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**Article**

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Article

# Relationship between Organizational Climate and Innovation Capability in New Technology-Based Firms

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**Abstract:** Successfully developing a new product, service, or production process for commercial purposes involves complex and dynamic changes, and therefore requires an organizational climate that fosters innovation. In this sense, the means by which knowledge is created and exploited in the firm constitute its key competence and the source of its innovation capabilities. The research objective was to establish the relationship between organizational climate and innovation capability. The sample consisted of 102 Colombian new technology-based firms. Partial least squares structural equation modeling (PLS-SEM) and PLSpredict were used for the statistical analysis. The results indicate that the organizational climate positively and directly influences the innovation capability (organizational ambidexterity, exploration, and exploitation). The findings obtained will help firms, especially those that require a lot of knowledge and carry out their activities in dynamic environments, to understand how organizational climate influences innovation capability, which is understood through the dimensions of exploration, exploitation, and organizational ambidexterity. This will provide new technology-based firms with a higher capacity to adapt to the conditions of uncertainty and complexity of the environment.

**Keywords:** organizational climate; innovation capability; exploration; exploitation; organizational ambidexterity; PLS-SEM

## 1. Introduction

Successfully developing a new product, service, or production process for commercial purposes involves complex and dynamic changes, and therefore requires an organizational climate that fosters innovation [1]. The present study seeks to describe two conceptual frameworks and to apply them to the study of firms in the technology sector. As these are knowledge-intensive firms, we can assess how the organizational climate can foster the processes of exploration, exploitation, and organizational ambidexterity, which in turn influence the renewal of internal and external competencies for new technology-based firms (NTBFs) in uncertain and dynamic environments [2].

In this sense, all the elements involved in the creation and development of knowledge in the firm constitute its key competence and are the source of its innovation capabilities [3]. Taking the organizational climate as a determinant of innovation capability, we focused on statements of the firm's strategic management that describe the confluence of organizational climate and innovation capability. This begins with how an organization supports the creation, application, and transfer of knowledge, which leads to the development or improvement of a product, service, or production process for commercial purposes while allowing the firm to better adapt to its environment [4]. On the other hand, for an organization to innovate, it needs creative staff that support and develop these innovations.

Given this need, an organizational climate that positively influences creativity and innovation within firms is important. A favorable organizational climate also motivates workers, and achieves better results, both economic and non-economic (job satisfaction, commitment, among others) [5].

The current economic environment involves rapid technological advances and accumulation of knowledge and requires firms to adopt measures that allow for more fluidity. Thus, open innovation is seen as a convenient alternative that can accelerate the process of knowledge transfer and use of resources [6]. Open innovation is an approach that has received growing interest from researchers in the organizational field. Various studies indicate that the input and output components of open innovation are favored by a favorable innovation climate, which is closely linked to the organizational climate [7] and the organizational culture [8]. On the other hand, open innovation is more effective in technology firms, probably due to the demands they face when working with large amounts of knowledge [9]. However, open innovation is more easily adopted by large firms, as there are barriers that hinder its implementation in small and medium-sized enterprises (SMEs) [10].

SMEs play an important role in a country's economies, especially in the Latin American context. Within SMEs, there is a group of enterprises influenced by technology and that seek to develop innovations; these are known as new technology-based firms (NTBFs). These firms generate innovative products and services through the systematic application of technological and scientific knowledge. In addition, this group of firms is of interest to inherently having innovative and technological attributes in their practice. What differentiates these firms is the innovation capacity they have to manage the technology they have, therefore the emphasis here is on exploring this construct in these firms [11].

Based on the preceding, the research objective was to establish the relationship between organizational climate and innovation capability. The proposed objective seeks to answer the research question: what is the influence of organizational climate on innovation capability in Colombian NTBFs?

To achieve the study objective, a multivariate technique was used because more than two variables were used (the elements of innovation capacity were considered as dependent variables). The method was variance-based structural equation modeling (SEM) or partial least squares (PLS-SEM). This method was preferred over its covariance-based counterpart SEM (CB-SEM), because it is mainly used to develop exploratory research theories or models and focuses on explaining the dependent variable. Furthermore, PLS-SEM works efficiently with small sample sizes and complex models where no assumptions are required regarding the distribution of the data [12].

The paper begins by theoretically developing the organizational climate and innovation capability constructs, and analyzing the relationship between these two concepts considering a firm's strategic management. We then provide an overview of the methodology used. Then, we describe the results of this empirical study given the proposed relationship between organizational climate and innovation capability (exploration, exploitation, and organizational ambidexterity). Finally, we present a synthesis of some theoretical and practical implications, together with some final considerations for study.

### 1.1. Organizational Climate

When firms have adequate resources, their organizational climate facilitates the development, adoption, and implementation of new products and processes [13]. An organizational climate is made up of subjective, individual, and social aspects, including the motivations, interpretations, and perceptions linked to the personal and contextual factors of each individual within a firm [14]. De Long and Fahey [15] suggest that in every firm, there are norms, practices, and values that explain why certain forms of knowledge are favored in certain situations since they govern individual perceptions and social interactions. Thus, they determine the way and quality of top-down and bottom-up relations, and patterns of behavior that affect individuals and their knowledge.

Therefore, firms should encourage individual behaviors and skills that promote actions or values that positively alter organizational climate [16]. This situation is facilitated by the attributes of the organizational climate, which implies the physical, emotional and mental involvement of individuals, so that information and knowledge are shared efficiently to promote debate about its implications at

different levels, including applicative, structural and governmental levels. This also seeks to promote the correct management of knowledge, for the improvement of capabilities and the promotion of innovation in the firm [17], encouraging individuals to act consistently in accordance with their objectives as well as those of firms [18].

However, any process aimed at developing an organizational climate is accompanied by experimentation and a degree of risk of failing to achieve the desired outcome, because the right conditions are not always present in a firm. Therefore, one must foresee aspects such as difficulty in assigning value to jobs with strong intellectual content, or the reluctance to abandon the widespread notion that knowledge-intensive assets must be internally produced to develop competitive advantages.

In this sense, organizational climate requires features that facilitate or promote the free flow of knowledge between members of a firm and for this knowledge to be efficiently used to improve processes that have a direct impact on the goods and services produced. In this regard, Nonaka argues that a commitment to knowledge acquisition originates in people and groups within-firm [19]. To achieve this, one must define an intention of global awareness, which allows individuals to judge the value of information and knowledge, both received and created, to use autonomy as a source of creativity and freedom to develop and absorb knowledge, and to allow the environment to fluctuate continuously to produce new interpretations of reality.

The purpose of the organizational climate is the creation of a regulatory framework that is conducive to the development of capabilities for the renewal of internal and external competencies in uncertain and dynamic environments. Therefore, the set of actions related to knowledge creation and transfer must aim at efficient development and renewal of the innovation capability of organizations to achieve and maintain an advantage over their competitors [20].

### 1.2. Innovation Capability

Innovation capability involves those skills that firms possess to create, transfer and manage the knowledge they possess, which is transformed into resources of diverse nature [21,22] through three essential activities, exploration, exploitation and organizational ambidexterity [23–26]. A successful innovation process is achieved with these three elements [27,28], which enable competitive policies to be established and that provide better organizational performance, all in a dynamic context and with a high degree of uncertainty [29–31].

Based on the contributions of March [32] and Levinthal and March [33], we propose that the processes of organizational learning be classified as a function of the elements of innovation capability. We suggest distinguishing between exploitation (which is responsible for innovating successfully from previous innovations, that is, the characteristics of a given innovation are perfected until all possibilities for improvement are exhausted or a radical innovation occurs in the field); exploration (responsible for the achievement of radical innovations that become dominant technical designs for a certain period); and development of both processes simultaneously. Joint exploration and exploitation processes underlie organizational ambidexterity, depending on the innovation's degree of novelty, the level of risk involved in making innovation and potential market applications and its immediacy [34].

For Levinthal and March [33], the processes of exploration and exploitation are essential for firms [35]; however, these processes compete for scarce resources. In this regard, some practices associated with knowledge exploration and exploitation may be mutually incompatible. In order to prevent conflict, it is necessary to find a compromised solution or to find a suitable combination of these processes, whereby it may even be possible to apply them simultaneously in different parts of the firm [36]. In consequence, managing to keep exploration and exploitation at a similar level is currently an essential requirement for firms to reach optimum performance levels [37–39].

In other words, exploration and exploitation, and their alignment as a result of organizational ambidexterity, are processes of exchange between environmental stimuli, knowledge within the organization and actions of those who comprise it, integrate every stage process of innovation and their achievement. This line of thought takes us to a new concept or perspective of innovation

capability, so that we can understand it as a skill that allows the creation, incorporation, communication and systematic use of knowledge to build and evaluate existing knowledge, which thus gives the organization and people that form it, the ability to act in changing environments [40,41].

### 1.3. Relationship between Organizational Climate and Innovation Capability

To better understand the relationship between organizational climate and innovation capability, it is convenient to analyze their confluence from the standpoint of strategic management [42], which includes models for making strategic decisions that affect firms. The relationship proposed is best understood from the perspective of strategic management, because it focuses on discerning the causes of existing differences in firm performance, and by doing so, it identifies factors and decisions that have a substantial influence on entrepreneurial competitiveness and creation of value [43].

Two main issues have been analyzed within these lines of thought. One approach has been to study the attributes of the sources or resources that provide a competitive capacity and allow a firm to obtain advantages over competitors [44,45]. On the other hand, to analyze the organizational processes and routines that lead to accrual and exploitation of relevant new resources and capabilities to face threats and take opportunities of dynamic environments [46]. From this standpoint, the firm is defined as an entity whose sustained success depends on the capability of expediently and efficiently renewing its knowledge base [47].

Spender proposes a dynamic corporate theory based on the way to create organizational knowledge among individuals integrating it, i.e., there are different kinds or types of knowledge in organization as a related expression among epistemological and ontological dimensions that will generate corporate financial earnings, to obtain a competitive advantage [48]. These different types of knowledge must be subject to analysis by firm directors for good governance and the subsequent management of the interactive process of exchange and implementation or creation of knowledge [49]. Knowledge creation practices have a direct impact on open innovation, incoming and outgoing innovation, linked to the transfer of knowledge [50].

From a different standpoint, Grant emphasizes differentiating significance generated in markets by knowledge, and diversity of degrees of relevance, different types of knowledge brought to action can come to have [51]. To bring this about, the firm must know how to develop its organizational skills, as an effective result of a strategic knowledge-based management, which will gradually become concrete, represented in a set of rules or guidelines, in organizational routines, in interactions or spirals, and in systems enabling commonality of organizational knowledge [49].

This pool of knowledge is the expression of capabilities derived from integration and coordination of personal expertise, surpassing individual level to encompass organizational scope, on which new knowledge will be gradually generated expressed in given essential competencies, like a combination of attitudes and values, intangible resources, explicit knowledge, skills founded on tacit knowledge, and on the talent of individuals and social groups, configuring, in summary, a set of distinctive necessary competences or features that structure those competencies [52].

Background research that has studied the relationship between these variables provides diverse results, although it is important to mention that they are conceptualized differently, as there is no previous study that establishes the direct relationship between the organizational climate and the innovation capability. In a study carried out in Malaysian manufacturing firms, they found that the perceived organization support does not mediate the relationship between knowledge management infrastructure and product innovation and process innovation, likewise, the correlation between organizational support and product innovation was 0.148 and with process innovation it was 0.128 [53]. In another study, conducted at technology companies in the vehicle sector in Sweden, they found that organizational capabilities have a positive impact on radical innovations (exploration) [54]. Similar results were found in Norwegian SMEs in service and manufacturing sectors [55].

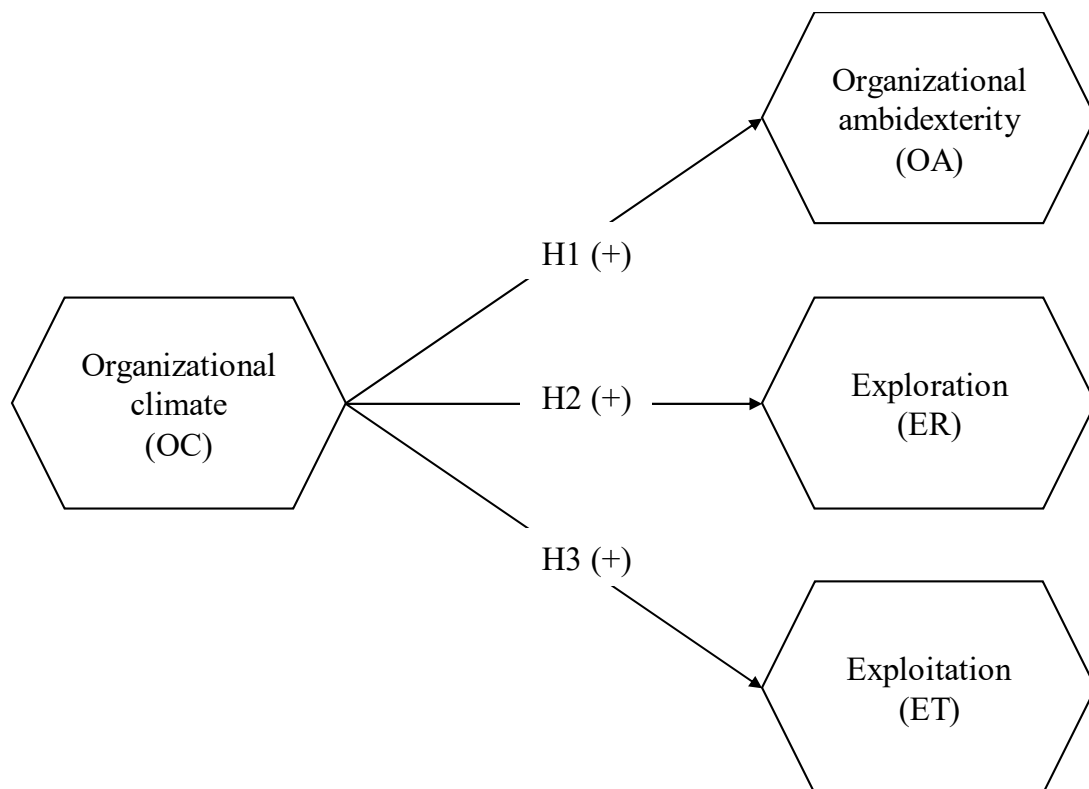
Despite multiple references in literature, there is no consensus as to specific attributes of strategic resources, or as to processes required for their efficient development [56,57]. This paper intends to

move ahead in a solution to these issues: more specifically, its analysis of the relationship between organizational climate and innovation capability, where the first favors creation and development of exploration and exploitation processes, and the combination thereof as a result of organizational ambidexterity. Everything here expressed to this point, leads us to present following hypotheses for empirical contrasting (Figure 1):

**Hypothesis 1 (H1).** *Organizational climate has a significant direct effect on organizational ambidexterity.*

**Hypothesis 2 (H2).** *Organizational climate has a significant direct effect on exploration.*

**Hypothesis 3 (H3).** *Organizational climate has a significant direct effect on exploitation.*



**Figure 1.** Research model and hypotheses. OC = Organizational climate; OA = Organizational ambidexterity; ER = Exploration; ET = Exploitation.

**2. Materials and Methods**

*2.1. Design*

An empirical study was developed to answer the research question. An associative strategy was used that explored the functional relationship between the organizational climate and innovation capability. The study was explanatory type, testing a structural model with a predictor and three objective elements of innovation capacity. The research design was of latent variables (LVD), which is made up of two sections, inner model (indicating how the constructs are related to each other) and outer model (indicating how the indicators are related to the structures they measure). The statistical analysis that allowed the development of this research design was the variance-based structural equation model (SEM) or partial least squares (PLS-SEM) [58].

### 2.2. Participants

Sampling was non-probabilistic of an intentional type [59]. On the other hand, the participation of NTBFs was strictly voluntary. To obtain the minimum sample size to be used in the study, an a priori power analysis was performed. This analysis allows us to determine what is the probability of not committing a type II error; that is, detecting an effect when it exists [60]. To execute this analysis, the G\*Power 3.1.9.7 [61] software was used. The following input parameters were established to obtain the minimum sample size to be used: significance level of 0.05 (one tailed), power of 0.95 (value above the recommended for social sciences), medium effect size ( $f^2$ ) of 0.15, and one predictor. From the results, the required sample size was 74 participants (Figure 2).

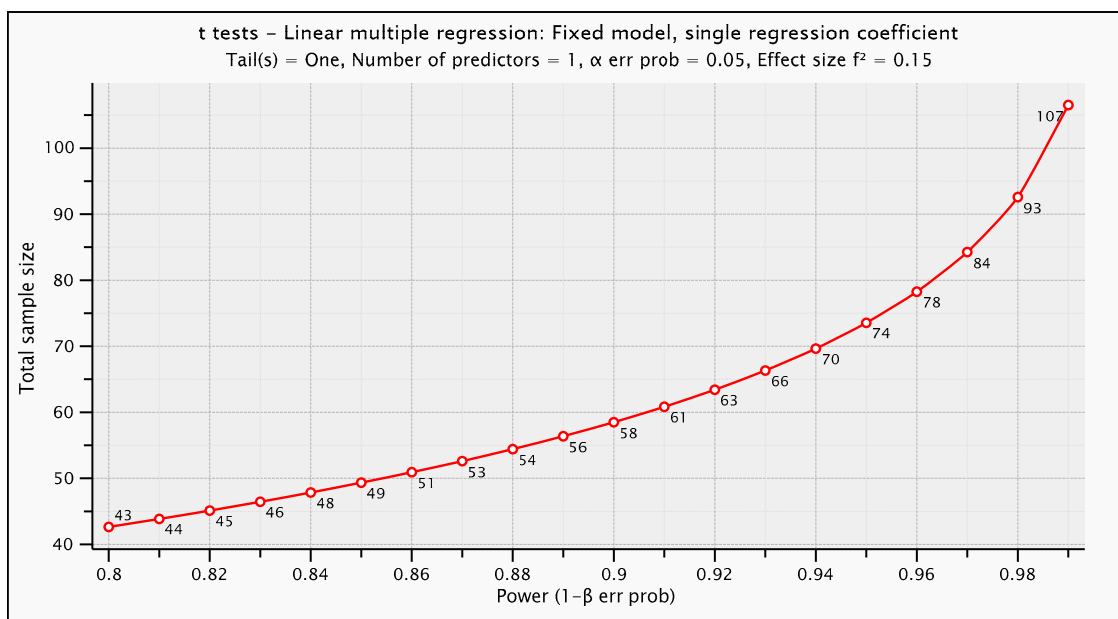


Figure 2. Results of a priori power analysis.

The sample was made up of 102 Colombian NTBFs that are part of the network of Incubators and Scientific and Technological Parks. These NTBFs belonged to the sectors linked to information and communications technology. NTBFs are micro-companies (with less than ten workers) or small (with less than 50 workers), whose purpose is to use technology to create innovative products, systems or processes, so they need their workers to have the best competences for managing this type of technological knowledge [11,62].

### 2.3. Instrument

The scale developed by Acosta-Prado, Romero, and Tafur-Mendoza was used, which has adequate psychometric properties and has been used in NTBFs [63,64]. The instrument contains 17 items related to the two constructs (organizational climate and innovation capability). The response options for the items were in five-point Likert format, with scores between 1 and 5 (never, little, sometimes, several times and very often). The scale has three sections. The first section explores the main characteristics of the firms. The second section deals with the measurement of the organizational climate with a total of 5 items (OC\_1 to OC\_5). Finally, the third part measures the innovation capability (organizational ambidexterity, exploration, and exploitation) through 12 items (ER\_1 to ET\_6).

### 2.4. Procedure

The instrument was applied by email to founding-promoters partners and executives of the NTBFs, with prior authorization of the executives of the following business centers: ParqueSoft

(Bogota, Cali, Medellin, Manizales, Pereira, and Quindio); TecnoParque (Bogota, Rionegro, Valledupar, Manizales, Pereira, and Cali); Prana Incubator of Creative Industries (Bogota); Colombian Association of Biotechnology, ASOBIOTEC (Bogota); and Colombian Association of Companies of the Electrical Sector and ICT, ASESEL (Bogota). Of the submitted forms, 102 firms managed to complete them, obtaining a response rate of 32%.

### 2.5. Data Analysis

The statistical analysis was divided into two parts. In the first, we sought to know the internal structure of each of the constructs studied. For this objective, an exploratory factor analysis (EFA) was used [65]. Before any EFA, it must be corroborated that the data are valid inputs, that is, that there is a minimum degree of correlation between the items. This was done through two measures of sample adequacy, the Kaiser–Meyer–Olkin Index (KMO) [66] and the Bartlett’s Sphericity Test [67]. For the extraction of the factors, the Unweighted Least Squares (ULS) were used due to their good performance with Likert-type scales.

A critical aspect in the EFA is the determination of the number of factors, therefore, various criteria were used to avoid underestimation or overestimation of factors. The classic Kaiser–Guttman rule or eigenvalues greater than 1, the Scree test [68], and a combination of these, the parallel analysis [69], were used. Oblimin oblique rotation was used when the construct presented more than one factor [70]. The analyses were performed with software R version 4.0.0 [71] through the base, pacman [72], and psych [73] packages.

The second part of the analysis consisted of testing the study model (Figure 1), for which the PLS-SEM was used, with the organizational climate being the exogenous construct and organizational ambidexterity, exploration and exploitation, the endogenous constructs. All the indicators of the constructs were reflective, that is, the items were assumed to be reflex or generated by underlying or latent variables [12]. The choice of this analysis methodology is justified in that it is robust in small samples, as is the case in this study, it is also appropriate to test predictive models, since it seeks to maximize the explained variance of the target variable [74]. In explanatory or predictive studies that seek to test a model, PLS-SEM is becoming a standard in different fields of research [75]. To use this multivariate technique, we worked with the SmartPLS 3.2.9 software [76].

The results of the PLS-SEM were evaluated for both parts of the model, structural and measurement [12]. In the measurement model, the reliability of the scores was estimated through the rho\_A and the composite reliability (CR) coefficients, for the convergent validity, the outer loadings were used at the item level and the average variance extracted (AVE) at the level of constructs, finally, the discriminant validity was evaluated using the Fornell and Larcker criterion, however, as it is a technique with certain deficiencies, it was complemented with the heterotrait-monotrait ratio (HTMT). For the structural model,  $R^2$  (explained variance),  $f^2$  (effect size),  $Q^2_{predict}$  (predictive performance), and the magnitude and statistical significance of the path coefficients were taken as evaluation indices.

## 3. Results

### 3.1. Exploratory Factor Analysis (EFA)

The first EFA was conducted for the organizational climate, where the KMO (0.850) and the Bartlett’s Sphericity Test ( $\chi^2(10) = 278.13, p = 0.001$ ) were adequate. From these results, the factors were extracted, where the three criteria used to determine the appropriate number of factors indicated that one factor was the recommended one. This unique factor explained the 62% variability in the items, whose factor loadings fluctuated between 0.660 and 0.840.

Regarding innovation capability, the Kaiser–Guttman rule suggests two factors; the Scree test indicates extracting one factor; and Horn’s parallel analysis suggests extracting three factors. A first EFA consisting of three factors was performed, however, two items were removed from the analysis, ET\_3 and ET\_2, the first for having a factor loading below the 0.40 and the second for having a similar



factor loading on two factors. With the remaining items, a second EFA was performed, in this analysis, adequate values were also obtained for the KMO (0.86) and Bartlett’s Sphericity Test ( $\chi^2(45) = 666.08$ ,  $p = 0.000$ ), proceeding to carry out the extraction of three factors. The first factor corresponded to organizational ambidexterity (34% of explained variance). The second factor was exploitation (19% of the explained variance). The third factor characterized the exploration (17% of explained variance). Overall, the factorial solution explained 70% of the variability of the items, with factorial loadings ranging from 0.50 to 0.94. The correlation between the factors was high, between the organizational ambidexterity with exploitation and exploitation was 0.59, and between these last two it was 0.47.

3.2. *Partial Least Squares Structural Equation Modeling (PLS-SEM)*

3.2.1. Measurement Model Evaluation

The reliability of the items was estimated using the internal consistency method, which seeks to establish to what degree a set of items are related to each other. Two coefficients were used for this purpose, rho\_A [77] and composite reliability (CR) [78], values above 0.800 being considered appropriate [79]. The results indicate that all the constructs exceeded the assumed criterion, being in a range of 0.853 and 0.911, so it can be affirmed that these possess adequate levels of reliability in the studied sample (Table 1).

**Table 1.** Quantitative statistical description for the constructs.

Variable	Outer Loadings	Outer Weights	rho_A	CR	AVE
Organizational climate (OC)			0.907	0.918	0.692
OC_1	0.848	0.277			
OC_2	0.866	0.264			
OC_3	0.855	0.270			
OC_4	0.860	0.219			
OC_5	0.719	0.162			
Organizational ambidexterity (OA)			0.911	0.924	0.669
ER_1	0.855	0.229			
ER_2	0.733	0.178			
ER_3	0.812	0.183			
ER_6	0.827	0.169			
ET_1	0.830	0.220			
ET_6	0.846	0.240			
Exploration (ER)			0.888	0.938	0.884
ER_4	0.929	0.486			
ER_5	0.951	0.577			
Exploitation (ET)			0.853	0.929	0.867
ET_4	0.938	0.563			
ET_5	0.924	0.510			

Note: rho\_A = coefficient rho\_A; CR = composite reliability; AVE = average variance extracted.

Convergent validity indicates how closely a construct is found to other alternative measures of the same construct. This procedure is a source of validity evidence, based on the relationship with other variables and was performed both at the item level and at the latent variable level. The convergent validity of the constructs was evaluated from the AVE, accepting as appropriate values those that are above 0.500 [80]. On the other hand, for the evaluation of the indicators, the outer loadings were used, taking a criterion of 0.708 to consider them acceptable [12]. From what is shown in Table 1, it is concluded that the indicators and the constructs have convergent validity [81].

The objective of discriminant validity is to establish to what degree a construct is different from others. The criterion usually used for this source of validity evidence is that of Fornell and Larcker [80], which consists of comparing the correlations between the constructs and the square root of the AVE,

where the latter must be greater than the earliest. However, this criterion has some limitations that are overcome by the HTMT ratio [77], whose procedure is based on the correlations between the indicators of the constructs and where values below 0.850 are expected, and that the confidence interval does not contain the 1. Table 2 presents the results of both procedures, managing to affirm that both constructs have convergent validity.

**Table 2.** Assessment of discriminant validity using the Fornell and Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT).

Construct	OC	OA	ER	ET
Organizational climate (OC)	0.832	0.632 (0.441; 0.775)	0.545 (0.322; 0.721)	0.615 (0.445; 0.823)
Organizational ambidexterity (OA)	0.589	0.818	0.716 (0.525; 0.849)	0.699 (0.540; 0.802)
Exploration (ER)	0.487	0.635	0.940	0.580 (0.435; 0.718)
Exploitation (ET)	0.553	0.620	0.509	0.931

Note: On the diagonal, the square root of AVE; below the diagonal, the correlations between latent variables; above the diagonal, HTMT ratio; numbers in brackets indicate the 95% bias-corrected and accelerated confidence intervals from bootstrapping (10,000 samples).

### 3.2.2. Assessment of the Structural Model

To estimate the statistical significance of the path coefficients, the bootstrapping procedure with 10,000 samples without sign changes was used. The results obtained from this procedure indicate that the three hypotheses tested were accepted, that is, all the path coefficients were statistically significant (Table 3). Detailing the results, organizational climate has a significant impact on organizational ambidexterity (0.589,  $p = 0.000$ ), exploration (0.487,  $p = 0.000$ ) and exploitation (0.553,  $p = 0.000$ ). Regarding effect sizes ( $f^2$ ), H1, H2 and H3 had a strong effect,  $f^2 > 0.350$  [82].

**Table 3.** Evaluating the research hypotheses and structural model.

Hypothesis	Path Coefficient	t-Statistic	p-Value	95% CI BCa	$f^2$	$R^2$	$Q^2_{predict}$
H1 (OC → OA)	0.589	7.991	0.000	(0.428; 0.705)	0.530	0.347	0.380
H2 (OC → ER)	0.487	5.395	0.000	(0.287; 0.640)	0.311	0.237	0.197
H3 (OC → ET)	0.553	6.646	0.000	(0.355; 0.701)	0.440	0.305	0.284

Note: 95% CI BCa = 95% bias-corrected and accelerated confidence interval (two-tailed).

Additionally, the evaluation of the explained variance of the three endogenous variables was carried out using the  $R^2$  coefficient. In all three cases, organizational climate explained more than 30% of the variance of the three elements of innovation capability ( $R^2 > 0.300$ ) [83], with organizational ambidexterity being the one that explained the greatest variance (53%). From these results, the structural model shows an important predictive capacity (Table 3; Figure 3).

In addition to the PLS-SEM, the predictive capacity of the model was analyzed. This analysis was performed with the PLSpredict algorithm, which is part of the current version of SmartPLS. For the interpretation of the  $Q^2_{predict}$  values, the small, medium and large relevance levels were considered, starting from 0.01, 0.025 and 0.50, respectively [75]. In this study, the predictive relevance of exploration was small, while the predictive relevance for organizational ambidexterity and exploitation was medium (Table 3). By presenting the three constructs as relevant predictive relevance at a practical level, the organizational climate assumes an important role as an antecedent of the elements of innovation capability studied.

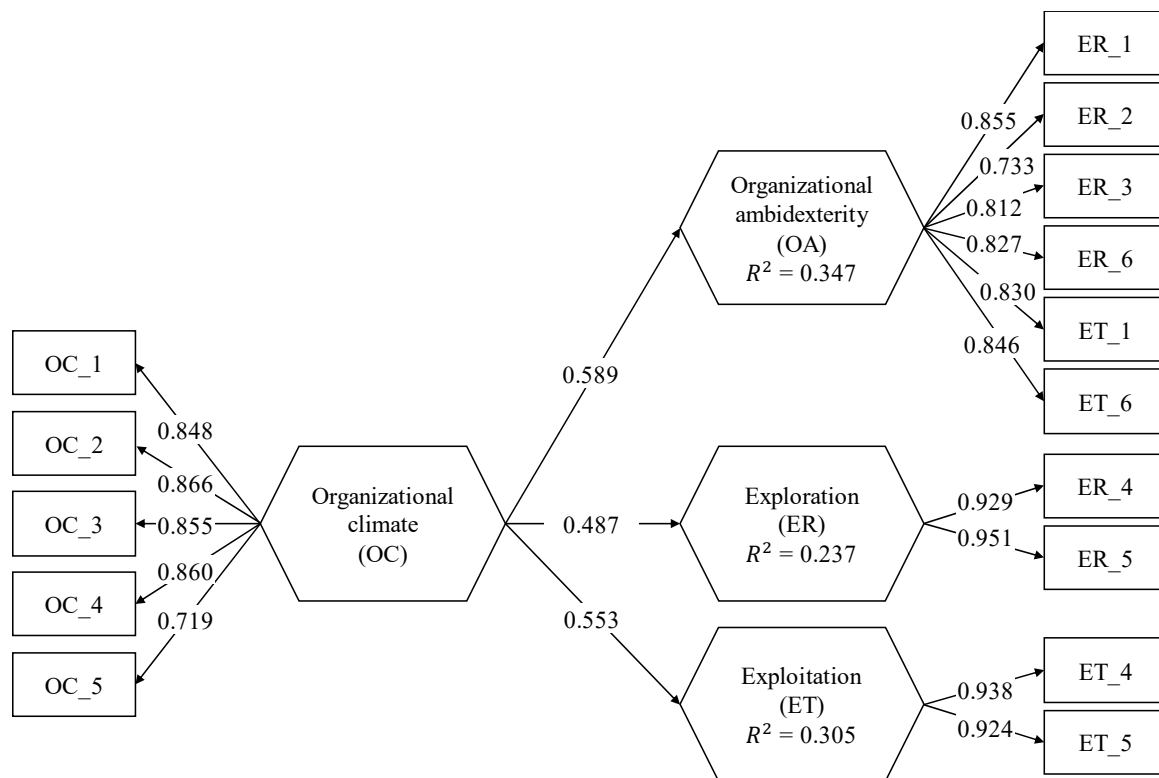


Figure 3. Results of the structural model.

#### 4. Discussion

The results of the study allow us to point out that organizational climate has a direct and positive effect on the capacity for innovation, through its processes of organizational ambidexterity, exploration, and exploitation ( $p = 0.000$ ). The three hypotheses proposed in this empirical study are contrasted. These findings allow the establishing of a relationship between the theoretical and practical postulates presented in the foundation of the study with the empirical knowledge generated, thereby achieving various new contributions in this field of knowledge. It should also be said that the results of the empirical research here presented attain the research’s objective, establishing a relationship between organizational climate and innovation capability in Colombian NTBFs. The relation proposed was envisaged from the standpoint of organizational ambidexterity, exploration, and exploitation processes. According to PLS-SEM results, processes involved favor the development of innovation capability that allows the creation and renewal of internal and external competences of NTBFs.

The relation proposed between organizational climate and innovation capability has made it possible to conduct a comprehensive revision of two theoretical frameworks of both academic and empirical studies that laid bases of this research work. Undoubtedly, these two constructs have been previously discussed; however, to overcome limitations and voids in the literature, this revision has been made to offering it as a source of discussion for its application to an empirical study conducted on NTBFs. It was thus deemed adequate to give a practical dimension to the implications of the research process.

One of the main findings is that processes of organizational learning (exploration, exploitation, and organizational ambidexterity) have a significant impact on NTBFs’ innovation capability to efficiently manage available and acquired knowledge of commercial and technological nature. All this knowledge contributes to the creation of a satisfactory organizational climate. The purpose of any technology firm is the constant updating and exchange of competences, internally and externally. In addition to the results obtained, a graphic representation is proposed of an analysis model in which a set of relations are established between organizational climate and innovation capability. The model

will make it possible to follow a line of action for future research projects in which we propose to include factors of the model to obtain superior entrepreneurial results. In this sense, it would now be the time to analyze the understanding and relation of constructs as critical components to measure enterprise results and be related to them.

The main implications of the study are theoretical and practical. From an academic standpoint, we established a relationship between two conceptual frameworks reflecting organizational climate and innovation capability, rarely studied in conjunction in the literature as an application in NTBFs. At a practical level, contributions are made based on the relation proposed and its graphic representation as a contrasted model that helps firms, especially knowledge-intensive ones that conduct their activities in dynamic environments, to understand how exploration, exploitation, and organizational ambidexterity processes can influence efficient management of available and acquired knowledge. This combination will allow an innovation capability that manages to reconfigure and improve the internal and external competencies that will provide NTBFs higher capacity to adapt to conditions of uncertainty and complexity of the environment.

The results obtained support what was found by other researchers in different contexts that involve the relationship between the organizational climate and the innovation capability. These studies correspond to the mediation of organizational capabilities and radical innovation [54], the organizational culture and the innovation capability [46], the organizational climate for innovation and organizational performance [5], the organizational climate and the innovation capability [55], innovation climate and open innovation [7], and organizational culture and open innovation [8].

In an open innovation framework, the results obtained help to understand the role that the organizational climate has in incoming open innovation [6], which implies sharing internal resources abroad, closely linked to the processes of organizational ambidexterity, which encompasses in a broad sense, the balance of innovation processes, in this case, between the internal and external exchange of resources. On the other hand, the analysis of the results would serve to propose actions and overcome the barriers that the implementation of open innovation in NTBFs supposes [10,84] according to the particular characteristics that they possess [85].

Among the methodological limitations presented by the study are the reduced sample size and the use of self-assessment instruments as indicators of the constructs. Regarding the first point, having a small sample prevents generalizing the results obtained, its value is found fundamentally in the description of the sample used and could be taken to technology firms with similar characteristics. However, the objective of this study was focused on Colombian NTBFs, obtaining a sample from different cities, reaching 32% of the population. Likewise, the statistical technique used (PLS-SEM) works robustly with small samples, minimizing the impact that this factor may have on the results obtained. For future studies, it would be recommended to expand the sample size to achieve a greater inference of the findings and to add contextual variables to the statistical model that were not taken in this study so as not to overload the model with the number of parameters to estimate.

Regarding the instrument used, although it has adequate psychometric properties and has been used in other studies [64], it is a self-report scale, therefore, the subjectivity of the person responding influences their responses, even if to a lesser degree. To avoid this, and especially to measure the variables of innovation capability (given that the organizational climate itself is made up of people's beliefs, perceptions, and feelings), it would be advisable to take concrete indicators of innovation, taken from audits or observation scales, which would be much more objective indicators and reflect the closest thing to what happens in the reality of these firms. It is important to note that how the organizational climate and the innovation capability are measured influences the interpretation of the results obtained [86].

It is also convenient to point out that innovation capability has been defined as a construct composed of three factors: exploration, exploitation, and organizational ambidexterity. These factors can be represented as a temporal loop from the acquisition of knowledge to its exploitation. A future line of research would be to study the innovation capacity development process from the temporal

viewpoint. For this, we propose to use cases of firms at different degrees of innovation development. This would give more consistency to the analysis of entrepreneurial outcomes of NTBFs.

The findings obtained suggest to the directors of the NTBFs to emphasize the proper management of organizational climate, to increase the innovation capacity and the innovative performance of their workers, which are the fundamental piece for the firms to achieve their strategic objectives. The examination of the elements that make up the organizational climate will allow the establishment of improvement plans within the firms and the implementation of constant monitoring and evaluation policies on how organizational culture influences the workers. The current dynamics in firms force them to fundamentally develop an organizational ambidexterity, which is more influenced by the organizational climate, therefore, it is a factor that managers can develop and improve to increase innovative performance.

## 5. Conclusions

The objective of the study was to examine the relationship between the organizational climate and the innovation capability in NTBFs. Through the PLS-SEM methodology, it was found that the organizational climate has a positive effect on the processes of organizational ambidexterity, exploration, and exploitation of innovation capability. Therefore, the three hypotheses proposed were tested. These results refer to how the proper management of working conditions within firms favor innovation, enhancing the capacity of its workers for adequate knowledge management that the firm has and promoting the incorporation of new knowledge in the open innovation framework.

The innovation capability of firms has become a tool that not only focuses on their resources but also seeks external knowledge that can be incorporated into their internal processes. This poses a challenge to NTBFs, given that the inherent technology they possess changes in an accelerated manner, therefore, the exchange of knowledge between firms is high and constant. Capturing as much information and managing it appropriately to create innovative processes or products is the premise that firms must follow. To achieve this, they must focus on the behavior and skills of individuals, since the achievement of the stated objectives will depend on them. A suitable organizational climate has repercussions on workers and makes it possible to enhance their performance with benefits for both themselves and firms.

Among the implications for management based on the results obtained, a series of measures stand out that can be adopted to improve the organizational climate, which corresponds mainly to the area of human resources. Starting from a baseline as a situational diagnosis of the NTBFs. Programs can be implemented to improve the conditions of work of the individuals, promote integration between functional areas, create a climate of trust between the organizational members and their managers, promote positive competition, and labor productivity with a stronger market orientation, and higher capacity to adapt to conditions of uncertainty and complexity of the environment.

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