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THE MATURITY'S DEGREE OF EACH DIMENSION OF INNOVATION IN DIFFERENT BRANCHES OF ACTIVITY

Andrey Miranda Del Santo

FACENS

Sorocaba - SP

<http://lattes.cnpq.br/1191020755804249>

Andreza Quintela de Almeida

FACENS

Sorocaba - SP

João Paulo Pereira

FACENS

Sorocaba - SP

Anderson Martins Fernandes da Costa

FACENS

Sorocaba - SP

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Abstract: The use of innovation within an organization is a very relevant topic when it comes to competitive advantage and market prominence. There are several types of innovation and several ways to use them within a company. The Innovation Radar comes with the proposal to measure how innovative an organization is and what its strongest areas of activity are. This article aims to use the Innovation Radar questionnaire as a basis for an analysis of the use of innovation within companies in three major branches of activity: Commerce, Industry and Service Provision. Through the results of the research, it was possible to conclude that the commercial sector is the one that stands out the most regarding the use of innovation in its areas of activity. The data collected can be used as a basis for future research regarding which particularities of each branch result in the emphasis on some dimensions of innovation compared to the others.

Keywords: Types of Innovation; Innovation Radar; Branches of Activity.

INTRODUCTION

Using innovation to gain a competitive advantage is a common attitude in today's job market (Paula, Danjour, Medeiros & Añez, 2015). According to Buckley (2022), this method brings benefits such as: attracting support from other institutions, making the company stand out in the market in a positive way, as well as helping to attract potential clients and partners. In an increasingly competitive environment, innovation is no longer a differentiator and is now fundamental to maintaining a company's growth (Buckley, 2022). As a result, institutions use a variety of ways to continue innovating constantly, such as partnerships with other institutions, with clients, internationalization and open innovation (combining ideas with external technologies) (Rocha, Olave & Ordonez, 2019).

Innovation can be divided into classifications, as well as acting in different sectors within an institution. Sawhney, Wolcott and Arroniz (2006) developed a survey showing the different ways in which innovation acts within a company and called these divisions "dimensions". It is possible to classify how innovative a company is using these dimensions, collecting information from a questionnaire and then generating a radar graph showing the company's score in each dimension. The company's overall average in the questionnaire classifies how innovative this company is and also shows the dimensions with the most and least emphasis in the respondent's institution.

The tool mentioned is called the Innovation Radar and will be used in this article to show which dimensions are worked on more frequently and which are not so prominent in three different branches of activity: commerce, industry and services. The results obtained can be used to justify the possible rise or failure of an institution in the sectors studied, or even to research the characteristics of each branch of activity that justify the emphasis (or deficiency) of performance in the dimensions of the radar.

THEORETICAL REFERENCE

The next section presents some concepts that will serve as a basis for understanding the research methodology applied and also for understanding the relevance of the topic in question.

INNOVATION IN COMPANIES

Innovation is made up of past knowledge and continuous experience. Rather than believing it to be an unknown process, it has demonstrated itself in structural techniques and predictable systems (Gupta, 2008). Innovation is probably the oldest known process and can be classified as a continuation

of human creativity. Innovation has been present in human life since the discovery of fire, in other words, since the discovery of the method of rubbing two stones together to generate heat, human beings have been innovating. This shows that it is natural to use human skills to create new things, in order to help human life in some way (Gupta, 2008). Within the capitalist model, since the beginning of the 20th century there has been a differentiation between invention and innovation, where it is understood that invention is the idea for a new or improved product/process and innovation is the production of wealth involving an invention (dos Santos, Fazon e de Meroe, 2011). This innovation will accelerate the creation of knowledge, as well as the development of products and services. (Gupta, 2008). In the business sector, innovation is a consequence of organizational learning (Tomaél, Alcará and Di Chiara, 2005), i.e. the idea of change resulting from previous practices or experiences, which may or may not bring about behavioural changes. Learning in an organization is an understanding of the past in order to guide future actions, a process that is developed over the years and with new experiences. Thus, innovation is called the new general rule for organizations, and creativity becomes a key element to be incorporated into companies (Tomaél et al., 2005). Innovation can also be divided into a number of types:

- Incremental Innovation;
- Radical Innovation;
- Disruptive Innovation; and
- Business Model Innovation

Incremental innovation is the most common. It uses the existing market, adapting to the organization, with minimal changes to products and services, adding value and increasing the company's competitiveness. According to Davila, Epstein and Shelton

(2007) an example of incremental innovation would be the Coca-Cola brand, with the perception of new market demands, where each age group had different interests, it became necessary to move away from a single product to a complete drinks company.

Radical innovation represents major changes, with the introduction of new processes and products bringing economic and social consequences. This is what they call revolutionary creation. As an example of radical innovation, Gomes and Fontgalland (2021) cite Apple, whose production was exclusively for computers until the late 1990s, and with the return of Steve Jobs, went through a process of financial difficulties and revolutionized its market strategy, gaining ground with the introduction of the iMac and later the iPod.

Disruptive innovation generates the use of new technologies and processes in the company's current market scenario. It refers to transformations that drive the emergence of new organizations, enhancing the low market and controlling the traditional market. One example of disruptive innovation is the evolution of the Netflix company. According to Neto and Freitas (2016), the company made it possible to rent DVDs using the postal service, which had already evolved into a monthly subscription model, where it guaranteed its subscribers unlimited rentals. With the development of the internet, Netflix was able to make its collection available via VOD (video on demand). It became even more consolidated between 2008 and 2010 with its partnerships with content production companies, increasing the titles available to its customers. Since then, it has become a streaming company and has overtaken the success of movie rental stores.

And finally, there is business model innovation, which is the act of taking general skills, lessons and technologies and adopting

them in a new market. Its risk tends to be lower due to the discernment involved in introducing proven technology. It's a market with great chances of new customers, if it's receptive. Bucciarelli (2019) brings up the market innovation of Airbnb, where the site can connect landlords with potential tenants for short or long stays. Even with the increased competition between Airbnb and hotels, the company still saw itself as a complementary business to hotels.

It's worth pointing out that innovation is possible with any of the types mentioned above. All that's needed is for the company to assess the best possibility, so that its execution can be a success (de Abreu, Maccari, Martins & de Jesus Maffei, 2005).

INNOVATION RADAR AND CLASSIFICATION OF COMPANIES ACCORDING TO THEIR DEGREE OF INNOVATION (GI)

As well as being segmented by type, innovation has levels that can be used to identify opportunities or even as a metric for gaining competitive advantage (de Carvalho, da Silva, Póvoa & de Carvalho, 2015). One of the ways of measuring this level is by using the Innovation Radar first proposed by Sawhney et al. (2006), developed on the basis of interviews conducted with managers of large companies responsible for innovation-related activities.

The Innovation Radar is divided into twelve parts, called dimensions, representing the company's innovation areas. Of these twelve, four are called "key dimensions that serve as business anchors" (Néto & Teixeira, 2014): Offer, Customers, Process and Presence. A few years later, Bachmann and Destefani (2008) added a new dimension called "Innovative Environment" in order to include the organizational climate as a variable to define the Degree of Innovation. The following table

shows the dimensions, characteristics and variables of the Innovation Radar.

In order to define its level of innovation, the company is given a questionnaire containing questions that have the answers 5, 3 or 1, with 5 being the highest level of innovation in that sector and 1 the lowest. The questionnaire is also presented using a Likert scale, either numerically (from 1 to 5) or textually (Strongly Agree to Strongly Disagree). Each dimension will generate a score called "Degree of Maturity" and the arithmetic mean of the degree of maturity of all the dimensions will result in the measurement of the company's degree of innovation (GI) (Souto Filho, 2019). The equation to arrive at the IG is shown in the figure below:

According to Neto (2012) the variables in the equation shown in figure 1 correspond to the following values:

- GI = Average degree of innovation of the companies surveyed;
- DA_i = Average of the Offer Dimension values;
- DB_i = Average of the Platform Dimension values;
- DC_i = Average of the Brand Dimension values;
- DD_i = Average of the Customer Dimension values;
- DE_i = Average of the values of the Solutions Dimension;
- DF_i = Average of the Relationship Dimension values;
- DG_i = Average of the values of the Value Added Dimension;
- DH_i = Average of the Processes Dimension values;
- DI_i = Average of the Organization Dimension values;

Dimensions	Characteristics	Variables
Offer	This refers to the products offered by the company. The company is considered when it launches new products.	i) New markets and products; ii) Boldness; iii) Response to the environment; iv) Design; v) Technological innovation.
Platform	Adapting the company's resources and infrastructure to market demands.	i) Production system; ii) Product versions.
Brand	The way the company uses and appropriates its brand.	i) Brand protection; ii) Brand leverage.
Customers	Check how the company is able to listen to and meet customer needs and identify new markets	i) Identification of needs; ii) Identification of the market; iii) Use of customer manifestations - processes and customers - results.
Solutions	Evaluates how the company integrates goods, services and information to minimize customer difficulties	i) Complementary solutions; ii) Integration of resources
Relationships	It addresses the relationship between customers and the company.	i) Facilities and amenities; ii) Computerization.
Adding Value	Ways in which the company relates to customers, partners and suppliers, offering extra services that add revenue.	i) Use of existing resources; ii) Use of opportunities for interaction.
Process	How the company uses its processes to seek improvements in its operational efficiency.	i) Process improvement; ii) Management system; iii) Certifications; iv) Management software; v) Environmental aspects; vi) Waste management
Organization	Methods by which the company structures employees' responsibilities.	i) Reorganization; ii) Partnerships; iii) External vision; iv) Competitive strategy.
Supply Chain	Evaluates how the company minimizes the costs attributed to logistical aspects.	i) Supply Chain.
Presence	It corresponds to the distribution channels and points of sale that the company uses to promote its products on the market.	i) Points of sale; ii) New markets.
Network	How the company interacts with the supply chain and customers.	i) Dialogue with the client.
Innovative Environment	Measures how the company creates an environment conducive to innovation.	i) External sources of knowledge I, II, III and IV; ii) Intellectual property; iii) Innovative daring; iv) Financing innovation; v) Collecting ideas

Table 1 - Dimensions, characteristics and variables of the Innovation Radar

Source: Fernandes and D'Anjour (2016) by Bachmann and Destefani (2008)

$$\overline{GI} = \frac{\sum_{i=1}^n DA_i + \sum_{i=1}^n DB_i + \sum_{i=1}^n DC_i + \sum_{i=1}^n DD_i + \sum_{i=1}^n DE_i + \sum_{i=1}^n DF_i + \sum_{i=1}^n DG_i + \sum_{i=1}^n DH_i + \sum_{i=1}^n DI_i + \sum_{i=1}^n DJ_i + \sum_{i=1}^n DK_i + \sum_{i=1}^n DL_i + \sum_{i=1}^n DM_i}{N}$$

Figure 1 - Degree of Innovation Equation

Source: Neto (2012).

- D_{ji} = Average of the Supply Chain Dimension values;
- DK_i = Average of the Presence Dimension values;
- DL_i = Average of the Network Dimension values;
- DM_i = Average of the values of the Innovative Environment Dimension;
- n = total number of questions in the dimension; and
- N = total number of dimensions.

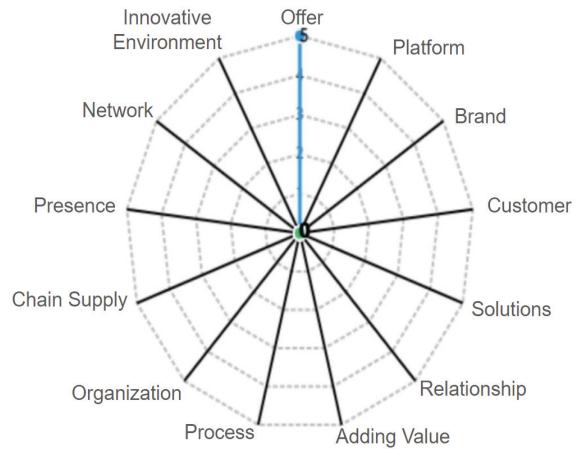


Figura 2 - Innovation Radar

Source: Adapted from Torchia, Silva and Bari (2016)

The result can vary between three types of company, as shown in the table below:

Types of company	Definition	Innovation Score (IG)
Systemic innovator	It's the one that innovates systemically.	O GI tem valor igual ou superior a 4.
Occasional innovator	This is the company that has innovated in the last three years, but has no systemic actions.	The GI is equal to or above 3 and below 4.
Little or nothing innovative	It's the company that innovates little or not at all	The GI is equal to or greater than 1 and below 3. If the GI score is 1, the company is not innovative.

Table 2 - Classification of companies by innovation score (GI)

Source: Néto and Teixeira (2014)

To facilitate the analysis and visualization of the results of the questionnaire by dimension, the data is usually visualized in a radar graph, as in the following figure:

The Innovation Radar has already been widely used in various surveys, market sectors and regions of the country. Some examples of its use are in surveys:

- Meios de Hospedagem: Um Estudo Sobre Marcas no Contexto da Inovação (de Araújo & Filho, 2014);
- Small Information and Communication Technology Companies in the State of Rio de Janeiro in the Light of the Innovation Radar: Identification and Analysis of the Main Obstacles to Innovation Processes (Denizot, 2014);
- Measuring Innovation through the Innovation Radar in Road Freight Transport Companies (Torchia et al., 2016); and
- Innovations in Technology Processes: A Case Study in an Accounting Company in the City of Natal/RN (Paula et al., 2015).

In addition, the Innovation Radar is used by the Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (Brazilian Micro and Small Business Support Service - SEBRAE) in the Local Innovation Agents (ALI) program (de Carvalho et al., 2015). This program

aims to help develop the innovation capacity of micro and small enterprises (MSEs) in Brazil (Porem & Kunsch, 2021) and uses the Innovation Radar to map innovation strategies for companies within the program. (de Lima & D'Anjour, 2016).

METHODOLOGY

In order to map the level of innovation in companies, this article uses descriptive quantitative research using a questionnaire. Descriptive research is characterized by pointing out relationships between variables and also by analyzing the behavior of a given population (Gil, 2008). In addition, the Likert scale will be used to analyze companies' patterns of conduct on the subject, due to its performance in providing a good understanding of the results, the possibility of quantitative analysis of the data collected and the versatility of the format (Batterton & Hale, 2017). The questions in the questionnaire are statements in which the respondent needs to mark from 1 to 5 how much they agree with the statement, taking into account the company in which they work, with 1 being equivalent to "Completely Disagree" and 5 "Completely Agree".

In order to reduce the number of questions in the questionnaire and avoid dropouts in the middle of the response process, some questions in the Innovation Radar have been reduced. For example, the following three statements from the original questionnaire were reduced to just the first statement:

- The company has successfully launched more than one new service/product on the market in the last 3 years;
- The company has successfully launched a new service on the market in the last 3 years;
- The company has unsuccessfully launched any new service on the

market in the last 3 years.

The answers with the highest scores (4 and 5) correspond to the quantity of the first statement, the average scores (2 and 3) correspond to the quantity of the second statement and the lowest score (1) corresponds to the third statement. With this, it is possible to analyze how close the company has come to the "Systemic Innovator" classification. The questions that follow this structure of "none", "some", "more than" have been reduced following the logic presented.

Questions that fall into one of the following conditions have also been excluded or merged:

- Questions that were similar to others from a different dimension; and
- Questions referring to a very specific type of company.

The questionnaire was developed using the Google Forms tool and, after two rounds of testing, disseminated via the following social networks: WhatsApp, LinkedIn and Facebook. The survey was carried out between 06/07/2023 and 06/24/2023 with a total of ninety responses, eighty-eight of which were valid. Two responses were excluded from the analysis because the individuals answered the same indicator for all the questions in the questionnaire.

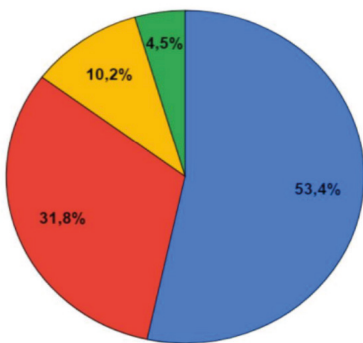
RESULTS

In order to obtain some information and analyze possible patterns among the companies' branches of activity, a question was added to the questionnaire regarding the sector of the respondent's company. The alternatives were defined from an article on the official SEBRAE website (2022), and are as follows:

- Commerce (Restaurant; Supermarket; Shops, etc...);
- Industry (Electronics; Automotive; Metallurgy, etc...);

- Provision of Services (Transportation; Communication; Financial Institution, etc...);
- Other.

The option “Other” was added and the respondent was asked to type in which sector the company they work for fits into, so that it would be possible to identify a different industry. Some of the answers entered fit into the sectors already mentioned and were therefore grouped with their respective industry. The other answers that didn't fit into any of the previous alternatives weren't repeated, so they didn't generate enough data to represent their sector and therefore won't be analyzed. The percentages of the data by sector, after the manipulation mentioned in the previous paragraph, were as follows:







	Provision of Services (Transportation; Communication; Financial Institution, etc...)
	Industry (Electronics; Automotive; Metallurgy, etc...)
	Commerce (Restaurant; Supermarket; Shops, etc...)
	Other

Chart 1 - Percentage of responses regarding the company's line of business
Source: Elaborated by the authors.

In view of the general results shown in the radar chart below, the dimensions of the Innovation Radar that stood out the most were: Solutions (with an average of 3.91) and Customers (with an average of 3.89). The

dimensions least worked on are: Innovative Environment (with an average of 2.97) and Supply Chain (with an average of 3).

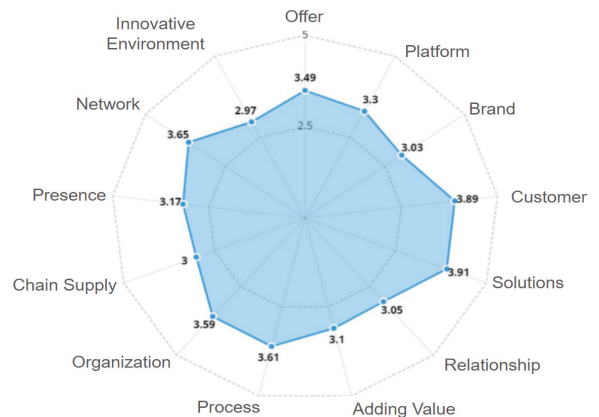


Chart 2 - Innovation Radar of general results
Source: Elaborated by the authors.

Looking at the commercial sector in Chart 3, the results show that the dimensions that stand out most in this market sector are: Offer, Customers and Solutions, all with an average of 3.89. The dimensions with the lowest performance are: Platform (average: 2.44) and Brand (average: 2.5).

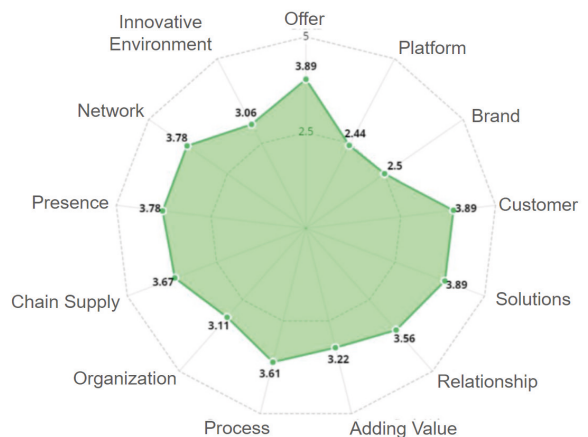


Chart 3 - Innovation radar for the commercial sector
Source: Elaborated by the authors.

Looking at the results for the industrial sector in Chart 4, it can be concluded that the most favored dimensions are: Offer and

Solutions (both with an average of 3.86), although the Customers dimension has a very close average (3.84). Adding Value (with an average of 3.04), Relationships and Innovative Environment (both with 3.11) are the dimensions with the lowest averages in this sector.



Chart 4 - Innovation radar for the industrial sector

Source: Elaborated by the authors.

When analyzing the results of the service sector in the following Chart, it can be concluded that the most important dimensions are: Solutions (average: 4.00) and Customers (average: 3.94). The less prominent ones are: Supply Chain (average: 2.57) and Innovative Environment (average: 2.84), with the Brand dimension close behind with an average of 2.87.

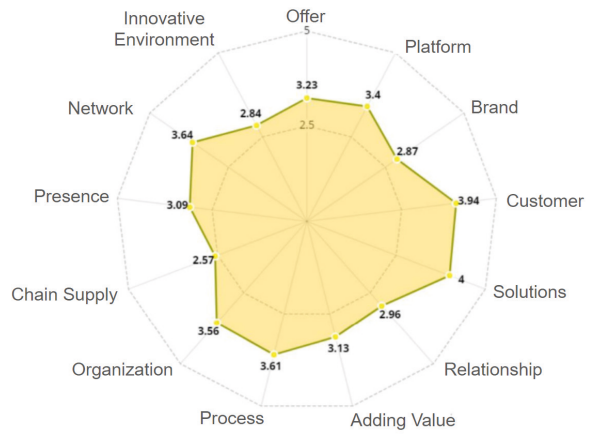


Chart 5 - Innovation radar for the service sector

Source: Elaborated by the authors.

Looking at Chart 6, which shows the Degree of Innovation (GI) of each sector analyzed, it is clear that the most innovative sector is Trade, with an average of 3.89. Taking Table 2 as a reference, which classifies companies according to the GI, all sectors are classified as “Occasional Innovators”, with the commercial sector being the closest to being classified as a “Systemic Innovator”.

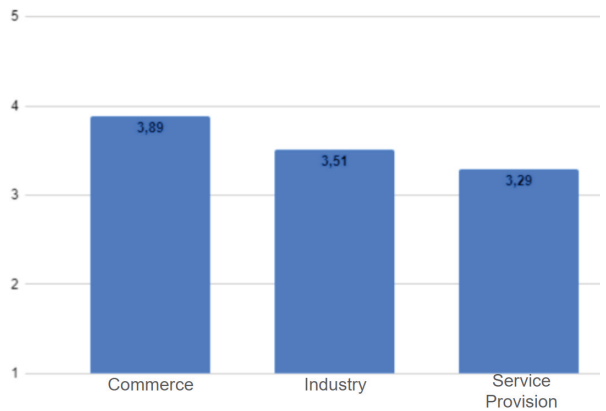


Chart 6 - Innovation level of each sector analyzed

Source: Elaborated by the authors.

CONCLUSIONS

In this work, the relevance of innovation in companies today was elucidated, as well as how it can be worked on within the organization. It also discussed how to measure a company's level of innovation using the Innovation Radar, showing its dimensions and characteristics.

The Innovation Radar questionnaire was used as the basis for this research, with the aim of generating an analysis of the most and least used dimensions of innovation in the

following industries: Commerce, Industry and Services.

This opens up the possibility of using this data to analyze which characteristics (internal and external) of each sector influence the prominence (or lack thereof) in their respective dimensions. Another possibility is to carry out the survey using the Innovation Radar questionnaire in its entirety, given that a fraction of the questions in the official questionnaire were used.

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