

## Research report

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# Climate for Innovation in Work Teams Scale for the Brazilian context

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## Abstract

This study aims to adapt and validate the Climate for Innovation Scale in work teams proposed by Scott and Bruce (1994) to the Brazilian context. Through exploratory factor analysis, we examined a sample of 592 employees from 140 work teams across different Brazilian states and the Federal District. Results revealed three distinct factors in the scale's structure: innovation support, innovation inhibitors, and resource supply. Although good fit and reliability indices were observed, it is important to note that the predominance of public servants in the sample may limit the generalizability of the findings to other organizational contexts. However, the findings suggest that the adapted scale could be a valid and reliable tool to assess innovation climate in work teams in the Brazilian context.

**Keywords:** organizational climate; organizational innovation; psychometrics; exploratory factor analysis

## Escala de Clima para Inovação em Equipes de Trabalho para o contexto brasileiro

### Resumo

Este estudo tem como objetivo adaptar e validar a Escala de Clima para Inovação em equipes de trabalho proposta por Scott e Bruce (1994) ao contexto brasileiro. Por meio da análise fatorial exploratória, examinamos uma amostra composta por 592 servidores de 140 equipes de diferentes estados brasileiros e do Distrito Federal. Os resultados revelaram três fatores distintos na estrutura da escala: suporte à inovação, inibidores da inovação e recursos disponíveis. Embora tenhamos observado bons índices de ajuste e confiabilidade, é importante ressaltar que a predominância de servidores públicos na amostra pode limitar a generalização dos achados para outros contextos organizacionais. No entanto, os achados sugerem que a escala adaptada pode ser uma ferramenta válida e confiável para avaliar o clima de inovação em equipes de trabalho no contexto brasileiro.

**Palavras-chave:** clima organizacional; inovação organizacional; psicometria; análise fatorial exploratória

## Escala de Clima para Innovación en Equipos de Trabajo para el contexto brasileño

### Resumen

Este estudio tiene como objetivo adaptar y validar la Escala de Clima para la Innovación en equipos de trabajo propuesta por Scott y Bruce (1994) al contexto brasileño. Mediante análisis factorial exploratorio, examinamos una muestra compuesta por 592 servidores de 140 equipos de diferentes estados brasileños y del Distrito Federal. Los resultados revelaron tres factores distintos en la estructura de la escala: apoyo a la innovación, inhibidores de la innovación y recursos disponibles. Aunque observamos buenas tasas de ajuste y confiabilidad, es importante resaltar que la prevalencia de empleados públicos en la muestra puede limitar la generalización de los hallazgos a otros contextos organizacionales. Sin embargo, los hallazgos sugieren que la escala adaptada puede ser una herramienta válida y confiable para evaluar el clima de innovación en equipos de trabajo en el contexto brasileño.

**Palabras clave:** clima organizacional; innovación organizacional; psicometria; análisis factorial exploratorio

## Introduction

The organizations are developing and operating in competitive and dynamic environments, research is increasingly interested in understanding individuals' orientation to innovation behaviors and how they are generated (Schuh et al., 2018). And some aspects support these innovations in organizations, such as the organizational culture and climate, management capacity and skills, control, and organizational structure, in addition to the development of new products and implementation of new processes (Afsar & Umrani, 2019; Botelho, 2020; Shanker et al., 2017). Work teams also have a considerable degree of importance in the innovative process as their growth, effort, loyalty, encourage creativity and, for that, a team climate is needed that enables productive performance (Can, 2019; Xu et al., 2019).

Work teams provide security to individuals, so that they share new ideas, as innovations come from the interaction of people in organizations (Shanker et al., 2017). Employees are more likely to get involved and develop ideas in environments that allow them freedom, autonomy, and support, which is possible by sharing their perceptions with the work group (Luu, 2019). The way to find success in organizational innovation can be by promoting an internal climate of innovation support, in teams and in the organization, motivated by management (Lyubovnikova et al., 2018; Mete, 2017; Schultz et al., 2017). The climate for Innovation in work teams stimulates the innovation capacity of its members and acts as a potentiator of organizational innovations (Mete, 2017; Shanker et al., 2017; Waheed et al., 2019). Therefore, the present study aims to adapt and verify the evidence of the validity of the internal structure of a scale that assesses the climate for innovation in work teams in the Brazilian context.

### *Theoretical background*

The organizational climate concerns collective perceptions of work experiences. Thus, organizational climate is a set of shared perceptions about the identification of policies, practices, events, and formal procedures of the organization (James & Jones, 1974; Martins et al., 2004; Shneider, 2000). Climate perceptions show behavioral points of organizational culture (Schein, 2010). In a recent literature review, Newman et al., (2020), point out that there are several definitions of the climate for innovation. However, the authors explain that the researchers are exploring the same phenomenon, employee perceptions of the degree to which the team or organizational environment is conducive to innovation and employee innovative behavior, differing only in focus, that is, in at which level the phenomenon is being analyzed. The review authors point out that several other climates are linked to innovation studies, namely: climate for initiative (Baer & Frese, 2003), proactive climate (Fay et al., 2004) and climate for implementing ideas (Klein & Sorra, 1996).

The creative climate is another construct that has a similarity to the concept of climate for innovation. It is mainly related to the individual processes of generating new ideas and solutions to problems and involves an environment conducive to sharing information and a focus on personal and professional development to a supportive climate to create ideas that will bring relevant gains (Isaksen & Akkermans, 2011; Tidd & Bessant, 2009; Newman et al., 2019). Amabile et al. (1996)

differentiate creativity from innovation by application, that is, while creativity is linked to the intellectual part in the creation of ideas, innovation focuses on the successful implementation of these ideas. Working groups and their leaders influence the perception of climate (Luu, 2019). Perceptions emerge from the interactions of individuals in a group, and when a workgroup supports the individual in a way that allows innovations to emerging, contributes and supports them. The individual is inclined to understand the organization as open to innovation (Afsar & Umrani, 2019; He et al., 2019; Scott & Bruce, 1994).

The climate for innovation emerges when individuals in the organization are oriented toward innovation practices (Hsu & Chen, 2017). The climate has a positive effect on organizational creativity and innovations. Managers need to ensure an encouraging place, with the ability to bring out and enhance individual creativity – a place where individuals willing to innovative practice perceive organizational support (Amabile et al., 1996; DiLiello & Houghton, 2006; Shanker, 2017). Organizations capable of developing a climate perceived as positive and creative by individuals are more likely to find high levels of motivation, commitment, and engagement in innovation processes (Shanker, 2017; Cangialosi et al., 2020; Li et al., 2020).

An organizational – or team – climate conducive for innovation results from organizational policies that lead employees to develop their potential more comprehensively and freely (Waheed et al., 2019). The innovative climate internally promotes thinking of freedom for employees, providing and stimulating the acceptance of challenges, providing appropriate technologies, and encouraging creative work approaches that influence performance, in addition to building a basis for decision making (Waheed et al., 2019; Sarros et al., 2008; Jaiswal, 2015).

The climate can be stimulated through elements that bring support to employees. Identification with the organization, involving affective evaluations such as feeling represented in it, generates compatible ideas and perceptions, such as: work being challenging; autonomy related to the tasks performed, in addition to the support and quality of leadership (Naranjo-Valencia et al., 2017; Theurer et al., 2018). Leadership plays a key role in facilitating processes, support, and trust to achieve organizational goals (Karatepe et al., 2020; Park & Jo, 2018).

The effects of climate can influence the organization in different ways and at different levels. In addition

to considering the interactions of individuals, it is necessary to identify factors that integrate these perceptions of the innovative climate in work teams. One of these factors is resources, which can be classified as tangible and intangible. Tangible resources are people, technologies, products, tools, financial resources, and work instruments. Intangible resources are those that involve the knowledge of individuals, the image of the organization and the time available (Carvalho et al., 2010; Ekvall et al., 1996). These factors are necessary for an adequate perception of the climate for innovation and, also, as monitors of innovation inhibitors. An organization that fails to innovate may be at risk and thus potentially decrease its ability to sustain itself and gain a competitive advantage (Hunsaker, 2020; Karatepe et al., 2020; Uddin et al., 2019).

Resources reflect opportunities at the strategic level of the organization, from the involvement of managerial skills, the development of internal processes, training, and knowledge sharing (Karatepe et al., 2020; Schuh et al., 2018). Enabling environments should include a greater willingness to share information, just as greater awareness of collaborating effectively (Eldor, 2017). Technological capability is seen as one of the resources needed to innovate and promote change, as well as to involve skills, knowledge, experience, and appropriate organizational structures (Uddin et al., 2019).

The literature presents several measures of Climate for Innovation, such as the Organizational Innovative Climate measure by Liu and Shi (2009), Situational Outlook Questionnaire by Ekvall (1999), and Team Climate Inventory by Anderson and West (1998), which aim to measure elements that describe creativity and climate for innovation in organizations. Liu & Shi's (2009) measure aims to assess five dimensions of innovation climate, but with a focus on the organization, emphasizing vision, leadership, autonomy, risk support, and collaboration. The items seek to portray the organization's innovation climate. The SOQ by Ekvall (1999) focuses on measuring employees' expectations regarding the innovation climate, namely, perceptions of opportunities for innovation, support, and leadership support, with the measure seeking to generate individual and team profiles, identifying strengths and weaknesses in the innovation climate. Anderson & West's (1998) scale focuses on team climate in terms of cohesion, conflict, leadership, and team structure.

While the other mentioned scales are not necessarily inadequate, the preference for Scott and Bruce's

scale for this study is justified for several reasons. Firstly, the widespread international acceptance of Scott and Bruce's scale suggests its credibility and validity, being recognized as a reliable tool for assessing the innovation climate in work teams. Additionally, its position as one of the first scales developed for this purpose makes it an established and reliable choice in research. The specificity of Scott and Bruce's scale in assessing elements, perceptions of available resources, and support related to the innovation climate in work teams. Furthermore, the ease of application and interpretation of the scale can be a practical advantage, especially considering the possibility of dealing with a large sample or limited time and personnel resources.

The Climate for Innovation measure, developed by Scott and Bruce (1994), is composed of 22 items, based on the innovation support scale developed by Siegel and Kaemmerer (1978). The scale is composed of two dimensions, namely: support for innovation and resource supply. The innovation support dimension seeks to understand the degree to which individuals perceive the work team as open to change, in an environment where there is support for new ideas and where employees tolerate organizational diversity. The resource supply factor assesses the degree to which personnel, financial and time resources are adequately offered in the organization for innovation to take place. Thus, the authors suggested a measure to assess when a working group, for example, supports individuals so that they can develop innovations by contributing and providing support. Through the scale, it is possible to identify whether the individual is more likely to see the workgroup as a supporter of innovation.

This article aims to adapt to the Brazilian context and identify evidence of validity of the climate perception instrument for innovation in work teams originally proposed by Scott and Bruce (1994), through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The more evidence the instrument provides, the greater the possibility of increasing the reliability of the measure (Borsa et al., 2012).

## Method

### *Participants*

The study sample is composed of 592 employees, totaling 140 work teams distributed in all regions of Brazil, as follows: 45% are from the Southeast, 17% from the Northeast, 15% from the South, 15% from the Midwest, and 5% from the North. Among the

respondents, 66% of the sample is male, 35% have completed higher education, followed by 24% with completed high school and 21% with some postgraduate degree. The average age of respondents is 43 years (SD: 8.17), with cases ranging between 20 and 70 years of age. Regarding the length of service, the average is 18 years (SD: 8.17), with a variation between 2 and 48 years of service for the organization. The target population of this research is made up of employees from different areas (e.g., administrative, customer service, etc.). Among the male respondents, 25% hold a leadership position in one of the areas, and among women, only 17% hold a leadership position.

The sample consisted of employees of a public company in Brazil, which is present in all states and in the Federal District. To participate in the research, some criteria were determined: the employee needed to work at the company for more than six months, be a member of work teams, have an employment relationship with the organization, and have immediate leadership. Additionally, the team of which the individual was part should be composed of at least three participants. The criterion of individuals having more than six months of tenure in the organization was to avoid short-term bias, reducing the impact of temporary or circumstantial events that may influence perceptions of the climate for innovation.

### *Measure*

The original Climate for Innovation Scale, created by Scott and Bruce (1994), consists of 22 items aimed at assessing individuals' perceptions of an innovative work environment. The scale is designed to investigate how open work teams are to change and new ideas. It has two factors: **Support for Innovation** ( $\alpha = 0.92$ ), which measures the extent to which individuals perceive work teams as open to change and capable of supporting and tolerating new ideas and employee diversity, and **Resource Supply** ( $\alpha = 0.77$ ), which assesses how adequately resources (such as personnel, funding, or time) are perceived by team members.

In order to adapt this instrument for the Brazilian context, we followed a rigorous translation-back-translation process, a widely recognized method for cross-cultural adaptation of research instruments. Initially, two bilingual translators independently translated the 22 original items from English into Portuguese. The translations were then compared and synthesized into a single version by the researchers. Following this, two additional bilingual translators, who had no

prior knowledge of the original scale, conducted back-translations into English. Discrepancies between the original and back-translated versions were discussed and resolved by the research team, ensuring that the final Portuguese version maintained conceptual equivalence with the original.

Next, we sought to establish the content validity of the adapted instrument. A panel of seven expert researchers in organizational behavior and psychometrics was convened to evaluate the relevance, clarity, and cultural adequacy of the translated items. These experts were chosen based on their extensive experience in both innovation research and instrument adaptation. Using the content validity index (CVI), we found a CVI of 0.94, indicating a high level of agreement among the experts regarding the relevance and clarity of the items (Alexandre & Colucci, 2011). This high CVI suggests that the adapted items were well-aligned with the constructs of the original scale while also being clear and coherent for use in the Brazilian context.

During the validation process, some items required adjustments based on the experts' feedback. Specifically, certain terms were revised to enhance clarity and better reflect the cultural context. However, no significant conceptual changes were needed. Thus, with these adaptations and validations completed, we proceeded with the collection and analysis of data for this research. Table 1 presents both the original items and their adaptations for the Brazilian context.

### *Procedures (Ethical and Data Analysis)*

The instrument was applied through the Lime Survey platform. The link was made available internally by email with the support of employees from the company's research area, during the 20-day period between February and March 2020. In order not to identify the individuals, work teams were selected, in which the units had 10 or more employees, which generated a total of 153 teams, with 765 individuals. At the end of the collection, 592 complete responses to the questionnaire were obtained, referring to 140 work teams. The data collection was conducted at the individual level, where participants assessed their respective work teams. For participation in the research, participants received the Informed Consent Form (TCLE in Portuguese), detailing the voluntary nature of their participation, with assurances of anonymity and confidentiality of information, thus adhering to the ethical principles governing research involving human subjects. Upon acceptance of the form, the research proceeded.



Table 1.

*The original items and the items adapted for the Brazilian context*

| N  | Original                                                                                               | Items adapted to brazilian context                                                                                        |
|----|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 1  | Creativity is encouraged here                                                                          | A criatividade é encorajada aqui                                                                                          |
| 2  | Our ability to function creatively is respected by the leadership                                      | A nossa capacidade para trabalhar de forma criativa é respeitada pela liderança.                                          |
| 3  | Around here, people are allowed to try to solve the same problems in different ways                    | Nesta equipe é permitido que as pessoas tentem resolver os mesmos problemas de maneiras diferentes.                       |
| 4  | The main function of members in this organization is to follow orders which come down through channels | A principal função dos membros desta equipe é seguir ordens, dos gestores, que chegam por meio dos canais de comunicação. |
| 5  | Around here, a person can get in a lot of trouble by being different                                   | Nesta equipe, um membro pode ter muitos problemas por agir de forma diferente.                                            |
| 6  | This organization can be described as flexible and continually adapting to change                      | Esta equipe pode ser descrita como flexível e continuamente adaptável às mudanças.                                        |
| 7  | A person can't do things that are too different around here without provoking anger                    | Um membro não pode fazer, nesta equipe, coisas muito diferentes sem provocar raiva.                                       |
| 8  | The best way to get along in this organization is to think the way the rest of the group               | O melhor meio de se entrosar nesta equipe é pensando do jeito que o resto do grupo pensa.                                 |
| 9  | People around here are expected to deal with problems in the same way                                  | Espera-se dos empregados que lidem com problemas do mesmo jeito.                                                          |
| 10 | This organization is open and responsive to change                                                     | Esta equipe é aberta e receptiva às mudanças.                                                                             |
| 11 | The people in charge around here usually get credit for others' ideas                                  | As pessoas que lideram esta equipe, normalmente, têm o crédito pelas ideias de outras pessoas.                            |
| 12 | In this organization, we tend to stick to tried and true ways                                          | Nesta equipe tendemos a seguir caminhos testados.                                                                         |
| 13 | This place seems to be more concerned with the status quo than with change                             | Esta equipe parece estar mais preocupada em manter o status quo do que com a mudança.                                     |
| 14 | Assistance in developing new ideas is readily available                                                | Há apoio nesta equipe para o desenvolvimento de novas ideias                                                              |
| 15 | There are adequate resources devoted to innovation in this organization                                | Existem recursos adequados dedicados à inovação nesta equipe.                                                             |
| 16 | There is adequate time available to pursue creative ideas here                                         | Há tempo suficiente disponível para trabalhar em ideias inovadoras nesta equipe.                                          |
| 17 | Lack of funding to investigate creative ideas is a problem in this organization                        | A falta de investimento para examinar ideias criativas é um problema nesta equipe                                         |
| 18 | Personnel shortages inhibit innovation in this organization                                            | A escassez de pessoal inibe a inovação nesta equipe.                                                                      |
| 19 | This organization gives me free time to pursue creative ideas during the workday                       | Esta equipe me disponibiliza tempo livre para buscar ideias criativas durante o dia de trabalho.                          |
| 20 | The reward system here encourages innovation                                                           | O sistema de recompensa incentiva a inovação.                                                                             |
| 21 | This organization publicly recognizes those who are innovative                                         | Esta equipe reconhece publicamente aqueles que são inovadores.                                                            |
| 22 | The reward system here benefits mainly those who don't rock to boat                                    | O sistema de recompensa beneficia majoritariamente aqueles que não "inventam moda".                                       |

Throughout all phases of the research, participants were informed of the voluntary nature of their participation, with assurances of anonymity and confidentiality of information, thus upholding ethical principles governing research involving human subjects. For this study, we conducted an exploratory factor analysis using JASP - Jeffrey's Amazing Statistics Program (version 0.18.3) software, known for its robust statistical analysis techniques (JASP Team, 2021).

To investigate the underlying structure of the data, an exploratory factor analysis was conducted. The decision on the number of factors to be extracted was based on parallel analysis, a method recommended for determining the number of significant factors to be retained (Hayton et al., 2004). The Promax oblique rotation was chosen due to the potential for correlations between factors (Costello & Osborne, 2005). Factor loadings were examined with a cutoff criterion of 0.40, as suggested by Hair et al. (2009), to include only items that showed a significant association with the factors. This criterion was adopted to ensure that only the most substantial factor loadings were considered in interpreting the results.

For the analysis of model fit indices, the following indices were examined: CFI (Comparative Fit Index), RMSEA (Root Mean Square Error of Approximation), NFI (Normed Fit Index), and GFI (Goodness-of-fit Index), as discussed in the specialized literature (Bentler, 1990; Boomsma, 2000; Byrne, 2001; MacCallum et al., 1992; McDonald & Ho, 2002; Ullman, 2001). The criteria adopted as satisfactory adjustments for the tested models were indices greater than 0.90 for CFI, GFI, and NFI, and values close to or less than 0.08 for RMSEA, as recommended by Hu and Bentler (1999) and Schermelleh-Engel, Moosbrugger, and Müller (2003).

The reliability of the constructs was assessed through Cronbach's alpha coefficient and McDonald's omega coefficient, with values above 0.70 considered satisfactory (Nunnally, 1978; Hair et al., 2010). In addition to Cronbach's alpha, we calculated the average variance extracted (AVE) and the composite reliability coefficients (CR) of the factors. These metrics are instrumental in assessing the structural model quality of a psychometric instrument (Valentini & Damasio, 2016; Hair et al., 2009). Literature posits that an appropriate AVE value should equal or exceed 0.50, with CR ideally reaching 0.70 (Fornell & Larcker, 1981; Hair et al., 2010).

In order to assess the internal validity of the scale, no missing data cases were found, as data collection was

mandatory for all items. The sample size remained at 592 subjects, resulting in a ratio of 26.9 subjects per item. This ratio exceeds the recommended guideline of at least 10 respondents per item, as suggested by Pasquali (2012). Thus, following these procedures, data analysis proceeded.

## Results

### *Exploratory Factor Analysis (EFA) of the Climate for Innovation in Work Teams Scale*

The exploratory factor analysis was conducted to investigate the underlying structure of the original scale developed by Scott and Bruce (1994). The results revealed that the factorial structure of the scale fits reasonably well with the proposed original factors, although indicating the presence of an additional grouping of items perceived by respondents. However, items 17 and 18 were suggested to be excluded from the analysis due to factor loadings below the established threshold, suggesting a weak relationship with the underlying constructs. This exclusion was made to ensure the consistency and interpretability of the analysis results. The factor loadings of the remaining 20 items ranged from 0.419 to 0.855, and Cronbach's alphas for the factors were all above 0.80, indicating satisfactory internal consistency. Additionally, McDonald's Omega coefficients and the Greatest Lower Bound (GLB) also suggested good reliability of the structure, as shown in Table 2. The results differ from those found by Scott and Bruce (1994), who identified a two-factor structure with an instrument composed of 22 items.

Normality tests were conducted for the data, including the Mardia multivariate normality test, which indicated the presence of significant kurtosis. However, as the software used for the analysis employed robust techniques that compensate for the lack of normality, the results of the exploratory factor analysis were considered reliable. Sample adequacy tests, such as Bartlett's test of sphericity ( $\chi^2 = 4559.25$ ,  $p < 0.001$ ) and the Kaiser-Meyer-Olkin (KMO = 0.90), supported the interpretability of the item correlation matrix. Additionally, parallel analysis (Timmerman & Lorenzo-Seva, 2011) suggested that a three-factor structure was most representative for the data, explaining 47.7% of the total instrument variance.

To assess the internal consistency of the structure composed of 3 factors, the adequacy of the model was evaluated by means of the RMSEA 0.063 (90% CI 0.057 - 0.07), CFI 0.972 (95% CI 0.96 - 0.99) and TLI

Table 2.

*Standard Matrix with the percentage of explained variance and reliability indices for Climate for Innovation in work teams scale*

|                                  | Factor 1 | Factor 2 | Factor 3 | Uniqueness |
|----------------------------------|----------|----------|----------|------------|
| CLIN2                            | 0.800    |          |          | 0.349      |
| CLIN3                            | 0.721    |          |          | 0.541      |
| CLIN1                            | 0.691    |          |          | 0.373      |
| CLIN14                           | 0.689    |          |          | 0.321      |
| CLIN6                            | 0.651    |          |          | 0.587      |
| CLIN10                           | 0.569    |          |          | 0.587      |
| CLIN21                           | 0.448    |          |          | 0.483      |
| CLIN8                            |          | 0.658    |          | 0.442      |
| CLIN9                            |          | 0.652    |          | 0.503      |
| CLIN5                            |          | 0.624    |          | 0.605      |
| CLIN7                            |          | 0.623    |          | 0.513      |
| CLIN4                            |          | 0.602    |          | 0.663      |
| CLIN13                           |          | 0.559    |          | 0.530      |
| CLIN12                           |          | 0.521    |          | 0.716      |
| CLIN11                           |          | 0.494    |          | 0.733      |
| CLIN22                           |          | 0.419    |          | 0.739      |
| CLIN16                           |          |          | 0.855    | 0.284      |
| CLIN19                           |          |          | 0.683    | 0.513      |
| CLIN15                           |          |          | 0.681    | 0.375      |
| CLIN20                           |          |          | 0.511    | 0.647      |
| CLIN17                           |          |          |          | 0.904      |
| CLIN18                           |          |          |          | 0.862      |
| FDI                              | 0.951    | 0.972    | 0.969    |            |
| N items                          | 20       |          |          |            |
| Percentage of explained variance | 0.477    |          |          |            |
| McDonald's Omega                 | 0.834    |          |          |            |
| Cronbach's Alpha                 | 0.864    |          |          |            |
| GLB                              | 0.953    |          |          |            |

*Note.* Applied rotation method is promax.

0.962 (95% CI 0.95 - 0.98). The indices found are considered satisfactory for the model. After considering the widespread utilization of the original instrument in academic literature, structured with 2 factors as previously indicated, we conducted an exploratory factor analysis (EFA) to examine the fit of the 2-factor model in the Brazilian context. However, this analysis

revealed that the 2-factor structure resulted in an increased RMSEA (0.08), indicating a larger residual. Furthermore, the model fit indices, TLI (0.81) and CFI (0.84), fell below the recommended threshold of 0.90, indicating inadequate model fit. Conversely, when considering a 3-factor structure, these indices surpassed the 0.90 threshold, suggesting an improved

model fit. Consequently, we concluded that, for the Brazilian context, the climate scale for innovation in work teams comprises 3 factors.

The exploratory factor analysis (EFA) indicated the grouping of items into 3 factors.

- The items that were grouped to factor 1 refer to the innovation support system by the work teams, items that measure respect for and encouragement of creativity, support for problem-solving and receptivity to changes;
- Factor 2 groups items that refer to possible inhibitors of innovation, such as the rigidity of activities developed by teams, inhibitors of innovative behavior, and the way in which team members act in the face of problems that may arise;
- The other items grouped under factor 3 refer to the resource supply that the teams have, the time available for creating ideas, financial resources, and the reward system.

In this way, the structure composed of 3 factors and 20 items form the instrument that seeks to measure the climate for innovation in work teams. The exclusion of items 17 and 18, due to their low factor loadings below the established threshold of 0.40, aims to ensure the consistency and interpretability of the results of the factor analysis, avoiding the inclusion of items that do not contribute significantly to the structure of the scale. This reduction in items not only enhances the clarity and precision of the instrument but also streamlines the measurement process, improving its efficiency and effectiveness in assessing the climate for innovation.

Additionally, several indices were computed to assess the adaptation of the scale to the Brazilian context. The  $\chi^2 / df$  ratio was found to be 3.33, which aligns with the acceptable criteria suggested by Kline (1998) (less than three) and Hair et al. (2005) (equal to or less than five). The analysis of AVE (Average Variance Extracted) and CR (Composite Reliability) was conducted for each individual factor. For Factor 1, Support for Innovation, AVE = 0.51, CR = 0.86; for Factor 2, Innovation Inhibitors, AVE = 0.35, CR = 0.83; and for Factor 3, Resource Availability, AVE = 0.50, CR = 0.80. Although the “Innovation Inhibitors” factor exhibited an AVE below 0.50, the other indices were satisfactory, with adjustments such as RMSEA, TLI, CFI, and GFI indicating improvements in the 3-factor structure.

The exploratory factor analysis revealed three distinct dimensions of the climate for innovation scale: Support for Innovation, Resource Availability, and Innovation Inhibitors. The CFI and TLI values exceeded 0.90, suggesting the model is adequate.

### Discussion and Final Considerations

The present research aimed to adapt and validate the Climate for Innovation scale, originally proposed by Scott and Bruce (1994), for the Brazilian context. The results of this study enabled the refinement of the scale by eliminating certain items and identifying an additional factor that improves the measurement of the construct, with validity indices that are appropriate for the Brazilian context. The emergence of 3 factors in the exploratory factor analysis, supported by significant coefficients, was particularly noteworthy.

The retention of the 3-factor structure was deemed appropriate, despite the “Innovation Inhibitors” factor having an AVE below 0.50. The nomenclature of this factor reflects the negative values attributed by respondents, indicating that the items comprising this factor were perceived as inhibitors of the climate for innovation. These findings suggest that the 3-factor structure provides a better fit for the Brazilian context, with adjusted and significant indices.

This study contributes to the literature by enhancing the measurement of the climate for innovation in work teams and can support further research in this field. Prior empirical studies on climate for innovation have underscored its influence on generating new ideas for organizational innovations (Marshall et al., 2019). Other research suggests that a conducive climate for innovation stems from supportive internal systems, opportunities for participation, and shared perceptions of incentives for innovative behavior (Shanker et al., 2017). Consistent with these insights, fostering psychological safety through incentives, rewards, and support encourages individuals to develop new ideas (Liu et al., 2019; Mete, 2017).

The factors delineated by the proposed scale encapsulate how the climate is perceived by participants in organizational work teams. This climate significantly influences individual behaviors, communication patterns, decision-making processes, problem-solving approaches, and conflict resolution strategies, thereby fostering openness to change and supporting novel and diverse ideas. Ultimately, this climate can impact organizational efficiency and productivity by providing



resources for innovation (Khan et al., 2016; Park & Jo, 2018; Sierra et al., 2017).

Creative environments conducive to generating new ideas, innovative behaviors, and fostering creativity are sustained by both group dynamics and environmental conditions (Bruno-Faria et al., 2008). Organizational support, encouragement of creativity, utilization of means to foster idea generation, goal structuring, and fostering a culture focused on innovation all contribute to such creative environments. Additionally, organizational challenges, such as tasks or missions, stimulate the expression of innovative and creative potential (Liu et al., 2019; Mete, 2017; Sierra et al., 2017). Thus, factors related to available resources and support for innovation can identify these characteristics within organizations under study. However, it is crucial to note that even when an organization provides resources and support for innovation, it may not necessarily be characterized as innovative or possess a creative environment (Jung et al., 2010).

Assessments of the climate for innovation are a way of observing how management is being developed, as innovating is a significant challenge for those who lead and are managers in organizational teams (Li et al., 2020; Isaksen & Ekvall, 2010). Leadership that fosters a climate for innovation provides and encourages the generation of ideas, achieve new ideas with hospitality and monitors their implementation. These actions enhance the attitudes of individuals and provide greater willingness to face new ideas. Organizations that support innovation build an innovative climate for employees (Hunsaker, 2020; Karatepe et al., 2020; Shanker et al., 2017; Khan, et al., 2016).

The Climate for Innovation measure indicates whether the organization must develop or improve an innovative climate of support, whether in time, financial resources, or trust, to maintain a competitive advantage. Companies with an orientation for innovation climate encourage employees to achieve organizational innovation (Khan et al., 2016; Sarros et al., 2008). One of the ways for organizations to stay in the competitive race is to promote a continuous atmosphere of innovation, whether in internal processes, procedures, and capabilities. Thus, employee behavior will be encouraged to perform impressive jobs (Park & Jo, 2018; Jia, et al., 2018; Merrifield, 2000).

The composition of the sample in this study, predominantly consisting of civil servants, presents several notable limitations. While these individuals participate in work teams within the organizational

framework in Brazil, the absence of a study involving the target population during the content validity phase may have impacted the adaptation process. Additionally, the sample size may not be sufficiently large to ensure the generalizability of the results, and the lack of diversity within the sample could limit the applicability of the findings to other sectors or demographics. Furthermore, the data collected relied on participants' self-perceptions, which introduces potential bias. The timing of data collection may also have influenced results, as it occurred during a specific period that may not accurately reflect the participants' experiences at other times. Variations in organizational conditions and external factors, such as economic changes, could further affect perceptions of the climate for innovation. Lastly, concerns about the reliability of the instruments used for measuring the climate for innovation should be acknowledged. These limitations highlight the need for further studies that encompass more diverse samples from both public and private organizations to ascertain better the stability of the factor structure inherent in the measure of climate for innovation.

Thus, despite limitations, it is understood that the EFA parameters obtained, such as Cronbach's alpha, encourage the use of the instrument with the proposed factor structure for obtaining data that can assess the behavior of the organizational phenomenon. In addition to contributing to the literature in the area, there is the possibility of improving the organization's internal measures and, consequently, improving organizational practices.

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