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RELATIONSHIP BETWEEN ORGANIZATIONAL CULTURE AND BUSINESS INNOVATION IN MICRO AND SMALL ENTERPRISES

RELAÇÃO ENTRE CULTURA ORGANIZACIONAL E INOVAÇÃO EMPRESARIAL EM MICRO E PEQUENAS EMPRESAS

RELACIÓN ENTRE LA CULTURA ORGANIZACIONAL Y LA INNOVACIÓN EMPRESARIAL EN MICROEMPRESAS Y PEQUEÑAS EMPRESAS

Antonio Carlos de Oliveira Cruz Junior[1]
Rogério Augusto Profeta[2]
Valquíria Miwa Hanai-Yoshida[3]

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Abstract

Objective of the study: To analyze the relationship between predominant organizational culture and business innovation capacity in Micro and Small Enterprises (MSEs).

Methodology: Thirty MSEs were selected for this study. The organizational cultural model was identified through the OCAI questionnaire, and the modified innovation radar classified the degree of innovation. The D'Agostinho test ($p<0.01$) and the Spearman correlation were used to evaluate normality and identify the relationship between the variables, respectively.

Originality/Relevance: The OCAI questionnaire and the innovation radar are research tools that have not yet been used together in studies related to the context of MSEs, according to the narrative review of the literature conducted.

Results: The organizational culture models predominant in the thirty companies participating in this work were identified as clan, hierarchical, and market types using the OCAI questionnaire. The results obtained indicate that the predominant organizational culture is complemented by characteristics of other cultures to a greater or lesser extent. Furthermore, most companies showed a low degree of innovation. We found a strong and positive relationship between the variables, i.e., the degree of innovation increases with the improvement of the organizational culture, prevailing in the context of the thirty MSEs studied.

Theoretical/methodological contributions: This study's data collection and treatment structure can be replicated in other cities or regions.

Social/Management Contributions: This study provides a framework for assessing the relationship between organizational culture and the degree of innovation in MSEs.

Keywords: Organizational culture. Innovation. Micro and small enterprises.

[1]Master's degree, Universidade de Sorocaba – Uniso. Sorocaba, São Paulo, Brazil. antonio.sjc@gmail.com
[2]Ph.D., Universidade de Sorocaba – Uniso. Sorocaba, São Paulo, Brazil. rogerio.profeta@prof.uniso.br
[3]Ph.D., Universidade de Sorocaba – Uniso. Sorocaba, São Paulo, Brazil. valquiria.yoshida@prof.uniso.br

Resumo

Objetivo do estudo: Analisar a relação entre a cultura organizacional predominante e a capacidade de inovação empresarial nas Micro e Pequenas Empresas (MPEs).

Metodologia: Trinta MPEs foram selecionadas para este estudo. O modelo cultural organizacional foi identificado por meio do questionário OCAI, e o radar de inovação modificado classificou o grau de inovação. O teste de D'Agostinho ($p<0,01$) e a correlação de Spearman foram utilizados para avaliar a normalidade e identificar a relação entre as variáveis, respectivamente.

Originalidade/Relevância: O questionário OCAI e o radar de inovação são instrumentos de investigação que ainda não foram empregados juntos em estudos relacionados ao contexto de MPEs, segundo a revisão narrativa da literatura realizada.

Resultados: Os modelos de cultura organizacional predominantes nas trinta empresas participantes deste trabalho foram identificados como tipos de clãs, hierárquicos e de mercado por meio do questionário OCAI. Os resultados obtidos indicam que a cultura organizacional predominante é complementada por características de outras culturas em maior ou menor grau. Além disso, a maioria das empresas apresentou um baixo grau de inovação. Encontramos uma relação forte e positiva entre as variáveis, ou seja, o grau de inovação aumenta com a melhoria da cultura organizacional predominando no contexto das trinta MPEs estudadas.

Contribuições teóricas/metodológicas: A estrutura de coleta e tratamento de dados deste estudo pode ser replicada em outros municípios ou regiões.

Contribuições sociais/para a gestão: Este estudo fornece uma estrutura para avaliação da relação entre a cultura organizacional e o grau de inovação nas MPEs.

Palavras-chave: Cultura organizacional. Inovação. Micro e pequenas empresas.

Resumen

Objetivo de estudio: Analizar la relación entre la cultura organizacional predominante y la capacidad de innovación empresarial en las Micro y Pequeñas Empresas (MPE).

Metodología: Treinta MPE fueron seleccionadas para este estudio. El modelo cultural organizacional se identificó a través del cuestionario OCAI, y el radar de innovación modificado clasificó el grado de innovación. Se utilizaron la prueba de D'Agostinho ($p<0,01$) y la correlación de Spearman para probar la normalidad e identificar la relación entre las variables, respectivamente.

Originalidad/Relevancia: El cuestionario OCAI y el radar de innovación son herramientas de investigación que aún no han sido utilizadas en conjunto en estudios relacionados con el contexto de las MPE, según la revisión narrativa de la literatura realizada.

Resultados: Los modelos de cultura organizacional predominantes en las treinta empresas participantes en este trabajo fueron identificados como tipo clan, jerárquico y de mercado a través del cuestionario OCAI. Los resultados obtenidos indican que la cultura organizacional predominante se complementa con características de otras culturas en mayor o menor medida. Además, la mayoría de las empresas mostraron un bajo grado de innovación. Encontramos una relación fuerte y positiva entre las variables, es decir, el grado de innovación aumenta con la mejora de la cultura organizacional, prevaleciendo en el contexto de las treinta MPE estudiadas.

Aportes teóricos/metodológicos: La estructura de recolección y tratamiento de datos de este estudio puede ser replicada en otras ciudades o regiones.

Contribuciones sociales/de gestión: Este estudio proporciona un marco para evaluar la relación entre la cultura organizacional y el grado de innovación en las MPE.

Palabras clave: Cultura organizacional. Innovación. Microempresas y pequeñas empresas.

Introduction

The relationship between organizational culture and innovation has been the subject of extensive research in recent decades (Aboramadan, Albashiti, Alharazin, & Zaidoune, 2020;

Büschgens, Bausch, & Balkin, 2013; Hazem & Zehou, 2019; Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2016). Since organizational culture refers to the principles, ideologies, and policies of an organization (Wudarzewski, 2018); and one of the concepts of innovation, since it implies a dynamic act, involves combinations of factors, actions, and practices that result in new services, processes, and products (Hazem & Zehou, 2019).

Among the models for analyzing organizational culture is the validated model by Cameron and Quinn (1999, 2006, 2011), also called the OCAI questionnaire (*Organization Culture Assessment Instrument*). According to its creators, it has good psychometric properties in terms of accuracy, reliability, and discriminatory power. In addition, the quantitative data collected from various individuals within the organization can provide a realistic representation of its culture.

As for one of the models for classifying Innovation, Sawhney, Wolcott, and Arroniz (2006) proposed a structure called innovation radar, which includes four factors – the offers that a company creates, the customers it serves, the processes it employs, and in the presence of the points that you use to take your offers to market. Consequently, the innovation radar could prevent the loss of opportunities in companies with a narrow view of innovation.

The presence of large companies with an innovative character in the Metropolitan Region of Vale do Paraíba (RMVP) makes Micro and Small Enterprises (MSEs) located in this region service providers (Tavares & Fonseca, 2017). Consequently, MSEs are representative of local development and essential in the development and construction of new products; because they have 194,997 small businesses, including individual micro-entrepreneurs, micro, and small companies, with annual revenues of up to 3.6 million and a record of the growth of 84.5% in the last five years, thus, an important industrial hub in Brazil (ASN, 2022).

Given the above, an assessment to understand the relationship between the predominant organizational culture and the business innovation capacity of MSEs located in this RMVP can guide entrepreneurs' decisions to promote actions that enhance their level of innovation, aiming at greater competitiveness in the market. That said, no studies were found that applied the OCAI questionnaire and the innovation radar together in studies related to the context of MSEs. Thus, this research aimed to investigate the relationship between organizational culture and the degree of innovation in the RMVP using the two data collection instruments.

Theoretical reference

Organizational culture refers to an organization's values and beliefs. An organization's principles, ideologies, and policies form its culture. Furthermore, this workplace culture decides how individuals interact with each other and behave with people outside the company. Employees must respect the culture of their organization to present their best level of work. Problems arise when individuals cannot adjust to new work culture and therefore feel unmotivated and reluctant to perform (Schein, 2006).

On the one hand, training employees for the organizational culture of innovation was identified as one of the main factors that hinder Innovation in Brazil (CNI, 2015); and on the other hand, organizational culture is one of the drivers of organizational performance (Kuswandi, Harijono, Handini, & Sanggarwati, 2017; Morone, 1989; Stacey & Ashton, 1990).

Organizations seek to understand ways to promote organizational culture and the mechanisms to be ready to develop, buy or adopt innovations. The relationship between organizational culture and innovation has been the subject of several types of research to impact the organization's innovation abilities (Aboramadan, Albashiti, Alharazin, & Zaidoune, 2020; Büschgens, Bausch, & Balkin, 2013; Hazem & Zehou, 2019).

Innovation, in turn, can have positive impacts on the performance of companies as a competitive instrument for long-term success of companies; therefore, it is considered an essential means of adapting to the needs of a changing and evolving environment, gaining competitive advantage, and facilitating the implementation of change initiatives (Deshpande, Farley, & Webster, 1993; Nonaka & Yamanouchi, 1989; Schein, 2006).

The concept of innovation received the famous treatment given by Schumpeter (1954) when he pointed out that innovation can be of five types: new products, new production methods; new markets; new sources of raw materials and other inputs; and new market structures in the industry.

Innovation encompasses the improvement in the production process of internal and external knowledge. The act of innovating is dynamic and involves combinations of factors, actions, and practices, resulting in new services, processes, and products (Souza, Lucas, & Torres, 2011; Terra, 2018). In this sense, it is essential to consider the role of leadership in the innovation process, as the culture comes from the top management to the employees who perform the activities (Melo & Silva, 2019).

The multitude of cultural variables under investigation has led to a fragmented concept of culture for innovation, and inclusion in management theory is still lacking. Furthermore, the

managerial practice requires an underlying framework for deciding which culture should be implemented to foster innovation and assess whether a specific culture is an effective and efficient instrument of coordination. Therefore, a framework is needed to classify cultural values without residues, make convenient comparisons regarding the grouped criteria, and assess their relationship to organizational innovation. (Büschgens et al., 2013)

Only a few studies have specifically modeled and empirically researched the relationship between organizational culture and degree of Innovation (Deshpande et al., 1993; Martins & Terblanche, 2003). However, empirical studies focusing on MSEs were found in smaller numbers. Among these, in Turkey, a comparison was made of the innovation capacity of small and medium-sized companies, examining the effects of organizational culture and empowerment through data acquisition through a structured questionnaire (Çakar & Ertürk, 2010). Using the adapted questionnaire from Çakar & Erturk (2010), the organizational culture impact on the capacity for strategic innovation in micro, small and medium-sized companies in Egypt was researched, where data collection was measured on a five-point Likert scale, and interviews were conducted. Unstructured with five entrepreneurs (Elkhouly & Marwan, 2016).

In small businesses, power distance and uncertainty avoidance are linked to empowerment and the ability to innovate at the individual level. In contrast, two new paths between collectivism and innovativeness and between assertiveness focus and mandate are found at the firm level. Furthermore, empowerment is positively related to innovation capacity for MSEs.(Çakar & Ertürk, 2010)

Many authors have developed and applied models to analyze organizational culture. Among these models, we can mention those of O'Reilly, Chatman, and Cadwell (1991), Hofstede (1991), of Cameron and Quinn (1999, 2006, 2011).

The O'Reilly, Chatman, and Cadwell model (1991)is based on the belief that cultures can be distinguished according to seven categories (risk and innovation acceptance, stability, people orientation, results from orientation, diligence, teams, and competitiveness) for values within organizations; and assesses the alignment between personal and organizational culture.

Hofstede's model (1991)examines the differences in cultural values among individuals from different countries, with a primary focus on the individual culture of society rather than a company. The six-dimensional model of national cultures (power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, long/short-term orientation, and indulgence/restraint) has become a paradigm for comparing cultures (Hofstede, 2011).

The Cameron and Quinn model (1999)is called the OCAI questionnaire. (*Organization Culture Assessment Instrument*) was validated by Choi *et al.* (2010), Heritage, Pollock, and Roberts (2014), Wudarzewski (2018), and Gorzelany *et al.* (2021), among others. The robustness of the model is due to the good psychometric properties in terms of accuracy, reliability, and discriminatory power, where quantitative data collected from various individuals within the organization (taking advantage of the core values and assumptions intertwined in the organization) can provide a realistic representation of its culture. (Cameron, 2009; Cameron & Quinn, 2011).

With the identification and definition based on the literature, twelve dimensions referring to innovation were proposed as a data collection instrument called innovation radar. This structure aimed to help companies with a restricted vision of innovation avoid lost opportunities (Sawhney, Wolcott, & Arroniz, 2006, 2021).

In an extensive survey with 818 MSEs from three different sectors in twelve cities in Paraná-BR, the innovation radar generated different results for each sector, albeit with similarities. These results led the authors to suggest that companies from different sectors be compared directly to the innovation radar within their respective sectors (Carvalho et al., 2016).

The innovation radar was assessed in interviews with managers responsible for innovation-related activities at large companies in various industries. Participants included Boeing, Chamberlain Group, Conoco, Philips, DuPont, eBay, FedEx, Microsoft, Motorola, and Sony. This research suggested that successful innovation strategies focus on a few high-impact dimensions rather than trying a fast approach to many dimensions simultaneously (Sawhney et al., 2006). The innovation radar can guide how companies manage the increasingly complex business systems through which they add value, enabling innovation beyond products and technologies (Sawhney et al., 2021).

Method

Data collect

The evaluation of MSEs, regarding the relationship between predominant organizational culture and capacity for business innovation was conducted in 30 MSEs of the industrial segment located in the Metropolitan Region of Vale do Paraíba (RMVP).

To preserve the identity of the organizations participating in the research, according to the commitment assumed in the confidentiality agreement, their identities were omitted and coded from “E1” to “E30”.

The selection of companies was based on fulfilling the basic premises that characterize an MSE and on the manager's availability to participate in the research. For selection, non-probability and non-random convenience sampling were used in this work. In addition, it was decided to use the classification of the Brazilian Service of Support to Micro and Small Enterprises (SEBRAE) according to the size of the company (SEBRAE, 2018)established by the number of employees.

Collection instruments

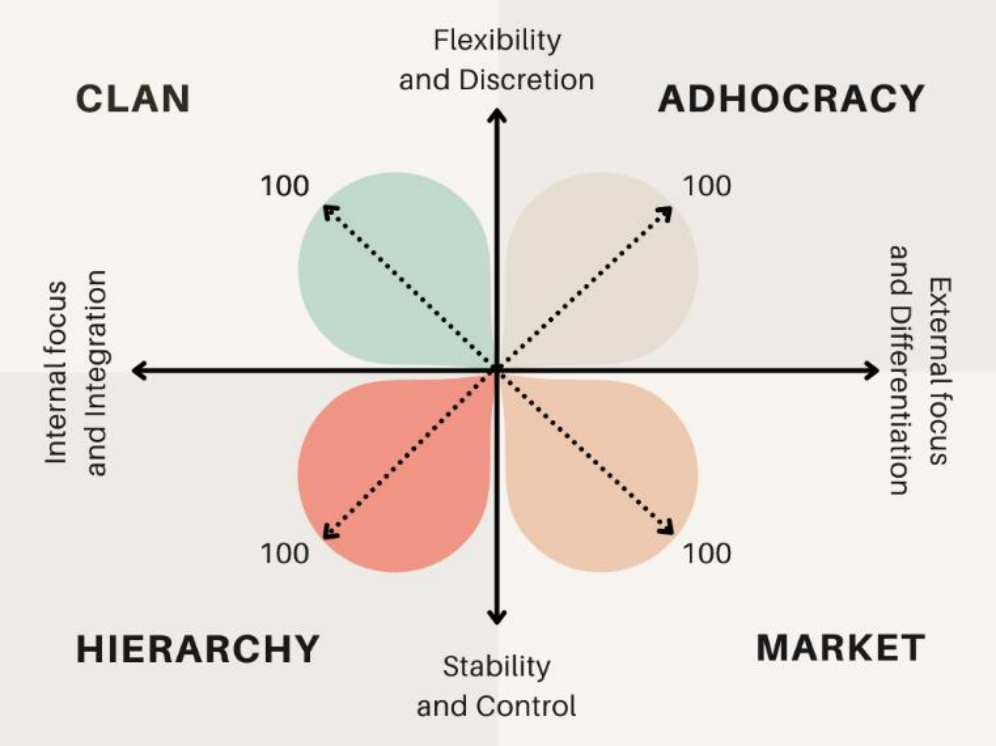
Two data collection instruments were adopted, the *Organization Culture Assessment Instrument* (OCAI) questionnaire that diagnoses the cultural model of each company (Cameron & Quinn, 2006, 2011)and the questionnaires prepared based on the twelve dimensions of innovation displayed by the innovation radar proposed by Sawhney, Wolcott et al. (2006), and modified by Oliveira, (2013). They classify companies according to the degree of innovation.

Analysis of the predominant organizational culture

The OCAI questionnaire uses a four-factor model to classify culture – clan, adhocratic, hierarchical, or market – along two continuous axes (internal *versus* external focus of the organization and stability *versus* flexibility in work approaches), as illustrated in Figure 1.

Figure 1

Types of organizational culture: structure of competing values



Source: Adapted from Cameron, KS; Quinn, RE Diagnosing and changing organizational culture: Based on the competing values framework. 3. ed. John Wiley & Sons, 2011.

The first dimension of the OCAI questionnaire concerns the orientation of its decision-making; it can be internally oriented, that is, focusing on development, collaboration, integration of activities, and coordination; or externally oriented, that is, looking at the market, what is possible with the latest technology, what competitors are doing, what customers want, and this could diversify activities (Sawhney et al., 2006).

The second dimension (Figure 1) is the focus on how managers prefer their company to organize itself, with a focus on stability (where clear structures, planning, budgets, and reliability are valued; assuming that reality can be known and controlled) or on the flexibility (that reality is unpredictable and not everything can be controlled; managers prefer a flexible attitude and organization to adapt quickly to changing circumstances – focusing more on people and activities than on structure, procedures and plans) (Cameron & Quinn, 2006).

Quinn and Cameron (2006) cited flexible organizations as the most effective, at the same time revealing contradictory behavior. The effectiveness of these organizations can be a consequence of managing competition within that framework and using the four types of values

together when necessary. (Cameron & Quinn, 2011)In Figure 1, we present the dimensions of the factors to represent organizational cultures according to the OCAI questionnaire.

The clan culture archetype is shaped by flexibility and aspects of continuous internal focus, considered representative of a family-style organization. The adhocratic culture, delineated by aspects of flexibility and continuous external focus, is based on innovation as a means of organizational functioning. The hierarchical culture, delineated by internal focus and aspects of ongoing stability, is highly reminiscent of the bureaucratic culture, primarily concerned with stability in organizational functioning, and has clear guidelines on how the organization should approach specific tasks. Finally, the market culture is shaped by the external focus and the aspects of continuous stability. This aspect is related to competitiveness and gain. Therefore, it is driven by the need to conduct transactions with external bodies to gain an advantage in its organizational niche. (Cameron & Quinn, 2011)

Percentile standards were applied to the distributions of the OCAI scale scores. Each question displays four answers, and the relative fraction must be distributed among them with two scopes, the current and the intended. Moreover, the value of the relative fraction is directly proportional to the type of predominant culture (Cameron & Quinn, 2011).

Analysis of the degree of innovation

The second research instrument used in the present work was the innovation radar (Figure 2), which is a model of four factors to classify innovation: offers that a company creates, the customers it serves, the processes it employs, and the points of contact. presence you use to take your offers to market (Sawhney et al., 2006).

Figure 2

Representation of the innovation radar

Source: Adapted from Sawhney, Wolcott *et al.* (2006, p. 77).

Innovation radar factors can be identified by answering key questions – "what", "who", "how" and "where" – distributed along two continuous axes (offers *versus* processes and presence *versus* customers) that create quadrants identifying the dimensions of the platform and solutions, customer experience and value perception, organization, and supply chain, and relationship and brand (Sawhney et al., 2006).

In the quadrants between offers and customers, between customers and processes, between processes and presence, and between presence and offers, the dimensions of platform and solutions, customer experience and perception of value, organization and supply chain, and relationship and brand are proposed, respectively (Sawhney et al., 2006).

In addition to Sawhney's innovation radar, Wolcott *et al.* (2006) and Oliveira (2013) presented two changes: first, the number of questions was increased; second, the questions were reformulated to allow for up to five response options in the Likert scale model. These changes sought to improve the arbitrary power of companies in terms of their ability to innovate for proper classification in the low, medium, or high categories of the degree of innovation.

The self-assessment questionnaire regarding innovation in the company (composed of four blocks with questions to identify the product, market, process, and organizational innovation) uses a five-point Likert scale for each question.

The conversion of qualitative data into quantitative obeyed the following rules: (i) the variation of the value of the points was from one to five, with the first column of response equivalent to one point, the second column equivalent to two points, and so on consecutively

up to five spots; (ii) the value of the general score was equal to the arithmetic mean of the scores of the answers in each column; and (iii) the classification of companies in the categories of low, medium or high degree of innovation used the value of the general score as a reference (following that determined in Table 1). The low, medium, and high degrees of innovation were determined by scores from 0 to 2.7, 2.8 to 3.7, and above 3.8, respectively.

The general characterization strategies of the sample are summarized in Table 1. The OCAI and modified innovation radar questionnaires are in Annexes MS01 and MS02, respectively.

Table1

Summary of characteristics of organizational culture and degree of innovation of companies

Questionnaire *Organization Culture Assessment Instrument* (OCAI) distinguishes two scopes (current and intended)			
Dimension	*Classification*	*Features*	*type of culture*
First: evaluates the orientation in decision making	Internal	Focusing on development, collaboration, integration of activities, and coordination.	Clan hierarchical
	External	Looking at the market, what is possible with the latest technology, what competitors are doing, and what customers want could diversify activities.	adhocratic market
Second: it ranks the focus on how managers prefer their company to organize itself	Stability	Where clear structures, planning, budgets, and reliability are valued, assuming that reality can be known and controlled.	hierarchical market
	Flexibility	Assuming that reality is unpredictable and cannot control everything, managers prefer a flexible attitude and organization to adapt quickly to changing circumstances – focusing more on people and activities than structure, procedures, and plans.	Clan adhocratic
Self-assessment questionnaire regarding innovation in the company			
Type of innovation	*Number of questions*	*Scoring scheme and overall score value*	*Degree of innovation*
in product	11	Each question contains five alternatives, with points from 1 to 5 distributed in columns. The overall score value is obtained by averaging the responses in each column.	Low = 0 to 2.7 Average = 2.8 to 3.7 High ≥ 3.8
marketing	13		
in process	14		
organizational	17		

Source: Adaptation of Cameron & Quinn, 2006, 2011; Oliveira, 2013; Sawhney et al., 2006.

Statistical analysis

The data obtained were statistically analyzed using the BioEstat 5.3 software for adherence to a normal distribution ($p<0.01$) using the Shapiro-Wilk test ($\alpha=0.05$).

To measure and identify the strength of the relationship between the variables organizational culture and business innovation, Spearman's correlation coefficient (ρ) was adopted, applying equation 1.

$$\rho = 1 - \frac{6\sum_i d_i^2}{(n^3 - n)} \qquad (1)$$

where n is the number of pairs (x_i, y), and $d$is equal to the rank of x_i among the values of x (relating to culture) subtracted from the rank of y_i in the values of y (relating to the degree of innovation). Note that if the stations x are exactly equal to the ranks of y, then all d_i will be zero and will be 1 (one)) (Gorzelany et al., 2021; Spearman, 1904).

Results

Analysis of the predominant organizational culture

The OCAI questionnaire is a valuable instrument to assess the organizational culture of Micro and Small Enterprises (MSEs), identifying the cultural model of each company. After classifying the predominant organizational culture model of the companies participating in this study, in line with Cameron and Quinn's proposal (2006), radar charts were obtained by converting qualitative data into quantitative data.

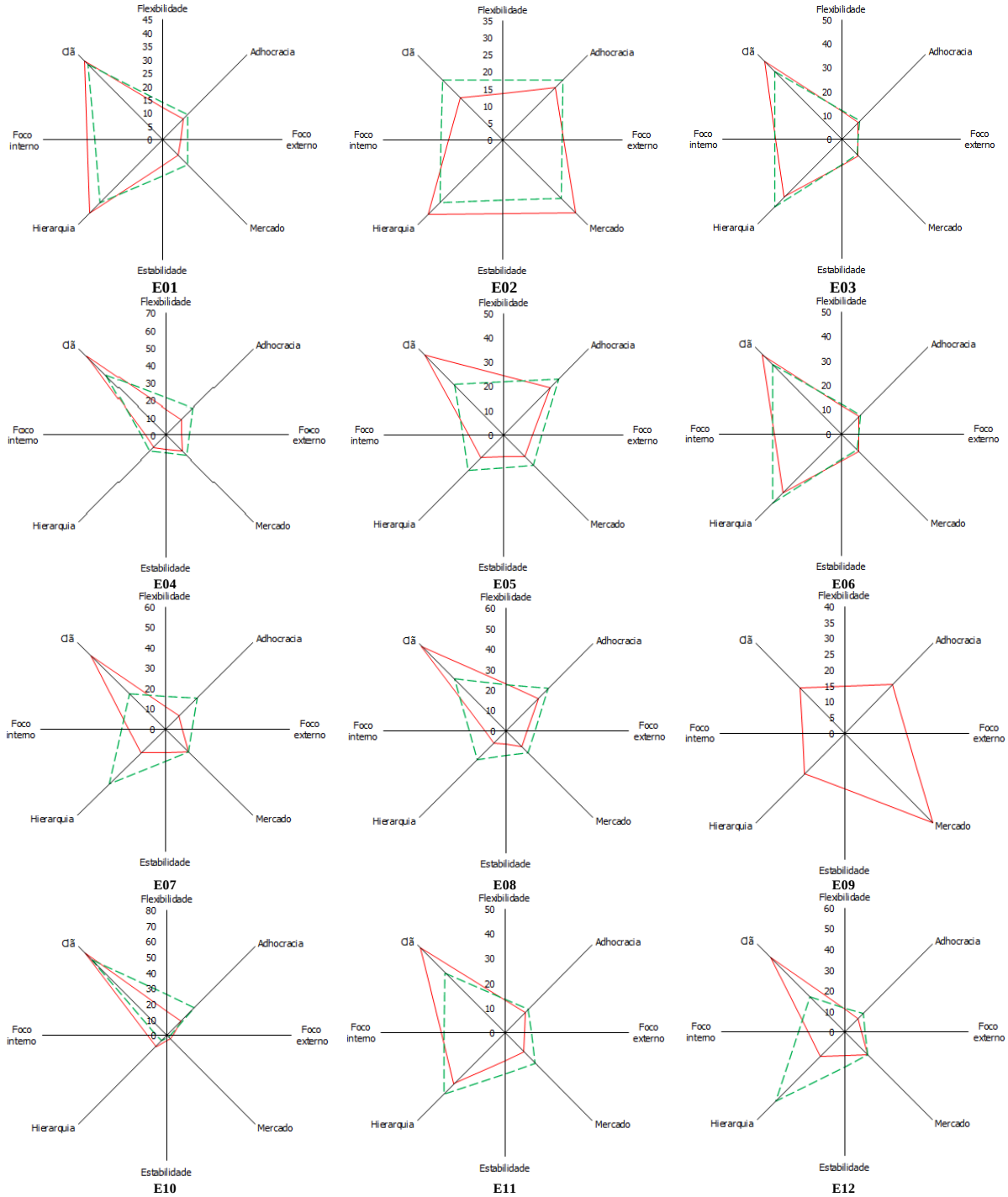
The predominant organizational culture in companies, as the name implies, overlaps. However, it is accompanied by characteristics of the other types of culture (that is, it presents a mixture of the four organizational cultures in the same company, as perceived in the analysis of the companies (Figures 3 and 4), corroborating what was described in the literature (Cameron & Quinn, 2011; Gorzelany et al., 2021)).

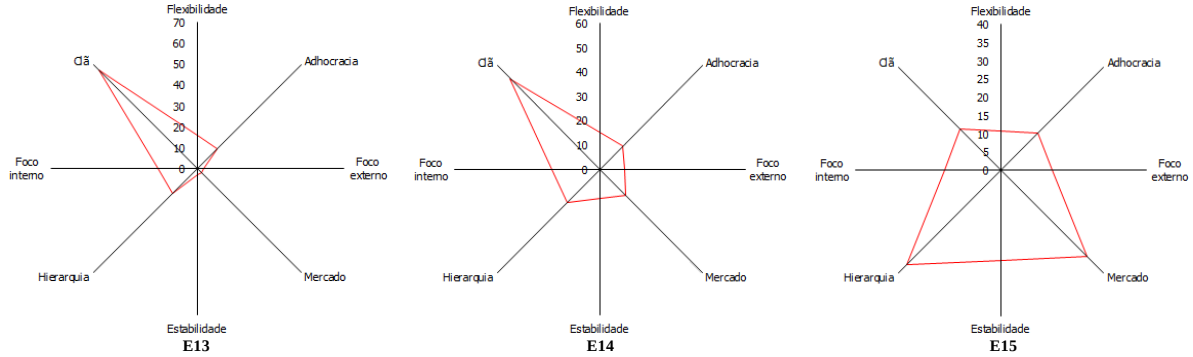
Participatory management practices correspond to the first defining dimension of the OCAI questionnaire (which concerns the internal orientation of decision-making, that is, focusing on development, collaboration, integration of activities, and coordination) (Wudarzewski, 2018). Bearing this in mind, on the one hand, we have companies E2, E4, E5, E7, E8, E10, E16, E20, E24, E26, E29, and E30 that are in the innovation prospecting phase. On the other hand, companies E9 and E13-15 did not manifest the desired future organizational culture. However, the practice of participatory management was identified in most companies (Figures 3 and 4).

The results of the analysis of culture can be seen in the form of radar charts in Figure 3 (displayed the competitive values of companies E01 to E15) and in Figure 4 (displayed the competitive values of companies E016 to E30).

Figure 3

Radar graphics resulting from the OCAI questionnaire applied to companies E01 to E15

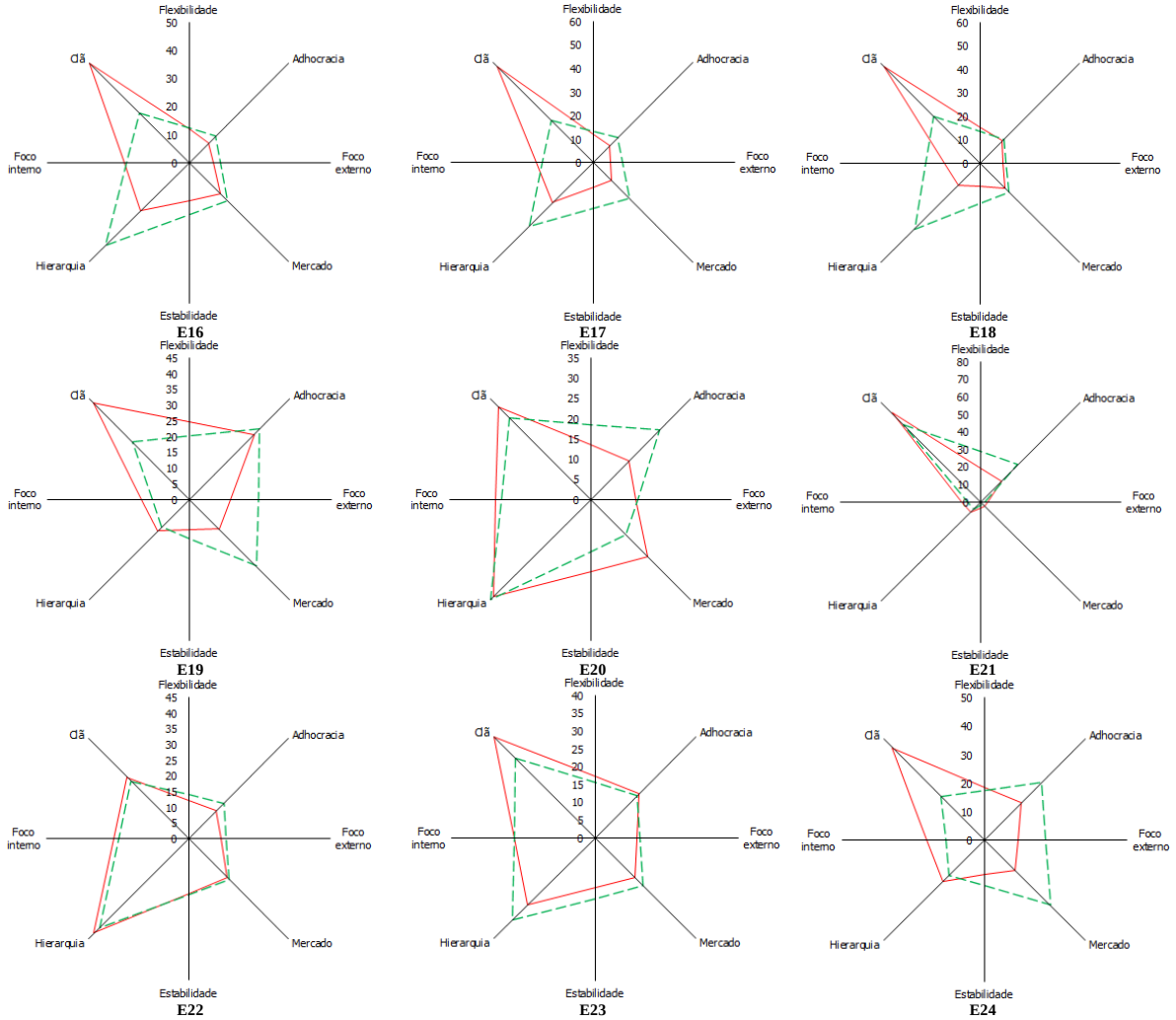


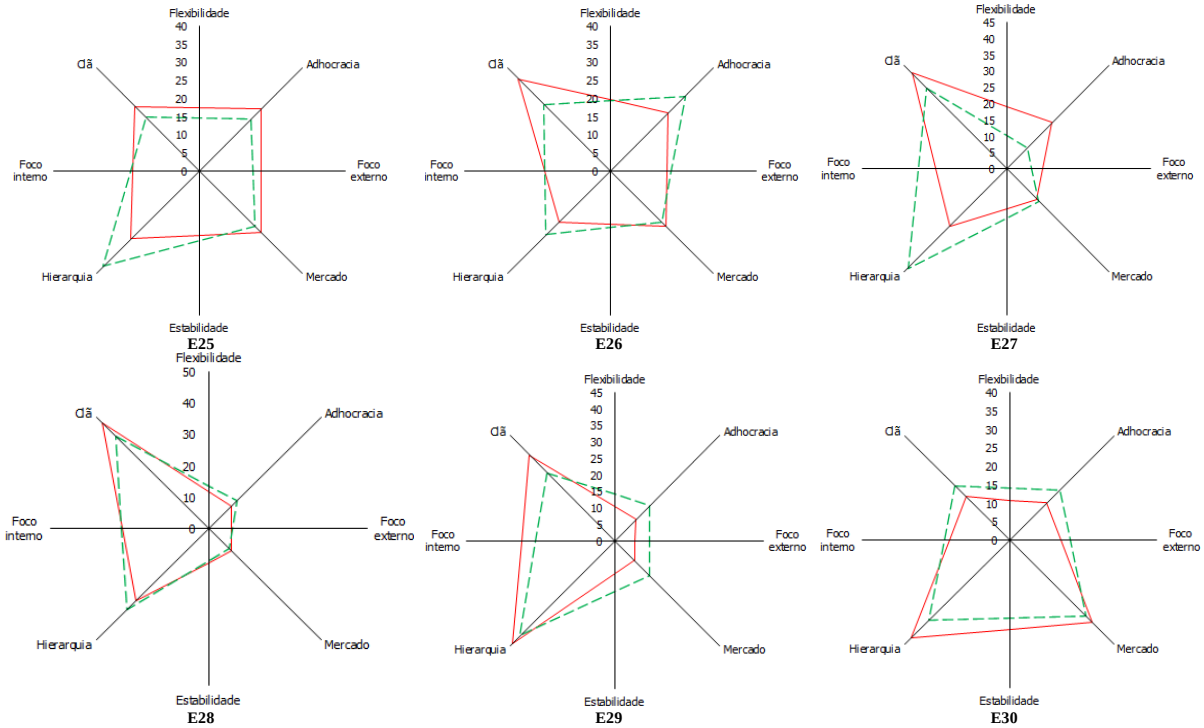


Note: Visualization of the competing values model based on the predominant organizational culture typology proposed by Cameron and Quinn (2006). Caption: □ current and □ intended.
Source: Own authorship.

Figure 4

Radar graphics resulting from the OCAI questionnaire applied to companies E016 to E30





Note: Visualization of the competing values model based on the predominant organizational culture typology proposed by Cameron and Quinn (2006). Caption: □ current and □ intended.
Source: Own authorship.

Analysis of the degree of innovation

The innovation radar, based on the twelve dimensions of innovation – offerings, platform, solutions, customers, customer experience, value perception, processes, organization, supply chain, presence, relationship, and brand (Annex MS01) – was able to identify the degree of innovation through the questionnaires answered by the managers of the companies participating in this work.

The quantitative data obtained to determine the degree of innovation - the equivalence of the general score for the degree of innovation made according to the information in Table 1 - and the classification of the predominant organizational culture of the sample group are shown in Table 1.

Table 1

Classification of the degree of innovation and predominant organizational culture identified in companies through the adapted innovation radar and OCAI model, respectively

Company	Product	marketing	Process	organizational	overall score	degree of innovation	predominant culture
E01	1.45	2.15	3.43	3.12	2.6	Low	Clan
E02	3.45	4.00	4.21	3.71	3.9	High	hierarchical
E03	1.64	2.31	3.29	3.35	2.7	Low	Clan
E04	1.36	2.38	2.50	2.53	2.3	Low	Clan
E05	3.09	3.54	3.07	3.53	3.3	Medium	Clan
E06	1.36	2.15	3.43	3.12	2.6	Low	Clan
E07	1.36	2.38	3.50	2.88	2.6	Low	Clan
E08	3.18	3.54	3.21	3.59	3.4	Medium	Clan
E09	2.73	4.31	4.29	3.88	3.9	High	Marketplace
E10	3.25	3.77	4.43	4.06	3.9	High	Clan
E11	1.27	2.23	3.29	2.94	2.5	Low	Clan
E12	1.45	2.23	3.57	3.00	2.7	Low	Clan
E13	1.45	2.38	3.79	2.59	2.6	Low	Clan
E14	1.45	2.15	3.43	3.12	2.7	Low	Clan
E15	2.55	3.85	4.07	4.06	3.7	Medium	hierarchical
E16	1.64	2.31	3.07	2.94	2.6	Low	Clan
E17	1.36	2.38	3.36	2.76	2.5	Low	Clan
E18	2.64	4.08	4.50	3.59	3.7	High	hierarchical
E19	1.45	2.23	3.57	3.00	2.7	Low	Clan
E20	3.18	3.00	3.07	3.59	3.2	Medium	hierarchical
E21	2.27	2.54	4.36	4.12	3.4	Medium	Clan
E22	3.18	2.92	2.86	3.29	3.1	Medium	hierarchical
E23	1.36	2.31	2.50	2.35	2.2	Low	Clan
E24	1.27	2.15	3.50	2.82	2.5	Low	Clan
E25	3.18	3.54	3.21	3.59	3.4	Medium	hierarchical
E26	1.36	2.38	3.36	2.76	2.5	Low	Clan
E27	1.36	2.38	3.50	2.88	2.6	Low	Clan
E28	1.64	2.31	3.14	3.35	2.7	Low	Clan
E29	2.36	3.54	2.71	3.00	2.9	Medium	hierarchical
E30	2.73	4.15	4.43	4.65	4.1	High	hierarchical

Note: Coding of companies (E1 to E30).
Source: Own authorship.

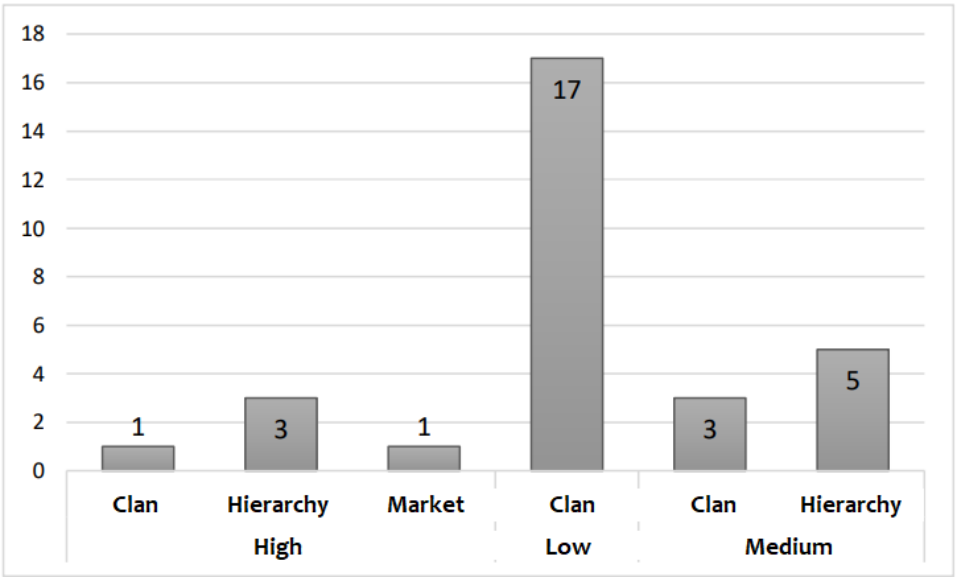
D among the companies interviewed, 55% had a low degree of innovation, 28% medium, and 17% high (Table 1); 17 companies were diagnosed with a low degree of innovation and clan culture. Therefore, most companies practice little or almost no innovation; the smallest part is those that invest in innovations and put them into action.

This diagnosis of the companies' degree of innovation corroborates the non-predominance of the adhocratic culture found (Figures 3 and 4). Conversely, identifying the low degree of innovation and clan culture (Graph 1), which are predominant in MSEs, can guide managers in decision-making to migrate the company to a model with competitive values.

The graphic illustration of the distribution of companies, which were part of the present study, according to the predominant organizational culture and the degree of innovation diagnosed, can be seen in Graph 1.

Graph 1

Distribution of companies according to predominant culture versus the degree of innovation



Source: Own authorship.

Statistical analysis

The purpose of the Shapiro-Wilk test, which can be used for samples of any size, is to provide a test statistic to assess whether a sample distribution is like a normal distribution (Shapiro & Wilk, 1965).

The normal distribution is essential as it is often used to model natural phenomena. In practice, one can investigate, for example, whether the sample data follow a normal distribution. Therefore, as a result, the test will return the W statistic, which will have an associated significance value, the p-value (if the p-value>0.05, the distribution is considered normal). When a variable adheres to the normal distribution, it can be treated with parametric and/or non-parametric tests; when it does not, a non-parametric test should be used to treat the data. (Rumsey, 2016; Shapiro & Wilk, 1965)

The Shapiro-Wilk results for the data collected from the dependent variables type of organizational culture and degree of innovation had p-values of 0.0069 and 0.0098, respectively

(Table 2). Therefore, these variables do not adhere to the normal distribution (for $\alpha = 0.05$), and a non-parametric test must be used to treat the data, such as the Spearman correlation coefficient.

Table 2 shows the result of the Shapiro-Wilk test for the data collected by the OCAI questionnaire and innovation radar instruments.

Table 2

Result of the Shapiro-Wilk test for data on organizational culture and degree of innovation

Results	sample data	
	Culture organizational	*Grade of innovation*
sample size =	30	30
Average =	1.3333	2.9890
standard deviation =	0.5467	0.5476
W =	0.6241	0.8808
p-value =	0.0069	0.0098

Note: Calculated in BioEstat 5.3 statistical software.
Source: Own authorship.

The Spearman correlation coefficient (ρ) was 0.4678 with r = 0.6839 (Table 3) with a confidence interval for ρ ranging from 0.43 to 0.84 for the variables organizational culture and degree of innovation. Although there is no consensus on the interpretation of correlation power, but only recommendations. For example, Cohen(1992, p. 99) suggests effect sizes (r) of 0.10, 0.30, and 0.50, respectively, for weak, moderate, and strong correlations; while Rumsey (2016, p. 293)suggests that values of r equal to 0.30, 0.50 and 0.70 the correlations are weak, moderate, and strong, respectively. Thus, the correlation between the degree of innovation and the predominant organizational culture identified in the present study can be considered substantial.

The Spearman correlation coefficient generates a number that varies from -1 to +1, and the proximity relationship with the extremes (-1 or 1) translates the strength of the correlation (Cohen, 1992; Rumsey, 2016; Spearman, 1904). A positive value shows a directly proportional relationship, and a negative value shows an inversely proportional relationship. Therefore, when the correlation value is closer to 1 (one), the higher the correlation between two variables will be (Gorzelany et al., 2021; Spearman, 1904). Finally, the p-value was $p<0.0001$ (Table 2), which suggests that the relationship is statistically significant at the $\alpha = 0.05$ level.

Spearman's correlation coefficient (ρ) was calculated, with 95% certainty, using the variables organizational culture and degree of innovation, and a correlation of 0.4678 was calculated (Table 3).

Table 3

Result of Spearman's linear correlation test for data on organizational culture (a) and degree of innovation (b)

Result	(a) and (b)
n (pairs) =	30
r(Pearson) =	0.6839
95% CI	0.43 to 0.84
99% CI	0.33 to 0.81
R^2 (correlation coefficient, ρ) =	0.4678
t =	4.9608
degrees of freedom =	28
p-value =	< 0.0001
Power 0.05 =	0.9965
Power 0.01 =	0.9783

Note: Calculated in BioEstat 5.3 statistical software.
Source: Own authorship.

Discussion

Based on the *Organization Culture Assessment Instrument* (OCAI) questionnaire proposed by Cameron and Quinn (2006), the radar charts (Figures 3 and 4) were analyzed, and 70% of the companies studied were classified as family-type organizations (clan). As mentioned earlier, the clan type is centered around emotional bonds, under a friendly work atmosphere, shared values, and goals – a elevated level of work participation, a sense of community and cohesion; where leaders empower and encourage participation, commitment, and loyalty; presenting partially independent work teams, privileging team results over individual achievements (Cameron & Quinn, 2011). However, about 81% of these companies were diagnosed with a low degree of Innovation (Graph 1).

The finding that the majority (70%) of the companies studied were classified as predominantly clan-type and 81% with a low degree of innovation among those in this class reflects the difficulty of establishing a relationship between the predominant cultural profile of an institution and its degree of innovation. This observation is because, in the clan class, it also appears in the classes with a medium and high degree of innovation. However, the same finding corroborates the conclusion of the research carried out by the National Confederation of Industry (CNI, 2015); where of the 100 participating executives, 62% indicated that the degree

of innovation in the Brazilian industry is low or very low; and of this 29% justified such levels to the lack of a culture of Innovation in Brazil/in companies.

Some authors argue that managers should focus on participatory management practices (for example, employee empowerment) to promote the innovativeness of MSEs by identifying the organization's cultural structure and can guide decisions to prospect and implement the desired cultural structure. (Cameron & Quinn, 2011; Gorzelany et al., 2021). However, others theorize that organizational culture is a product that develops uniquely, slowly within the organization, cannot be determined, or dictated by management, is not easily defined, and is difficult to transfer between organizations (Harel, Schwartz, & Kaufmann, 2021; G. J. Tellis, 2013; G. J. Tellis, Prabhu, & Chandy, 2009).

Each organization has elements of leadership, skills, infrastructure, values, culture, and organizational processes. The challenge is to adapt these components to an innovation framework compatible with the organization and its objectives (Skarzynski & Gibson, 2013 apud Harel et al., 2021). In addition, developing an organizational culture that encourages innovation is integral to the innovation process (Terziovski, 2010).

The hierarchical culture was predominant in companies with a medium (5) and high (3) degree of innovation, to the detriment of clan and market cultures (Graph 1). Therefore, there was an indication that decision-making focused on development, collaboration, integration of activities and coordination, and stability in organizational functioning are related to the degree of innovation diagnosed. However, using the four cultural values together can make the company more competitive in the market (Sawhney et al., 2021).

Our findings on the predominance of clan culture in MSEs corroborate the results obtained by Cakar and Ertürk (2010) in a study to analyze the impact of organizational culture and employee empowerment on the innovation capacity of small and medium-sized companies in Turkey. In this, medium-sized companies revealed collectivism and uncertainty avoidance as positively associated with empowerment, and hierarchical distance was negatively related to empowerment.

In another study (Elkhouly & Marwan, 2016), with results similar in part to those of this research, it was found that a culture conducive to innovation in micro, small and medium-sized companies in Egypt would have a small hierarchical distance, where power would be distributed equally, and participatory decision-making would occur. Furthermore, organizational culture could be driven to strategic innovation by preventing uncertainty, as the authors identified that the interviewed employees liked to have transparent and predictable guidelines without

ambiguity. These findings can be compared with those of the present research, as they are like the predominance of the clan culture with a view to the adhocratic future, as in the case of companies E20 and E26.

Analyzing data resulting from the application of the OCAI questionnaire (Figures 3 and 4) together with the degree of innovation identified (Table 1), it can be deduced that there is no organizational culture better than the other, and the different types of culture complement each other, being able to be present to a greater or lesser extent, exemplified by companies E02, E09, E10, E18, and E30. However, identifying the culture that brings more results to the organization is essential, and seeking to strengthen this identified culture can make the company more competitive in the market (Cameron & Quinn, 2011; CNI, 2015).

The positive relationship between organizational culture and the degree of innovation identified in the present work indicates that with the improvement of organizational culture, the degree of innovation would increase in MSEs, located in the Metropolitan Region of Vale do Paraíba. This finding was also affirmed by Dulaimi and Hartmann (2006). In their published case study, they considered organizational culture as one of the factors that most stimulated innovative behavior among the approximately 1,500 members of a Swiss construction company.

A survey by the National Confederation of Industry (CNI, 2015)identified that innovation is part of the business strategy in 99% of the companies consulted. Among the motivations to innovate, the entrepreneurs pointed out, in the first place, the competitive advantage. The increase in productivity, profit, and internationalization potential was also mentioned. The training was identified as an obstacle to innovation.

At the end of the present work, the participating companies received, in return, an individualized technical report regarding their organizational culture classification and their degree of innovation diagnosed with the use of the applied method; as well as clarifications based on the literature (Cameron & Quinn, 2011; Wudarzewski, 2018)on the possible relationship of the types of organizational culture identified with the company's innovation.

Final considerations

With the data collection instruments, the OCAI questionnaire, and the modified innovation radar, it was possible to assess the relationship between the culture of a predominant organization and the degree of Innovation of MSEs. The results of this research support the suggestion that micro and small enterprises (MSEs) in the industrial sector in the Metropolitan

Region of Vale do Paraíba. The predominant organizational culture is strongly related to the company's degree of innovation. Furthermore, this relationship is positive; that is, it indicates that with the improvement of organizational culture, the degree of innovation would increase in MSEs. However, the hypothesis arises that if the investigation were conducted in this model for industries in the same sector, we would have the same outcome.

The investigative structure adopted in this research can become an essential tool for corporate executives and entrepreneurs who seek growth through innovation.

It is worth mentioning that the work does not intend to generalize since it was restricted to a specific region. However, the data capture structure allows the research to be replicated in other regions of Brazil and the world so that different situations can be identified and the potential reasons for differences analyzed since the prevalence or not of innovation is a result of numerous variables. Also, a periodic replication could indicate the transformation over time, discovering how cultural policies may influence companies' innovation capacity.

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Annexes

Annex 01

Supplementary material (MS01)

Translation into Portuguese of the model by Cameron and Quinn (2006) to analyze organizational culture, also called the OCAI questionnaire (*Organization Culture Assessment Instrument*)

1	DOMINANT CHARACTERISTICS	CURRENT	IDEAL
A	This company is a very personal environment. It is like a family extension. People share things in their lives with each other.		
B	This company is a very dynamic and entrepreneurial place. People are willing to seek new challenges and take risks.		
C	This company is results oriented. Its most significant concern is getting the job done. People are very competitive and focused on results.		
D	This company is a structured and controlled environment. As a result, formal processes often govern what people do.		
	TOTAL	100	100

2	ORGANIZATIONAL LEADERSHIP	CURRENT	IDEAL
A	The leadership in this company generally teaches, facilitates, and develops the employees.		
B	The leadership in this company is generally oriented towards entrepreneurship and innovation and deals well with risk situations.		
C	The leadership in this company is generally oriented to pursue an objective, aggressive and result-oriented goals.		
D	Leadership in this company is usually oriented towards coordinating, organizing, and making the organization more efficient.		
	TOTAL	100	100

3	EMPLOYEE ADMINISTRATION	CURRENT	IDEAL
A	The administrative style in this company is characterized by group work, consensus, and participation.		
B	The management style in this company is characterized by individual risk-taking, innovation, freedom, and originality.		
C	The administrative style in this company is characterized by high competitiveness, high demands, and achievements.		
D	The administrative style in this company is characterized by job stability, compliance, predictability, and stability in relationships.		
	TOTAL	100	100

4	ORGANIZATIONAL COHESION	CURRENT	IDEAL
A	What holds this company together is loyalty and trust. There is a high commitment to the organization.		
B	What keeps this company together is a commitment to innovation and development. There is a motivation to be at the top.		
C	What keeps this company together is the emphasis on goals and achieving goals.		
D	What holds the organization together are formal rules and policies.		
	TOTAL	100	100

5	STRATEGIC EMPHASIS	CURRENT	IDEAL
A	This company emphasizes human development. As a result, trust, openness, and participation persist.		
B	This company emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.		
C	This company emphasizes competitive actions and activities. Exceeding targets and winning markets are predominant.		
D	This company emphasizes permanence and stability. Therefore, efficiency, control, and standardized operations are essential.		
	TOTAL	100	100

6	SUCCESS CRITERIA	CURRENT	IDEAL
A	This company defines success based on human development, teamwork, employee commitment, and concern for people.		
B	This company defined success as having original products or new products.		
C	This company defined success based on gaining market share and beating the competition. Therefore, competitive market leadership is vital.		
D	This company defines success based on efficiency. Therefore, meeting deadlines and providing good service and low-cost products are essential.		
	TOTAL	100	100

Annex 02

Supplementary material (MS02)

The innovation radar model proposed by Sawhney, Wolcott, and Arroniz (2007), modified by Oliveira (2013), and revised by our team to analyze the degree of innovation. Four blocks of questions to identify a product, market, process, and organizational innovation are described.

BLOCK 1. QUESTIONS TO IDENTIFY PRODUCT INNOVATION **Product innovation involves the production of goods with some differentiation (coffee maker with water de-chlorinator, for example) and the provision of differentiated services, whether aimed at the specialized area (unique welds, for example) or the third sector (rental of camping equipment, for example).**						
1.01	What interest does your company have in the development of new products?	None	Little	Medium	High	Intense
1.02	Does the company follow the technological evolution of competing products?	Never	Rarely	Sometimes	Often	Ever
1.03	How many new products have the company successfully launched in the last three years?	None		One	Some (2/3)	Several
1.04	How many new products has the company developed in the last three years that have not been successful?	None	One	Some (2/3)	Several	Many
1.05	How many products or variations does the company offer that use the same components, modules, or the exact composition base? (e.g., same pattern type for different clothing models)	One	Some (2/3)	Several		Many
1.06	How many products are offered in different versions to serve different markets or niches?	One		Some (2/3)		Several
1.07	How many products does the company have with its brand? (products with some innovation on which the company holds or held production exclusivity)	None		One	Some (2/3)	Several
1.08	Has the company made or used its leading brand to promote other products?	Never	Rarely	Sometimes	Often	Ever
1.09	What percentage of the last three years' total revenue comes from producing your brand's products? (choose the percentage value that most closely matches your reality)	0%	10%	30%	50%	>50%
1.10	Did the company offer any new complementary products to its customers, creating revenue opportunities? (for example, coffee producers lease espresso machines to bars that buy their products)	None				
1.11	Does the company have a patent in force, has it applied for a patent, or has it registered a product?	None		One		Some

BLOCK 2. QUESTIONS TO IDENTIFY MARKET INNOVATION						
2.01	Does the company adopt any formal relationship practice to identify customer needs?	Never	Rarely	Sometimes	Often	Ever
2.02	Does the company follow the growth of the market and its participation in it?	Never	Rarely	Sometimes	Often	Ever
2.03	Does the company follow the market evolution of competing products?	Never	Rarely	Sometimes	Often	Ever
2 .04	Does the company adopt formal practices to identify customer satisfaction with its products?	Don't	Rarely	Sometimes	Often	Intensely
2.05	Does the company seek to identify new markets or niches? In what way?	Don't		Informal		Systematics
2.06	With what effort does the sales team use in the newly identified markets?	Don't	Minimum	Medium	High	Extreme
2.07	Did the company sell through new forms of customer access, such as direct or online sales?	No	Very little	Few	Various	Quite
2.08	Does the customer service, or the complaints received, support the improvement of products/services?	Never	Rarely	Sometimes	Often	Ever
2.09	Over the past three years, have improvements in current products resulted from information obtained or customer perceived needs?	None	Few	Some	Many	All
2.10	Has any product launched in the last three years resulted from information obtained or perceived needs from customers?	None		One		Several
2.11	Does the company allocate resources (material, human and technological) to customer relationship activities?	None	Very little	Little	Any	Quite
2.12	Has the company identified and adopted new ways to generate revenue using existing products and processes? (e.g., coffee vendors can rent espresso machines)	No		One		Various
2.13	How many markets with different income levels does the company serve?	One		Two		Three

BLOCK 3. QUESTIONS TO IDENTIFY INNOVATION IN PROCESS (PRODUCTION TECHNOLOGY)						
3.01	Does the company review product design to correct malfunctions, facilitate the production of diversified models, or improve manufacturing efficiency?	Not applicable	No	Rarely	Sometimes	Constantly
3.02	Does the company adopt in-line production processes?	Not applicable	Not. Adopt only functional layout	For a few products (1 or 2)	For multiple products (3 or 4)	For all products
3.03	Are these in-line production processes flexible (allowing the production of different products or models)?	Not applicable	None	Few (1 or 2)	Several (3 or 4)	All
3.04	What is the average order fulfillment time?	Not applicable	1 month	15 days	1 week	<3 days

BLOCK 3. QUESTIONS TO IDENTIFY INNOVATION IN PROCESS (PRODUCTION TECHNOLOGY)						
3.05	What percentage of production requires some rework? (adopt the value that is closest to your reality)	Not applicable	>10%	<5%	<2%	Zero
3.06	Does the company have a process description sheet and operating procedures standards, and does it promote employee awareness and training for quality?	Not applicable	No	In a few processes (1 or 2)	In several processes (3 or 4)	For all processes
3.07	Does the company adopt the practice of developing suppliers to guarantee the speed and quality of supplies?	Not applicable	No	Rarely	Sometimes	Ever
3.08	What is the order delay rate?	Not applicable	>10%	<5%	<2%	Zero
3.09	What is the order return rate for non-compliance (lack of quality)?	Not applicable	>10%	<5%	<2%	Zero
3.10	In the last three years, the company started to adopt modern manufacturing equipment maintenance techniques as preventive maintenance.	Not applicable	No	In ½ of the equipment	On various equipment	In the leading parents' equipment
3.11	Does the company adopt effective measures to ensure clean production or environmental management?	Not applicable	No	Few		All necessary
3.12	To what extent does the company make efforts to reduce manufacturing costs?	Not applicable	Don't	Little	Medium	Quite
3.13	Has the company modernized its production equipment in the last three years by adopting the latest technologies?	Not applicable	None	Very little	Some	Quite
3.14	Has the company received any new process certification (ISO9001, ISO14001, CEP, TS, OHSAS18001, or others)?	Not applicable	I never thought of asking	Intends to request	Is in process	Yes

BLOCK 4. QUESTIONS TO IDENTIFY ORGANIZATIONAL INNOVATION						
4.01	Does the company analyze its organizational structure in search of lean and more efficient organizational charts?	Never		Sometimes		Continuously
4.02	How do you rate the improvement made in the last three years in the efficiency of your administrative staff?	None		Little	Average	High
4.03	Does the company care about implementing participatory management?	No	Intends im-plant	The process has already started	It is under implantation	is already implanted
4.04	Qualification and development of personnel (selection, training, education, aiming mainly at the multifunctionality of the	None	Less than 10%	About 25%	More than 50%	All

BLOCK 4. QUESTIONS TO IDENTIFY ORGANIZATIONAL INNOVATION						
	personnel) does it reach what fraction of your employees?					
4.05	Evaluate, on a scale from 0 to 4, where 4 represents the best situation, the company's attitude concerning staff satisfaction at work (consider the quality of life at work, job stability policy, integration between employees, fair and transparent treatment of employees, or other.	0	1	2	3	4
4.06	To what extent, on a scale of 0 to 4, does the company practice the knowledge retention policy (an effort to keep staff in the company, proposing improvements in working conditions)	0	1	2	3	4
4.07	Rate your management information system on a scale of 0 to 4 (management decision support system integrating sales, production, finance, and administration)	0	1	2	3	4
4.08	Rate your MPC system on a scale of 1 to 4. (It receives grade 4 if the system is integrated with sales and supplies and develops the master production plan, scheduling of manufacturing activities and control of production operations, and issues reports to the entire company)	0	1	2	3	4
4.09	Evaluate on a scale of 1 to 4 the agility of the quotation and the negotiation period. (It has an efficient order budget system that speeds up its execution and practices negotiation quickly)	0	1	2	3	4
4.10	Does the company practice cooperative relationships with suppliers? (climate of partnership and mutual trust, suppliers, guarantee quality and on-time supply, and contracts are for long periods)	Not applicable	With none	With few (1 or 2)	With some (3 or more)	With the strategists
4.11	Does the company practice a Cooperative relationship with its main customers? (climate of partnership and mutual trust, customers help in the development of the product project, in the analysis and improvements of the production process, the company guarantees	Not applicable	With none	With few (1 or 2)	With some (3 or more)	With the strategists

BLOCK 4. QUESTIONS TO IDENTIFY ORGANIZATIONAL INNOVATION						
	the quality and supply on time and opens their cost and price formation spreadsheets, receiving, in consideration, fair prices and long-term supply contract)					
4.12	Has the company absorbed any kind of knowledge or technology from its relationship with customers and suppliers?	None		Some		Various
4.13	From its relationship with customers and suppliers, has the company established any partnership or participated in any cooperative project for product development, process improvement, or market search?	None		Some		Various
4.14	Has the company taken any action to reduce the cost of transporting raw materials or finished products?	None		Some		Various
4.15	Has the company taken any action to reduce the cost of raw materials or product inventories?	None		Some		Various
4.16	The company used government incentives (tax, credit, subsidized university assistance, or other)	Never		One time	Sometimes	Several times
4.17	Did the company use the support of entities such as SEBRAE, SENAI, SESI, universities, junior companies, employers' unions, or other services such as RETEC?	Never		One time	Sometimes	Several times