria utilized to classify companies as being micro and small in Brazil.

were responsible for 56.1% of the total number of jobs in September 2011. These figures confirm the relevant role of MSEs to generate jobs in the country (SEBRAE, 2011).

The picture is similar in Sergipe — the state has a total of 30,448 micro and small businesses, representing 98.7% total. The most important sector is commerce, with 55.6%, followed by services with 28.5%, industry with 10.1% and construction with 5.8% (Table 3).

Table 3 – Number of Micro and Small Enterprises by Economic Sector in Sergipe (2010)

Sector	Number of MSEs	%
Industry	3,081	10.1
Construction	1,763	5.8
Commerce	16,917	55.6
Services	8,687	28.5
Total	30,448	100

Source: SEBRAE & DIEESE (2011), based on data from the Ministry of Employment (Annual Report in Social Information – RAIS).

With respect to generation of jobs in the state, commerce again leads the pack, with 40,569 (41%), followed by services with 28,363 (28.7%), industry with 17,232 (17.4%) and construction with 12,726 (12.9%).

3 INNOVATION AND SMALL BUSINESSES

In the view of Alsaaty (2011), the innovation strategy for small businesses — in function of the limited resources and their need to grow — is the market. In other words, customers are the focus in their innovative activities. The study “Inovação e Competitividade nas MPEs Brasileiras” (“Innovation and Competitiveness in Brazilian MSEs”), prepared by SEBRAE/SP (2009) based on a survey of 4,200 MSEs, assessed the innovation and competitiveness in the universe of Brazilian micro and small enterprises. The companies were classified according to the level of innovation and it was found that 54% of them could be considered “non-innovative companies”, while 43% were considered “innovative companies” and 3% “very innovative companies”. The results showed that the innovative MSEs outperformed the non-innovative firms. In the comparison between 2008 and 2007, 86% of very innovative MSEs and 64% of the innovative MSEs declared their revenue had grown, against 47% of the non-innovative MSEs. In short, the survey indicated that more innovative firms earned higher revenues than the non-innovative companies.

There is general consensus that small companies face more difficulties to innovate than larger ones. The report “Desenvolvimento Tecnológico e Inovação nas Microempresas e

Pequenas Empresas: Fatores de Influência” (“Technological Development and Innovation in Micro Companies and Small Companies: Influence Factors”), prepared by the Permanent Forum of Micro and Small Businesses (2007), indicated questions that hamper technological development and innovation in MSEs. The main ones were: reduced technical know-how of MSEs; dependence on suppliers of the main innovative technological inputs; low level of investment in R&D; little tradition of investing in technological development; high cost of acquiring innovations; difficulty of obtaining credit to acquire equipment, low approximation with technology centers; lack of physical infrastructure; and lack of trained personnel.

According to the Oslo Manual (OECD, 2005), financing is a determining factor for innovation in small businesses, which rarely have their own funds to conduct innovation projects, besides facing more difficulties in obtaining outside financing than large companies.

However, Botelho, Carrijo & Kamasaki (2007) argued that the smaller a company’s size, the more innovative it will be, and stressed that factors favoring innovation among small companies are location in local productive arrangements and interactions and proximity with R&D institutions. For Benedetti (2006), small companies use innovation for growth and continuous development. He found that actions aimed at innovation make an important contribution to the growth of the firm studied and that its owners were constantly trying to develop small innovations to assure competitiveness and profitability.

For Andreassi (2003), the innovation by small businesses (except high-tech firms), unlike large companies in which innovation is based on R&D, is typically linked to the production line, in activities related to adaptation of technologies acquired from other companies or small improvements implemented by the industrial engineering area. Andreassi & Sbragia (2002), in their study of small, medium and large companies called “Fatores determinantes do grau de inovatividade das empresas: um estudo utilizando a técnica de análise discriminante” (“Factors that determine the innovation degree of companies: a study using the discriminant analysis technique”), selected the following indicators: 1) R&D expenditures in relation to revenue (%); 2) number of staff members with advanced degrees per number of employees (%); 3) number of patent applications filed or patents granted per number of employees (%); and 4) number of employees assigned to R&D, among others. The authors concluded that the number of employees assigned to R&D activities is the most important factor separating more from less innovative companies.

On the other hand, Bachmann & Destefani (2008) argued that indicators of patent activity and percentage of revenue spent on R&D are not adequate for MSEs, because these

firms' in general do not spend on R&D, do not have staff members with advanced degrees and do not file patent applications. Table 4 indicates some of the dimensions used as metrics of innovation in small, medium and large companies.

Source	Dimensions
Tidd, Bessant & Pavitt (2009)	1) vision and leadership for innovation; 2) appropriate organizational structure; 3) key roles for innovation in the organization; 4) training; 5) involvement of people; 6) formation of a team for innovation; 7) creative climate; 8) external focus; 9) multidirectional and multichannel communication; and 10) organizational learning capacity.
Mendel, Oliveira & Mendel (2004)	1) physical environment; 2) communication; 3) organizational structure; 4) leadership and autonomy; 5) teamwork; 6) participation; 7) management involvement; 8) availability of resources; 9) recognition and reward; 10) strategy for new products and services; 11) training and development; and 12) organizational learning.
Silva, Hartmann & Reis (2006)	1) entry; 2) exit; 3) forms of innovation; 4) sources of innovation; and 5) impacts of innovation.
Scherer & Carlomagno (2009)	1) leadership; 2) strategy; 3) relationships; 4) culture; 5) people; 6) structure; 7) processes; and 8) financing.
Sawhney, Wolcott & Arroniz (2006)	1) offerings; 2) platform; 3) customers; 4) solutions; 5) relationship; 6) value capture; 7) processes; 8) organization; 9) supply chain; 10) presence; 11) networking; and 12) brand.

Table 4 – Dimensions used as innovation metrics
Source: Prepared by the authors based on review of the literature (2011).

According to Robertson, Casali & Jacobson (2012), the creation of an integrated and dynamic innovation environment by MSEs mainly depends on modifications of their processes, since these are responsible for changes that affect innovation, from creation of an idea to its development and launch. They also stress that the competitive potential of these companies can be improved by insertion of practices that allow them to innovate competitively.

Vasconcellos & Marx (2011) indicated phases in the innovation process of MSEs: preliminary investigation, which involves an initial idea; detailed investigation and preparation of a business plan, in which the company plans and seeks support for innovation; development of the innovation, which involves the enablement of the idea; testing and validation, to try out the product, service or practice developed; and mass production. Forsman (2011), in explaining the capacity to develop innovation in small enterprises, stated

that patterns of innovation exist in these firms that should be explored and encouraged, to enable them to improve their processes and practices with customers and suppliers.

Campos & Campos (2013) indicated in their multiple case study of small businesses that innovation is not a privilege of large companies and that small ones can adopt incremental innovations to expand their markets. However, the lack of a defined process to manage results prevents these firms from realizing their full potential.

For Esteves & Nohara (2011), MSE's face difficulties to compete in comparison with large companies because they do not have sufficient resources to expand their activities to places far from their home base or to invest in innovations to allow them to develop more broadly.

Feldens, Maccari & Garcez (2012) pointed out the main barriers to innovation in products faced by small and mid-sized technology companies in Brazil. The innovation process and its obstacles were analyzed by conducting interviews with various agents involved in the process, including entrepreneurs, venture capital investors and managers of incubators. The analyses compared two viewpoints, that of entrepreneurs and that of investors. The main factors affecting innovation highlighted by the authors were: (i) difficulties related to legal barriers, costs and availability of capital; (ii) lack of investors to finance the more advanced stages of development and shortage of exit modes, thus increasing the investment cycle compared to international averages; (iii) the participation of investors who are close friends of the entrepreneurs in the management of companies; (iv) the difficulty of finding qualified technical and management staff to develop new and uncertain businesses; (v) cultural aversion to risk, inducing both entrepreneurs and investors to be conservative in their decisions; and (vi) a sense of good perspectives for the future, linked to the availability of capital.

In this study we use the dimensions proposed by Sawhney, Wolcott & Arroniz (2006), complemented by the innovative ambience dimension of Bachmann & Destefani (2008), to measure the innovation level of micro and small enterprises in Sergipe that participate in the Local Innovation Agents Project. These dimensions are detailed in the Innovation Diagnosis Model, presented next.

The Local Innovation Agents Project (ALI) was conceived by SEBRAE based on an Indian method for transfer of knowledge, to promote a culture of innovation in MSEs (SEBRAE, 2010). The main objective of the ALI Project is to enhance the competitiveness of

MSEs by diffusion of information on innovation, technology and application of solutions, according to the characteristics of each business and generating a direct impact on management practices, enabling the improvement of products and processes and identification of new market niches for their products and services. The ALI Project is based on the Oslo Manual (OECD, 2005), in which the types of innovation currently accepted are addressed.

4 THE INNOVATION DIAGNOSIS MODEL

The aim of innovation diagnosis is to measure the current level of innovation of a firm and indicate the activities that are and are not being carried out. The tool used is based on the Innovation Radar instrument developed by Sawhney, Wolcott & Arroniz (2006) and uses 12 dimensions by which a company can seek opportunities to innovate. This instrument was developed based on interviews with managers responsible for activities related to innovation in various large companies.

According to Sawhney, Wolcott & Arroniz (2006), the Innovation Radar consists of four key dimensions that serve to anchor businesses: 1) the offerings a company creates; 2) the customers it serves; 3) the processes employed; and 4) the points of presence it use to put its offerings in the market. Eight more dimensions are added to these four (platform, solutions, relationship, value capture, organization, supply chain, networking and brand) that can be used as avenues of pursuit.

We complemented this tool with the innovative ambience dimension proposed by Bachmann & Destefani (2008), because we believe an organizational climate propitious to innovation to a prerequisite. This tool was adapted for use in the Local Innovation Agents Project. According to SEBRAE (2010, p. 6), “the method adopted assumes that innovation is not an isolated event or fact, but instead is the fruit of a process; hence the concern with assessing not just a simple result (number of innovations), but rather the maturity of the process of managing innovation by companies.”

The Innovation Radar instrument (Figure 1) encompasses the following dimensions: 1) offerings; 2) platform; 3) brand; 4) customers; 5) solutions; 6) relationship; 7) value capture; 8) processes; 9) organization; 10) supply chain; 11) presence; 12) networking; and 13) innovative ambience.

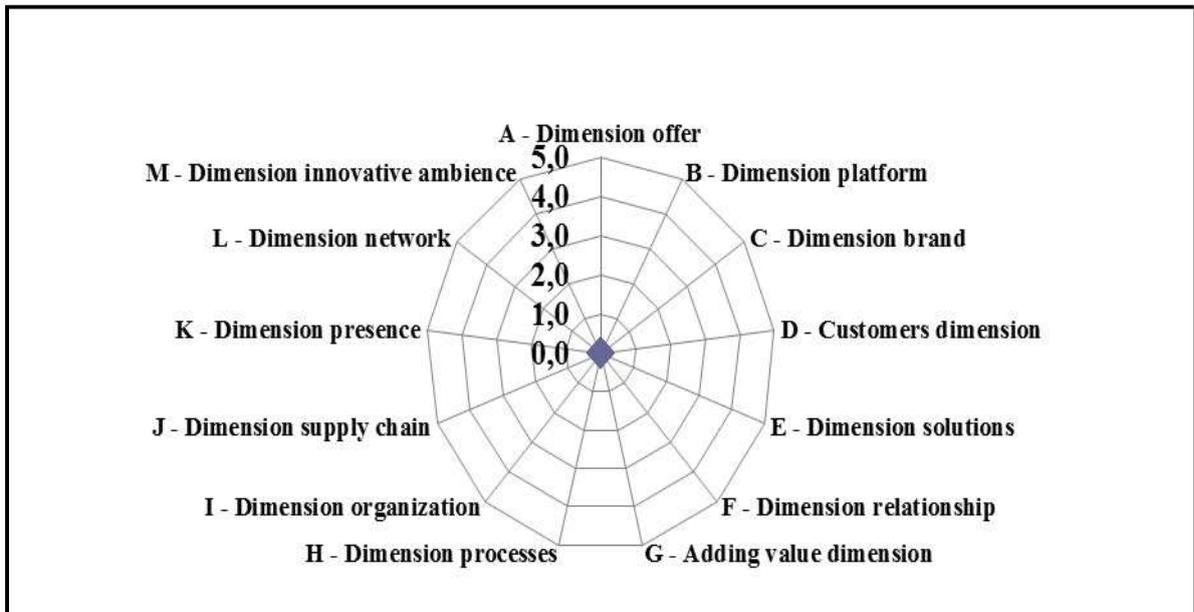


Figure 1 – Innovation Radar

Source: SEBRAE/SE (2011)

The indicator, which is the average of the values of each of the innovation dimensions, is a useful yardstick to measure the level of innovation of micro and small enterprises. The visualization of the Innovation Radar (Figure 1) reveals the strong and weak points regarding the dimensions analyzed and enables immediate action in the dimensions that are most problematic, which in theory should be the first to be resolved. A company's innovation level is measured by means of the dimensions, which are in turn composed of variables to which scores are assigned, according to the following criteria: 5 points when the variable is systematic or common; 3 points when the variable is occasionally present; and 1 point when the variable is not present/does not exist.

We calculated the innovation level (IL) of the firms based on the evaluation of each of the variables making up the 13 dimensions in the innovation diagnosis (ID). The company's innovation level is obtained by dividing the sum of the mean values obtained in each dimension by the number of dimensions.

The mean innovation level (IL) - of all the companies is obtained by dividing the sum of the means of each dimension of all the firms surveyed by the total number of dimensions. The firms in a process of innovation are those that innovated in the previous three years, but do not have a systematic process. Their Innovation Radar results are between 2 and 3 in the 13 dimensions. Companies that obtain a score of 1 in all the dimensions are considered not to have any concern with innovation (SEBRAE, 2010).

We classified the companies into three types according to the value of the innovation level (IL), on the referred scale of 1 to 5. Firms with IL scores greater than or equal to 4 are defined as **systematic innovators**, because they systematically engage in management of innovation. Those with IL scores greater than or equal to 3 and less than 4 are defined as **occasional innovators**. They are companies that innovated in the previous three years, but without systematizing the process. Finally, firms with IL scores greater than or equal to 1 and less than 3 are defined as **low or non-innovators**. They are companies that innovate very little or not at all. Table 5 shows the types and criteria used in the classification.

Type of Company	Definition	Innovation Level Score (IL)
Systematic innovator	The company systematically practices innovation.	IL equal to or greater than 4.
Occasional innovator	The company innovated in the previous 3 years, but has no systematized process.	IL greater than or equal to 3 and less than 4.
Low or non-innovator	The company innovates little or none.	IL greater than or equal 1 and less than 3. If the IL score is 1, the company does not innovate.

Table 5 – Classification of companies by innovation level scores
Source: Prepared by the authors.

The variables used for each dimension of the innovation diagnosis were:

1. Offerings dimension – Variables: a) new markets; b) new products; c) boldness; d) response to the environment; e) design; and f) technological innovation.
2. Platform dimension – Variables: a) production system; and b) product versions.
3. Brand dimension -Variables: a) brand protection; and b) brand leverage.
4. Customers dimension –Variables: a) identification of needs; b) identification of markets; c) use of manifestations of customers-processes; d) use of manifestations of customers-results.
5. Solutions dimension – Variables: a) complementary solutions; and b) integration of resources.
6. Relationship dimension –Variables: a) facilities and amenities; and b) computerization.
7. Value capture dimension – Variables: a) use of existing resources; and b) use of opportunities for interaction.
8. Processes dimension – Variables: a) improvement of processes; b) management systems; c) certifications; d) management software; e) environmental aspects; and f) waste management.

9. Organization dimension – Variables: a) reorganization; b) partnerships; c) external vision; and d) competitive strategy.
10. Supply chain dimension – Variable: suppliers.
11. Presence dimension – Variables: a) points of sale; and b) new markets.
12. Networking dimension – Variable: dialog with customers.
13. Innovative ambience dimension – Variables: a) external sources of knowledge I; b) external sources of knowledge II; c) external sources of knowledge III; d) external sources of knowledge IV; e) intellectual property; f) innovative boldness; g) financing of innovation; and h) collection of ideas.

5 METHODOLOGICAL PROCEDURES

We obtained quantitative data on the companies through a survey among micro and small enterprises in the state of Sergipe. The data collection instrument was the Innovation Diagnosis Questionnaire, composed of three blocks of queries: 1) Block I – questions related to the profile of each company, for identification and characterization: company name, fictitious name, CNPJ (taxpayer number), address, telephone, CNAE (national economic activity code), number of people occupied and size of customer base; 2) Block II – 42 objective questions to calculate the innovation level, divided into the 13 dimensions, where each dimension is composed of a set of variables that received a score of 1, 3 or 5, according to the criteria adopted in the ID model; and 3) Block III – open questions that can contribute to the process of analyzing the innovation environment of the companies.

The universe (population) surveyed was composed of 1,260 micro and small enterprises in Sergipe, all of them participants in the Local Innovation Agents Project. Because participation in the Project is by voluntary adhesion, the companies were not randomly selected. The basic information about the companies was obtained from the Client Response System, ALI module, which is a database maintained by SEBRAE/SE. This universe of 1,260 companies was the base for calculating the innovation level in the first stage of the survey, and represented 4.1% of the MSEs in the state of Sergipe (SEBRAE; DIEESE, 2011) in the study year (2011). The data other than company listing information in the database were gathered *in loco* by local innovation agents, who personally interviewed the owners of the companies.

We used descriptive statistics to analyze the innovation level. Some analyses were conducted by stratifying the data according to productive chains, with the aim of drawing

comparisons and revealing possible differences between chains. Since companies participate in the Local Innovation Agents Project by adhesion, it is not possible to generalize the results to the universe of MSEs. However, we tried to follow scientific mechanisms to allow at least statistical generalization of the population studied, namely micro and small enterprises in Sergipe in the productive chains studied.

6 CHARACTERIZATION OF THE COMPANIES

About 63% of the companies studied were from the commerce sector, followed by 21% from industry and 15% from the service sector. Regarding location, 994 companies (78.89%) were established in the Aracaju, the capital, and 266 (21.11%) in the rest of the state. A large percentage of the industrial companies came from outside the capital (39.78%). This can be explained by the participation of municipalities like Tobias Barreto and Itabaianinha, where there is a high concentration of small textile and apparel companies, and the municipality of Lagarto, known for furniture and wood articles, where there is also a large concentration of small industries.

The breakdown by sector of the companies was 25.79% in food, followed by 21.75% in civil construction, 20.71% in textiles and clothing, 20.56% engaged in the health sector, 8.73% in lumber and furniture, and 2.46% for others. The high percentage of companies in the food sector can be explained by the large number of restaurants, snack bars and pizzerias.

7 INNOVATION LEVEL OF THE MSEs

The average innovation level of the companies was obtained by dividing the sum of the average values of each dimension for each company by the total number of dimensions. Table 6 shows the average scores obtained by the 1,260 MSEs in each of the 13 dimensions, along with the highest and lowest values found in the dimensions, the most frequent results (mode), the standard deviation and the mean innovation level of these companies.

Table 6 – Innovation Level Scores of the Companies According to the Dimension

Dimension	Innovation Level				
	Mean¹	Minimum	Maximum	Mode	Stand. Dev.
Offerings	2.11	1.00	4.33	1.67	0.06
Platform	3.77	1.00	5.00	5.00	0.11
Brand	2.73	1.00	5.00	3.00	0.14

¹The scale that measures the innovation level of the company goes from 1 to 5.

Customers	2.45	1.00	5.00	2.00	0.06
Solutions	2.05	1.00	5.00	1.00	0.13
Relationship	1.92	1.00	5.00	1.00	0.09
Value Capture	1.49	1.00	5.00	1.00	0.16
Processes	1.43	1.00	4.20	1.00	0.07
Organization	1.65	1.00	4.50	1.00	0.09
Supply Chain	1.68	1.00	5.00	1.00	0.04
Presence	1.57	1.00	5.00	1.00	0.10
Networking	1.63	1.00	5.00	1.00	0.08
Innovative Ambience	1.65	1.00	3.75	1.25	0.07
Mean Innovation Level	2.01				

Source: Prepared by the authors based on data from SEBRAE/SE (2011)

As can be seen, the average innovation level of the companies evaluated was 2.01. According to the classification proposed here, overall the companies can be classified as low innovators, because the average score is in the interval from 1 to 2.99.

The minimum score for the offerings, customers, processes, networking and innovative ambience dimensions was 1.00 and the maximum scores were 4.33, 5.00, 4.20, 5.00 and 3.75 respectively. The standard deviations of the dimensions were: offerings (0.06), customers (0.06), processes (0.07), networking (0.08) and innovative ambience (0.07). These are low, denoting the values were closely distributed around the mean of the distribution. Because of this low standard deviation, it can be said that these five dimensions are homogeneous.

The mean values of the dimensions offerings (2.11), customers (2.45), processes (1.43), networking (1.63) and innovative ambience (1.65) were all below 3, indicating that the variables measuring these five dimensions are not expressive.

The mode is the event or category of events that occurs with greatest frequency, indicating the value or category that is most probable. According to Hair Junior et al. (2009), the histogram is a graphic depiction of a variable that represents the frequency of occurrence (mode) within a category of data. The data representing the mode of the offerings dimension can be observed in the histogram below (Figure 2). It can be seen that in this dimension, the largest number of firms had innovation level scores in the interval from 1.51 to 2, followed by the interval from 1 to 1.5. About 80% of the companies received scores in this dimension

below 3, indicating that the variables measured in this dimension are not highly important to these companies. Only 20% of the companies showed evidence of seeking new markets, launching new products, improving the design of their products, using new technologies and using new materials.

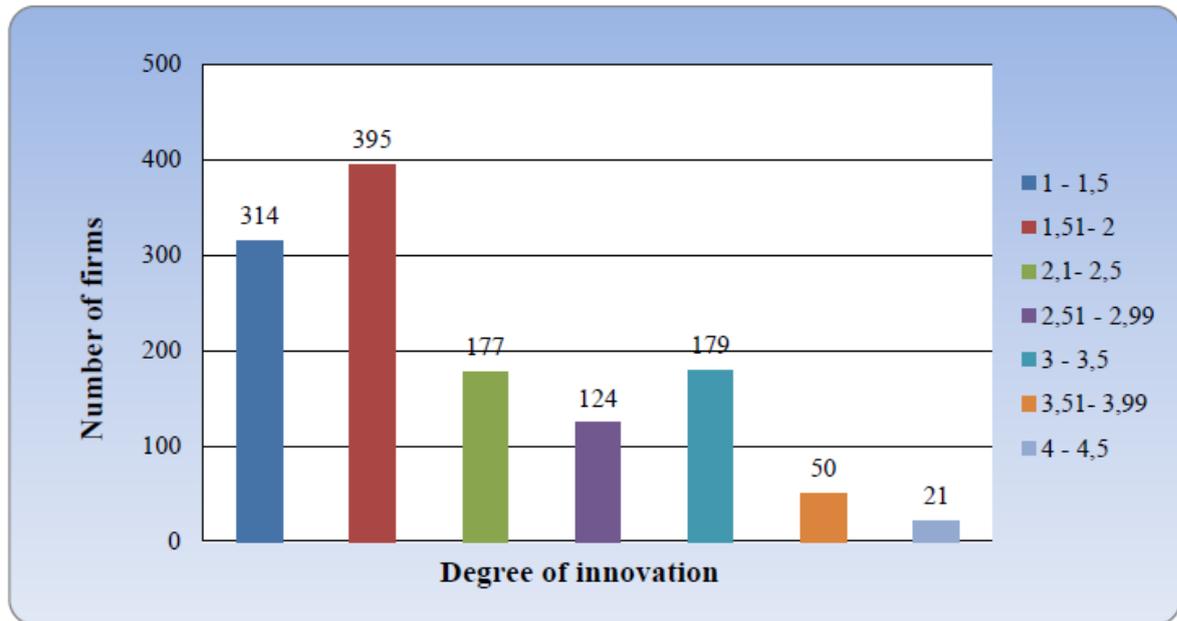


Figure 2 – Histogram of the Offerings Dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The data that represent the mode of the customers dimension can be observed in the histogram in Figure 3. In this dimension, the largest number of firms had scores in the interval from 3 to 3.5, followed by the interval from 1 to 1.5. About 61% of the firms had scores in this dimension below 3, indicating that the variables measured in this dimension are relatively unimpressive for these companies. Approximately 39% of the companies presented evidence that they listen to the comments and identify the needs of customers.

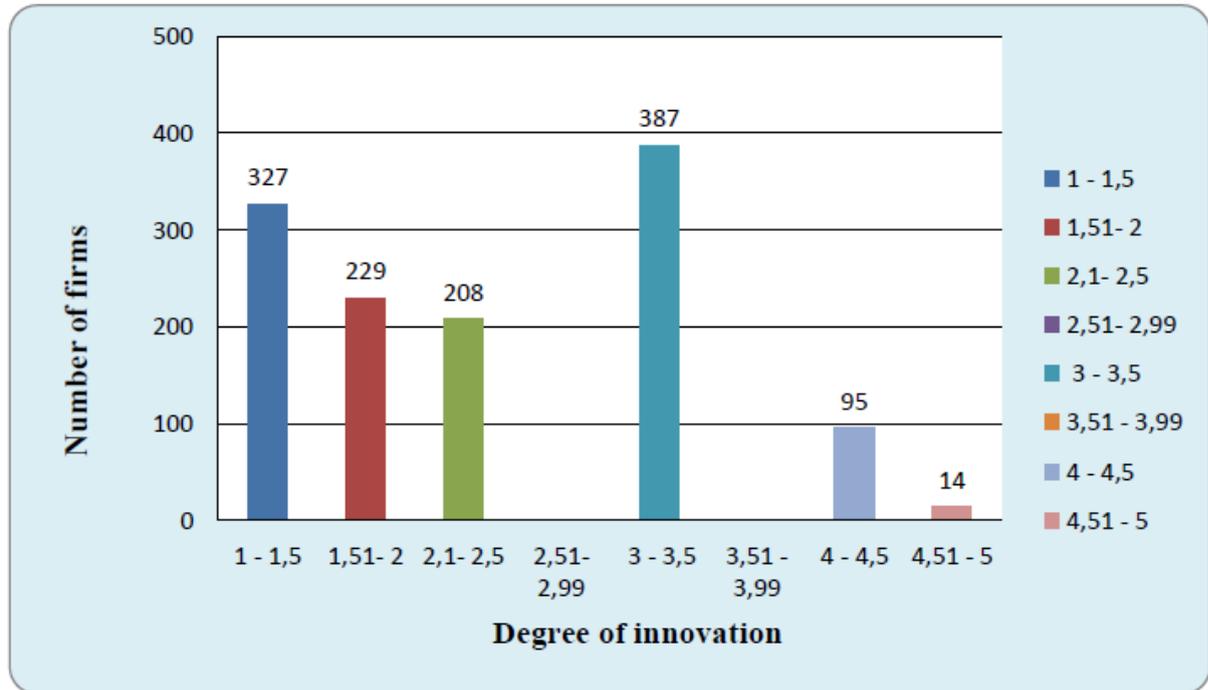


Figure 3 – Histogram of the Customers Dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The data representing the mode of the processes dimension are shown in the histogram in Figure 4. In this case, the largest number of companies received scores in the interval from 1 to 1.5, followed by the interval from 1.5.1 to 2. Roughly 98% of the firms scored below 3, indicating that the variables measured in this dimension are relatively unimpressive for these companies. Only 2% of the firms showed evidence that they are improving their internal processes.

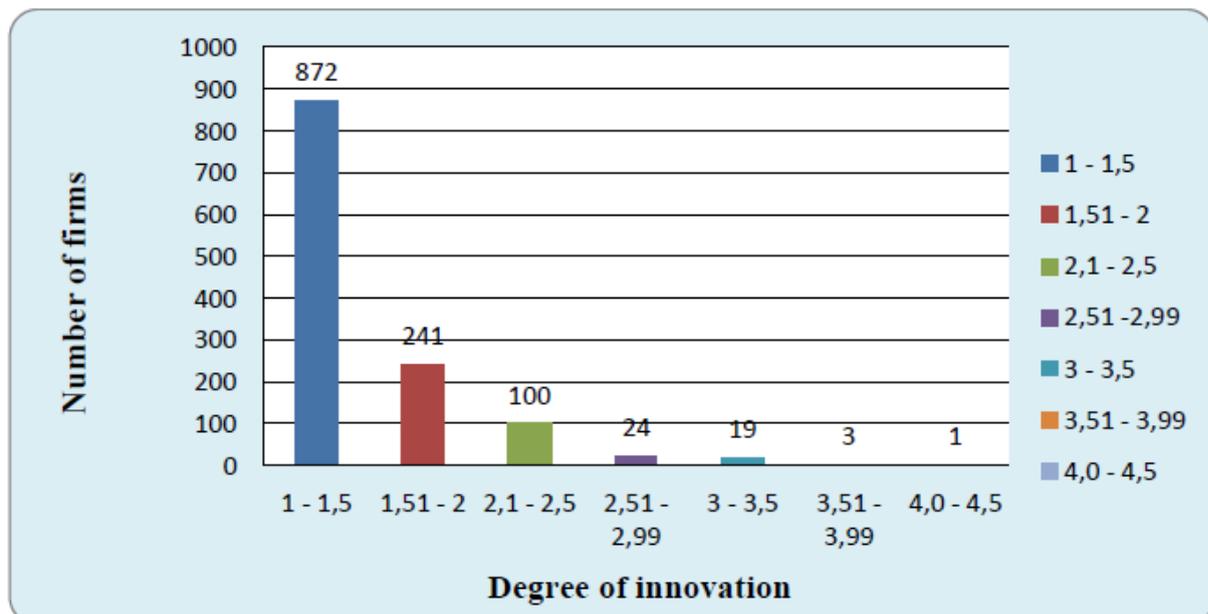


Figure 4 – Histogram of the Processes Dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The histogram in Figure 5 shows the data representing the mode of the networking dimension. In this case, the largest number of companies scored in the interval from 1 to 1.5, followed by the interval from 3 to 3.5. About 73% of the companies scored below 3 in this dimension, indicating that the variables measured in this dimension are relatively unimpressive for these companies. Approximately 27% of the companies showed evidence that they maintain sporadic or regular dialog with their customers.

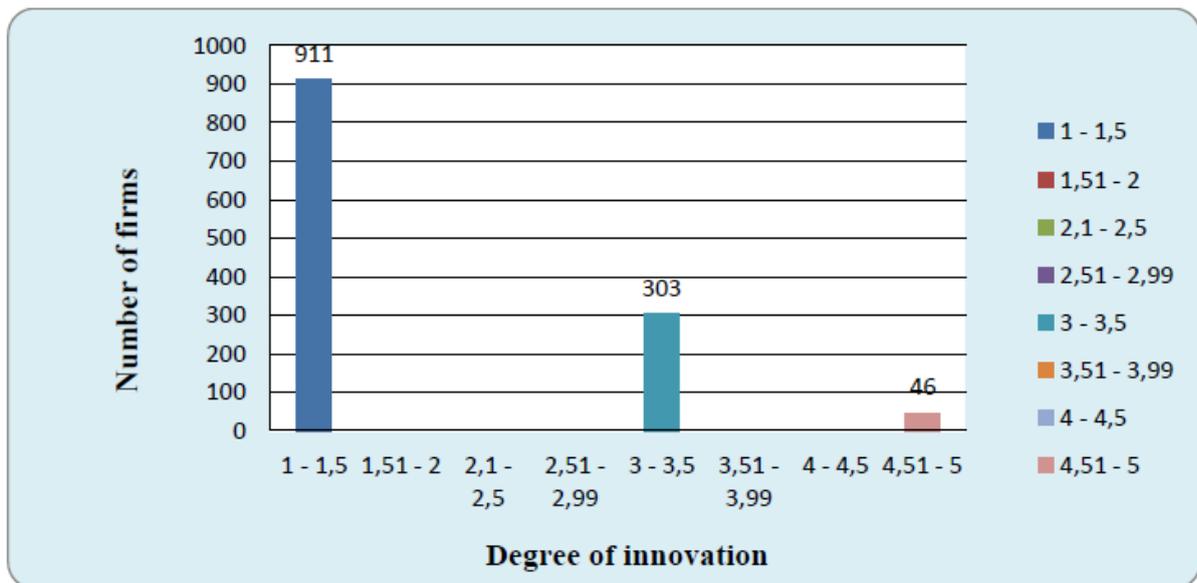


Figure 5 – Histogram of the Networking Dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The data that represent the mode of the innovative ambience dimension are depicted in Figure 6. The largest number of companies in this dimension received innovation level scores in the interval from 1 to 1.5, followed by the interval from 1.5.1 to 2. Again, about 98% of the companies scored below 3, indicating that the variables measured in this dimension are relatively unimpressive for these firms. Only 2% of the companies showed evidence that they have a favorable internal climate for innovation.

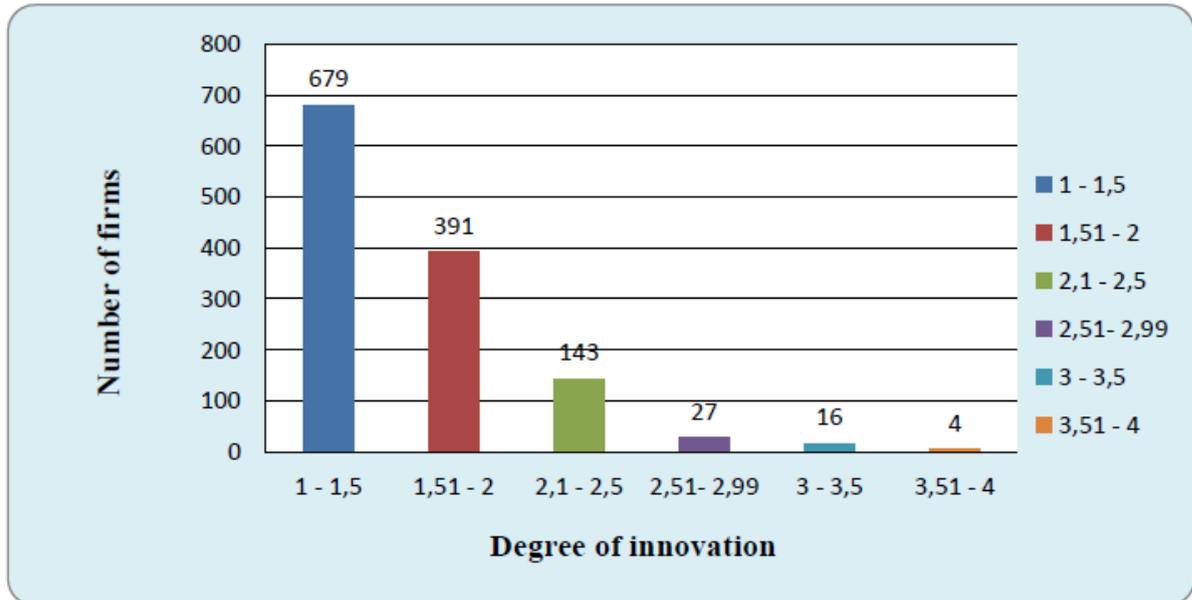


Figure 6 – Histogram of the Innovative Ambience Dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

Figure 7 is of the radar type and presents the scores obtained by the 1,260 companies in the 13 dimensions. The nearer the placement is to the center point of the graph, the lower the innovation level is in that dimension, and vice versa.

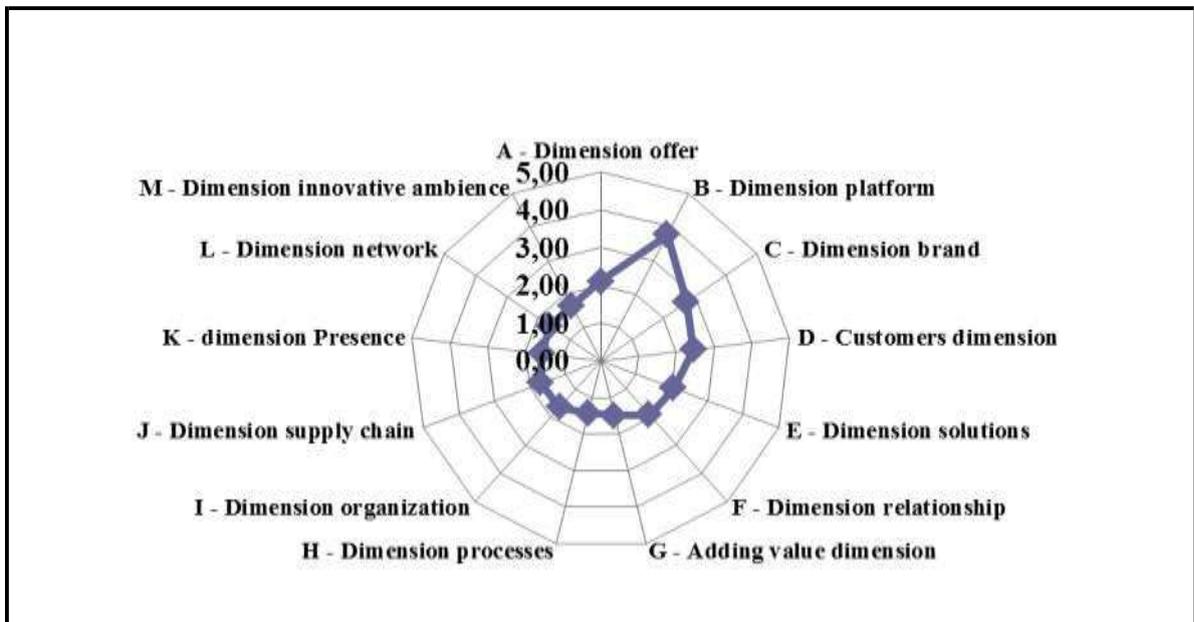


Figure 7 – Innovation Radar of all the companies by dimension
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

It can be seen that the platform dimension received good scoring, but the other dimensions scored below 3. These dimensions are the ones that pose the greatest problems and should be analyzed first by companies to prepare an action plan to improve their performance.

Table 7 presents the detailed data on the means of the companies in each of the 13 dimensions, broken down by economic sector. The figures show that the companies in the textile and apparel sector had the highest average innovation level (2.1), followed by firms in the health (2.06), food (1.99), lumber and furniture (1.97) and construction sectors (1.92).

Table 7 – Mean Innovation Level Scores of the Companies by Dimension, According to Productive Sector - 2011

Dimension	Innovation Level				
	Sector				
	Food	Civil Construction	Lumber & Furniture	Health	Textiles & Apparel
Offerings	2.08	1.93	2.36	2.16	2.25
Platform	3.84	4.03	3.81	3.40	3.77
Brand	2.82	2.47	2.75	2.61	3.01
Customers	2.30	2.38	2.31	2.71	2.53
Solutions	2.17	1.72	1.60	2.28	2.23
Relationship	1.71	1.90	1.94	2.05	2.07
Value Capture	1.54	1.31	1.18	1.55	1.68
Processes	1.49	1.33	1.48	1.51	1.36
Organization	1.66	1.59	1.58	1.77	1.65
Supply Chain	1.69	1.74	1.95	1.56	1.64
Presence	1.58	1.36	1.54	1.65	1.77
Networking	1.46	1.64	1.51	1.75	1.73
Innovative Ambience	1.55	1.61	1.63	1.84	1.65
Mean Innovation Level	1.99	1.92	1.97	2.06	2.1

Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The boldface numbers in Table 5 are the best obtained in each productive sector. It can be seen that the platform dimension obtained the highest scores in all cases. This result makes sense because one of the variables measured in this dimension is the company's production line, and since the study involved micro and small businesses that use their production system to make more than one line of products, the variable received high scoring.

For a better understanding of the innovation level of the companies, we analyzed the data separately for each sector: food, civil construction, lumber and furniture, health, and textile and apparel. The results are summarized below:

The average innovation level of the 325 companies in the **food sector** was 1.99, indicating that innovation is still incipient in this group. It can be said that, according to the classification² proposed in the model, these companies are low or non-innovators. Of particular note is the high frequency of scores of 1 in the mode, presented in various dimensions, meaning that the variables measured in these dimensions are not present or do not exist in these companies. The mean value obtained in each of the dimensions indicates great variation of the results and evidences that the best results were obtained in the platform and brand dimension, while the networking and processes dimensions obtained lower average scores. Figure 8 shows the average values obtained in each of the dimensions by all the companies in the food sector, where the platform and brand dimensions stand out with the highest scores.

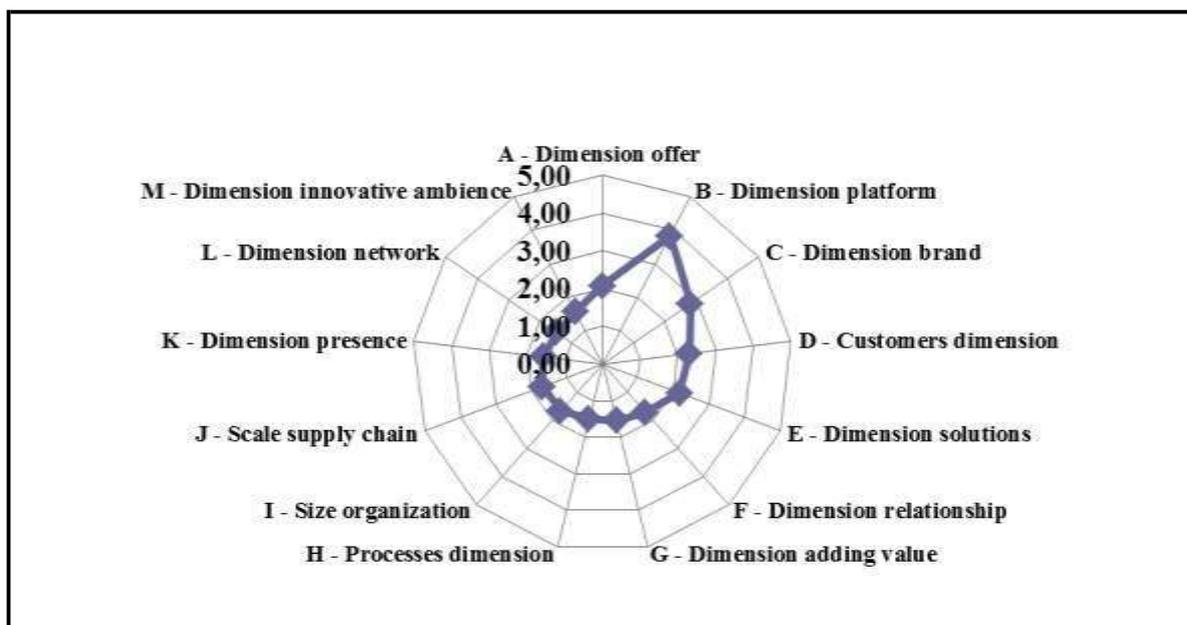


Figure 8– Innovation Radar of companies in the food sector
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The average innovation level of the 274 firms in the **civil construction sector** was 1.92, again indicating still-incipient innovation in this group. It can be said that according to the classification proposed in the model, these companies are low or non-innovators. Figure 9 depicts the scoring obtained in each of the dimensions by all the companies in the civil construction sector. It can be seen that the platform dimension received the highest score,

² Systematic innovators, occasional innovators and low or non-innovators.

while the offerings, solutions, value capture, processes, organization, supply chain, presence, networking and innovative ambience dimensions all received scores below 3, indicating unimpressive performance in the variables that measure these dimensions.

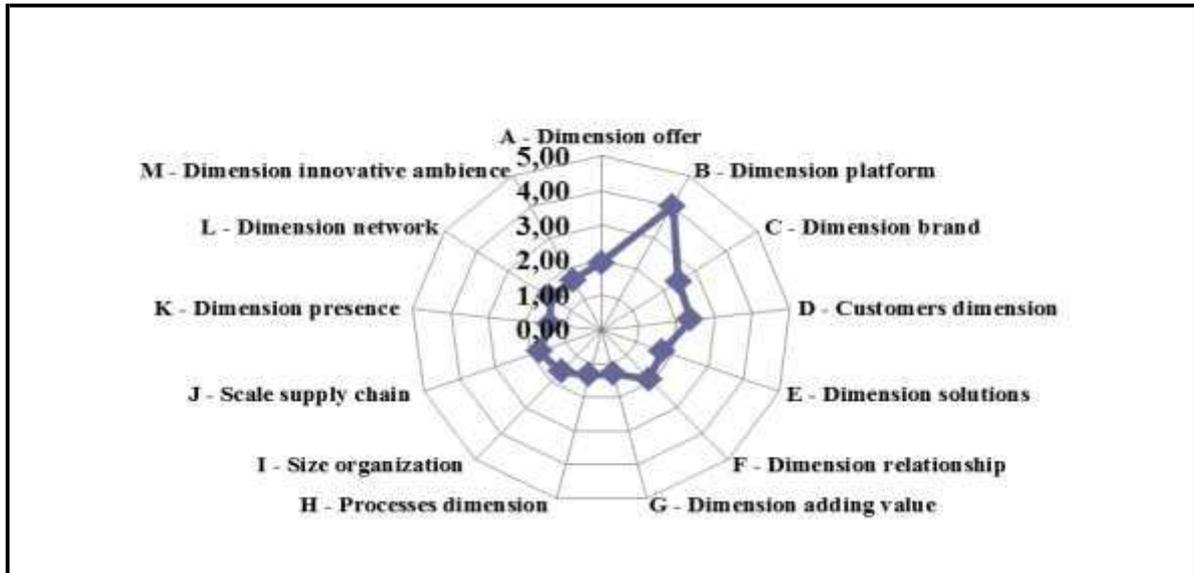


Figure 9 - Innovation Radar of companies in the civil construction sector
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The average innovation level of the 110 companies in the **lumber and furniture sector** was 1.97. Since the scale measuring the innovation level goes from 1 to 5, that value corresponds to the first quartile of the scale, indicating still-incipient innovation in this group. It can be said that these firms are weak innovators according to the classification proposed in the model. Figure 10 allows visualizing the average scores obtained in each of the dimensions by the companies in the lumber and furniture sector, with the platform and brand dimensions standing out with the highest scores.

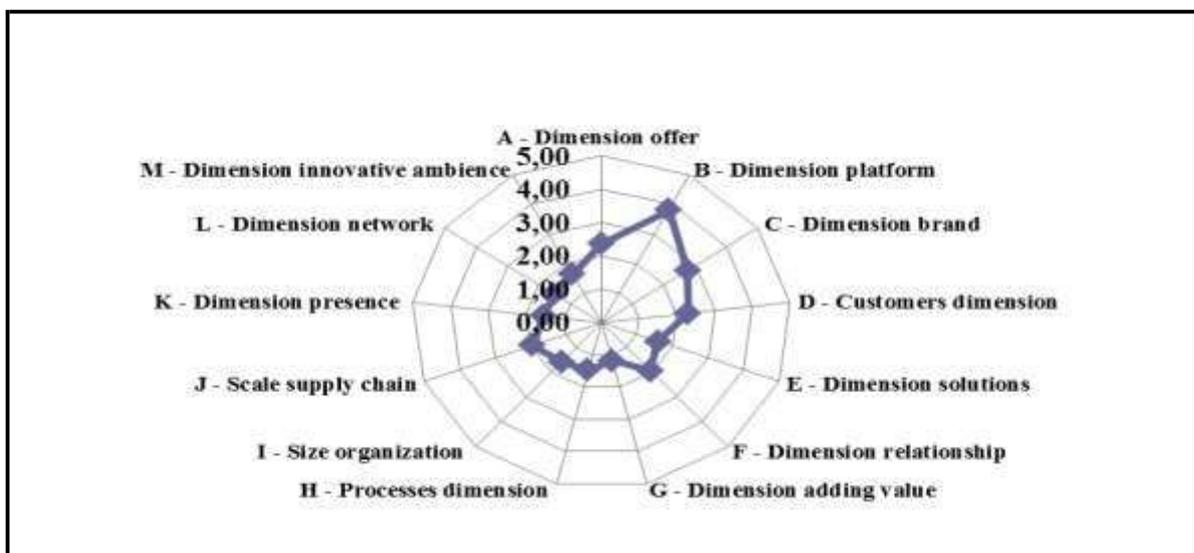


Figure 10 – Innovation Radar of companies in the lumber and furniture sector
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The average innovation level of the 259 companies in the **health sector** was 2.06, again indicating this group is incipient regarding innovation. According to the classification proposed in the model, these firms are low innovators. Figure 11 shows the average scores obtained in each of the dimensions by the firms in the health sector, in which the platform, brand and customers dimensions stand out with the highest scores.

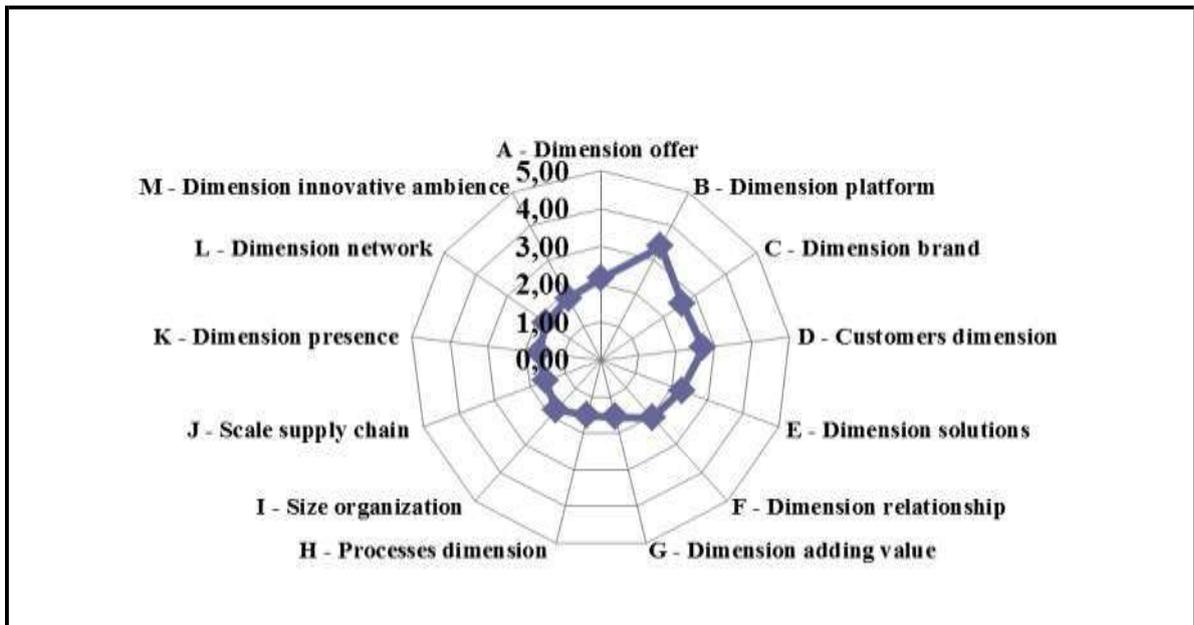


Figure 11 – Innovation Radar of companies in the health sector
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

The average innovation level of the 261 companies in the **textile and apparel sector** was 2.1, indicating still-incipient innovation in this group. According to the proposed classification, these firms are low innovators. The average scores obtained in each of the dimensions of these companies are shown in Figure 12.

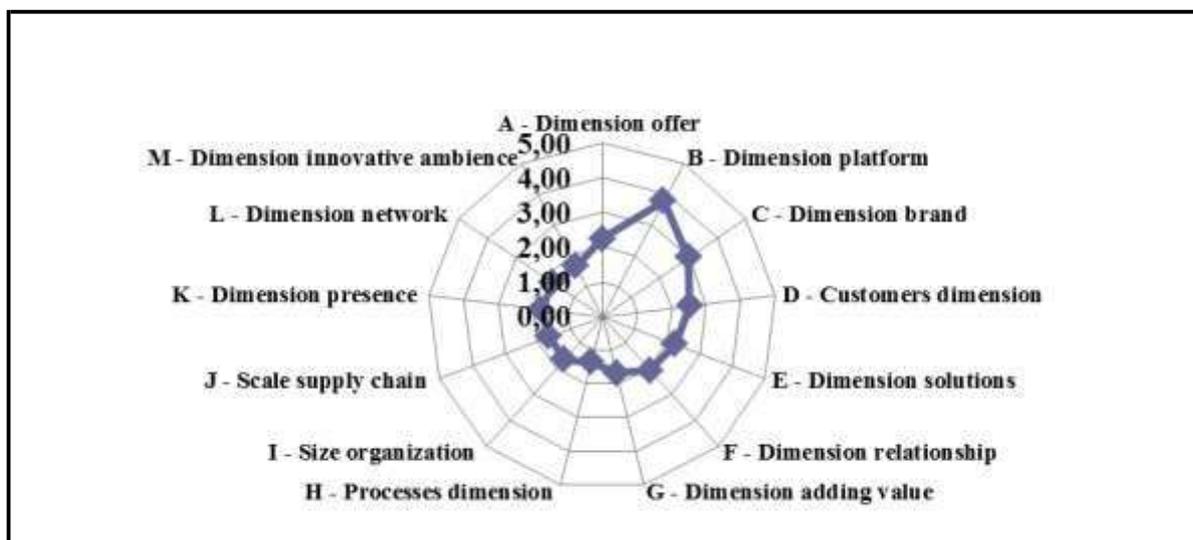


Figure 12 - Innovation Radar of companies in the textile and apparel sector
Source: Prepared by the authors based on data from SEBRAE/SE (2011).

It can be seen from Figure 12 that the platform and brand dimensions received the highest scores, and all the others were below 3.

We also compared companies located in the state capital (Aracaju) against those outside the capital, represented by three municipalities (Lagarto, Tobias Barreto and Itabaianinha) where there are concentrations of industries. Lagarto has a tradition of producing furniture and other wood articles, while Tobias Barreto and Itabaianinha are noted for their textile and clothing companies.

About 31% of the companies studied in the **lumber and furniture sector** are located in municipalities outside the capital, and of these, 84% are situated in Lagarto. These companies had a higher average innovation level (2.25) than the companies in Aracaju (1.83), a fact that can be explained by the high concentration of companies in Lagarto in this sector that have been active for many years and have accrued experience in dealing with technological questions. The greatest difference in the average scores was in the offerings dimension (1.22), in which the companies in Aracaju obtained a score of 2.00 versus 3.22 for those in Lagarto, meaning that firms in Lagarto offer more diverse products.

Finally, about 59% of the firms in the **textile and apparel sector** are located outside the capital, and of these 91% are situated in Tobias Barreto and Itabaianinha, where there is a concentration of micro and small enterprises in this sector. The average innovation level of the 40 companies in this sector located in the capital was 2.29, versus 1.86 for the 52 peer companies located outside the capital.

8 CONCLUSIONS

The aim of this study was to analyze the innovation level of micro and small enterprises located in the state of Sergipe. For this purpose, we used innovation diagnosis, based on the model proposed by Sawhney, Wolcott & Arroniz (2006), complemented by Bachmann & Destefani (2008).

The average innovation level found in the 1,260 MSEs was 2.01, and the highest score was attained by companies in the textile and apparel sector. This is a business with natural dynamism, partly in response to the need to stay abreast of the latest style trends, which requires companies to establish a stronger relationship with customers and suppliers and to strive to offer new products.

When analyzing the key dimensions offerings, customers, processes and networking of the model proposed by Sawhney, Wolcott & Arroniz (2006) and the innovative ambience

dimension proposed by Bachmann & Destefani (2008) in each of the sectors, it is interesting to note that the scores in all of these dimensions were below 3, indicating the low importance attached to the variables of these five dimensions.

The comparison between companies in the capital (Aracaju) versus other regions of the state showed that industrial companies in the textile and apparel sector of Aracaju obtained a higher average innovation level (2.29) than those in Tobias Barreto and Itabaianinha (1.86), even though these two municipalities are noted for producing these goods through an established local productive arrangement. Botelho, Carrijo & Kamasaki (2007) argued that one of the factors favorable to innovative activity among small firms is location in places where such arrangements exist, but this was not verified in the MSEs in Tobias Barreto and Itabaianinha, since their innovation levels were low.

The results showed that 96.43% of the companies were considered low or non-innovators and only 3.57% were considered occasional innovative companies. In contrast, in the study carried out by Nascimento (2009) with 53 companies (micro, small and midsize) in the information technology sector in the state of Minas Gerais, the results showed that most of the companies surveyed (71%) were classified as medium innovators.

It should be considered that for the majority of MSEs, the innovation process is complex, making it hard for them to innovate. According to the Permanent Forum of Micro and Small Companies (Fórum Permanente das Microempresas e Empresas de Pequeno Porte, 2007) and Caron (2004), the main difficulties faced by MSEs are little approximation with technology centers and lack of physical infrastructure, trained personnel and financial resources.

As a theoretical contribution, this study adds to the knowledge of innovation in small businesses in Brazil, especially in measurement of innovation, an area where there are few previous studies. With respect to its practical relevance, the measurement of the innovation level of the companies analyzed should enable the companies participating in the Local Innovation Agents Project of SEBRAE in Sergipe to identify their strong and weak points in relation to other companies in their sectors, and in the final analysis, should contribute to reduce the mortality rate of MSEs in the state.

A suggestion for continuity of this work is to carry out in-depth studies of the companies with the highest scores, to enable determining the factors that enable them to be more innovative in relation to other firms in the same productive sectors.

The results and the tools used in this study can serve as the base for new investigations of the question of innovation in micro and small enterprises. However, we must mention that the model has limitations, because its dimensions do not capture all fundamental aspects of innovation, such as tolerance for risk and creativity.

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