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Innovation Climate Scale: psychometric analysis in Peruvian workers

Escala de Clima de Innovación: análisis psicométrico en trabajadores peruanos

Sergio Dominguez-Lara
Professor at Universidad de San Martín de Porres, Peru
sdominguezl@usmp.pe
https://orcid.org/0000-0002-2083-4278

Manuel Fernández-Arata
Professor at Universidad de San Martín de Porres, Peru
mfernandeza1@usmp.pe
https://orcid.org/0000-0002-8582-9904

Patricia Bárrig-Jó
Professor at Pontificia Universidad Católica del Perú, Peru
pbarrig@pucp.pe
https://orcid.org/0000-0003-4685-5760

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Abstract: the changes caused by the COVID-19 pandemic pushed organizations to attempt to remain current and competitive. Thus, the ability to respond to new demands and adapt to shifting conditions was an unavoidable requirement, which implies innovating in the development of their processes. In that sense, the growing importance of innovative work behaviors in the development of organizations has driven researchers to investigate mechanisms that foster such behaviors in workers. The objective of this study Is to analyze the psychometric properties of the Innovation Climate Scale (ICS). The instrumental study involved 273 Peruvian workers (50.916 % male) ranging in age between 22 and 76 years old (Mean = 45.224), employed mostly in the private sector (75.092 %). The psychometric analysis explored item clarity and relevance by means of assessment by expert judges (content validity). Internal structure was assessed via confirmatory factorial analyses, both of oblique models and bi-factor. Finally, scoring reliability (alpha coefficient) and construct reliability (omega coefficient) were estimated. This study finds the ICS items to be clear and relevant, a greater empirical support for the unidimensional model as its internal structure, and an adequate reliability. In conclusion there is favorable evidence of validity and reliability for the application of the ICS in Peruvian companies as a useful tool to measure the innovative climate perceived by its workers, providing information for decision making and planning of innovation strategies and organizational creativity.

Keywords: innovation, innovation climate, workers, content analysis, factorial analysis, multivariate analysis, structural equation models, reliability analysis.

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Resumen: los cambios, producto de la pandemia, impulsaron a las organizaciones a mantenerse vigentes y competitivas. Por ello fue necesaria la capacidad para responder a las nuevas demandas para adaptarse al cambio, lo que implica innovar en el desarrollo de sus procesos. En ese sentido, la creciente importancia del comportamiento laboral innovador en el desarrollo de las organizaciones impulsó a los investigadores a buscar los mecanismos que estimulen dicho comportamiento en los trabajadores. Por lo expuesto, esta investigación tuvo como objetivo analizar las propiedades psicométricas de la Escala de Clima de Innovación (ECI). El estudio instrumental se realizó en 273 trabajadores peruanos (50.916 % hombres) entre 22 y 76 años (Media = 45.224) pertenecientes en su mayoría a empresas privadas (75.092 %). En cuanto al análisis psicométrico se exploró claridad y relevancia de los ítems por medio de la valoración de jueces expertos (validez de contenido), la estructura interna se evaluó mediante el análisis factorial confirmatorio tanto de los modelos oblicuos como bifactor, y por último se estimó la confiabilidad de las puntuaciones (coeficiente alfa) y del constructo (coeficiente omega). En cuanto a los hallazgos, los ítems de la ECI son claros y relevantes, el modelo unidimensional tiene mayor respaldo empírico como estructura interna, y la confiabilidad es adecuada. Se concluye que la ECI tiene evidencias favorables de validez y confiabilidad para su aplicación en empresas peruanas, constituyendo una herramienta útil para conocer el clima innovador percibido por sus trabajadores, aportando información para la toma de decisiones y planeamiento de estrategias de innovación y creatividad organizacional.

Palabras claves: innovación, clima de innovación, trabajadores, análisis de contenido, análisis factorial, análisis multivariado, modelos de ecuaciones estructurales, análisis de confiabilidad.

Introduction

Emergency measures to deal with the COVID-19 pandemic required changes in the activities and processes of public companies and institutions, as well as in the behavior of consumers and users. For example, social distancing and mobility restrictions disrupted business transactions and led to layoffs and job losses. While some areas of work, such as health services and the sale of basic products, maintained in-person care, albeit with limitations, other jobs moved to virtuality. For its part, electronic commerce had a boost when digital platforms were implemented to meet economic activity and consumer needs (Cámara Peruana de Comercio Electrónico, 2021; Lizarzaburu, 2023; United Nations Conference on Trade and Development, 2021).

Innovation is fundamental to the productivity, profitability and sustainable development of any organization; also, globalization, technological development and the tendency to associate with the public and private sectors have significantly increased the importance of innovation (Chan *et al.*, 2014). For organizations to remain current and competitive in ever-changing environments, they must respond to new demands and the ability to innovate and adapt to these changes (Kodden, 2020). Innovation in organizations can be understood both by the innovative results themselves, and by the process by which innovative practices are developed and established in the organization (Pichlak, 2016).

The innovation climate could be positively affected by a supportive climate, by the positive emotional response to change and by being subject to risk-taking in the workplace (Ye *et al.*, 2022). There are factors that support or limit the development of innovation climates within companies, whose identification can help us to understand the benefits that an innovation climate offers to the organization and its workers, as well as to know those contingencies that occur between the innovation climate, the team, factors and organizational results (Newman *et al.*, 2020). Precisely, one of these factors is the organizational climate, which refers to the lines of interaction established in the organization and the psychosocial environment that characterizes it, while at the individual or psychological level it denotes the perception that workers have about the climate of the workplace in general, or the area in which they work (Ehrhart and Schneider, 2016; Patterson *et al.*, 2005).

At the organizational level, the innovative climate refers to organizations that promote and guide their efforts to encourage the innovative behavior of their workers, rewarding their performance and investing in their innovative proposals (Newman *et al.*, 2020). At the individual level, the innovative climate is defined as the cognitive representations of the organizational environment that workers have as a result of psychologically significant interpretations of the context (Baltes *et al.*, 2009). Thus, the person would behave according to what he/she considers relevant and expected.

Considering the individual-psychological perspective, Scott and Bruce (1994) defined the innovative organizational climate as the degree to which members of a workplace perceive a cli-

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mate that supports innovation. These authors evaluated an explanatory model of innovative worker behavior, finding that perceptions of an organizational climate that supports innovation have an effect on such behavior, and act as a mediating variable in the influence of leader-worker interactions and systematic problem-solving style on individuals' innovative behavior.

For West and Sacramento (2012), creative and innovative organizations are places where most of their members belief in the organization's inspiring vision and the achievements it wants to achieve. Consistency, norms that foster diversity, continuous development, membership and leadership are some of the hallmarks of innovative organizations (Kanter, 1996; Siegel and Kaemmerer, 1978). Moreover, there is evidence that the innovative climate depends, in part, on interactions with the leader and colleagues as well as on organizational culture (Sarros *et al.*, 2008). In addition, transformational leadership is related to worker performance through the climate of innovation (Brimhall, 2019) and creativity (Mumford *et al.*, 2023). Other elements that promote innovation and creativity in an organization are strategies (institutional mission, means to achieve goals), incentives to innovate (recognition, availability of resources, consideration of ideas) and shared communication in the organization (between areas and working groups, decision-making information) (Carmona *et al.*, 2020).

Hence, because of the characteristics of organizations, as well as the perspective from which the innovative organizational climate is defined, there are various ways to measure the construct (Isaksen, 2023). For example, Patterson *et al.* (2005) developed and validated an organizational climate measure that includes the institution's administrative practices as well as the organization's productivity and innovation, while Siegel and Kaemmerer (1978) constructed a scale to assess workers' perception of innovation support in their workplaces by identifying three dimensions, creativity support, difference tolerance, and personal engagement.

For their part, Scott and Bruce (1994) proposed the Innovative Climate Scale (ICS) to evaluate organizational support for innovation with a modified version based on two dimensions of the scale of Siegel and Kaemmerer (1978), support for creativity and tolerance for differences. In addition, the authors added questions to assess the perceived rewards for innovation at the organizational level and the degree to which people believe the resources available are adequate to achieve innovation goals. To evaluate the structure of the 26 items of their scale, they performed an exploratory factor analysis with the main components of the Varimax extraction and rotation method.

When evaluating a two-dimensional structure, they retained 22 of the initial 26 items, as they had factor loads above .40 and were factorially complex, i.e., they loaded by more than one factor at a time. In that sense, they identified a first factor composed of 16 items, which they called *support for innovation* which explained 31.67% of the variance. This dimension assesses whether an organization's members perceive it as open to change, tolerant of diversity, and supportive to search for new ideas. The second factor, *resource provision*, had six items that measured the degree to which human resources, funding and time in the organization are perceived as adequate by workers, explaining 15.74% of the variance. All items had factor loads between .52 to .80 and Cronbach's alpha was .92 in the innovation support dimension and .77 in the resource supply dimension.

The ICS is one of the most requested instruments to evaluate the innovation climate (Newman *et al.*, 2020), and was used along with other variables, such as transformational leadership and organizational innovation (Jung *et al.*, 2003), organizational culture (Sarros *et al.*, 2008), or creativity and climate of support for innovation (Khalili, 2016). While it has no known psychometric studies, one paper reported Cronbach's alpha coefficients of .94 for innovation support and .76 for resource provision (Sarros *et al.*, 2008), while others assumed its one-dimensionality, reporting adequate reliability Hence, the aim of this paper is to analyze the psychometric properties of ICS in Peruvian workers because in recent years companies are focusing their attention on the creation of a more favorable organizational climate to promote the innovative behavior of their workers, i.e., how workers perceive their work

environment (Ye *et al.*, 2022). Among the various implications of this situation, is the need to have evaluation tools with psychometric evidence, validity and reliability, to assess the climate of innovation present in organizations.

This study is important at the applied level because the use of an instrument, in a context and population different from those of the original study, requires evidence of both validity and reliability to ensure its applicability. In addition, having an innovation climate measurement scale is an important resource for developing the innovative behavior of its members (Dhar, 2015), and can contribute to knowing the degree to which employees in the country perceive their organizations as open to change, which support new ideas with tolerance to the diversity of its members, as well as the degree of agreement with the adequacy of their resources. It is also possible to know the factors that support or limit the development of innovation climates, which would facilitate understanding the benefits and disadvantages of the innovation climate, and its organizational and individual implications. Thus, a measure with appropriate psychometric properties would allow to know and understand the innovation climate of a company so that professionals develop actions that promote innovation within the organization (Newman *et al.*, 2020).

The increasing and significant importance of innovative work behavior in the development and survival of competitive organizations has prompted researchers to look for mechanisms that stimulate this type of behavior in employees (Afsar and Umrani, 2019). In this sense, several studies highlight the need to create an organizational climate structure that supports and provides resources for the development of innovation, tolerating risk, due to its significant influence on the innovative work behavior of employees (Afsar and Umrani, 2019; Shanker *et al.*, 2017). The model of social interactionism on which the study is based emphasizes that leadership, working group relationships and problem solving directly or indirectly affect individual innovative behavior through perceptions of innovation climate (Scott and Bruce, 1994).

On the other hand, it is justified at a methodological level because, in addition to the original study, there are no other scientific publications on evidence of psychometric validity of the Innovative Climate Scale (Scott and Bruce, 1994) in national and international contexts, so providing psychometric evidence would legitimize its use both in the context of professional and academic application, since only empirical studies were found whose use of the ECI would not be conclusive because the validity evidences are necessary conditions to properly interpret the results (American Educational Research Association *et al.*, 2014), and the reliability estimate does not replace the validity (Cortina, 1993). Likewise, although some instruments use inverted items, the study of their impact on their factor structure is relevant (Dominguez-Lara *et al.*, 2019), since the literature recommends dispensing with such items (Suárez-Álvarez *et al.*, 2018), because sometimes they are usually eliminated during the research process *(Sánchez-Villena et al.*, 2021). Also, in view of the potential association between dimensions, it is necessary to explore the possible presence of a global factor through bifactor modeling (Rodríguez *et al.*, 2016).

Based on the above, as a research hypothesis it is established that the items are representative of the construct (hypothesis 1), an internal structure of two dimensions predominates (hypothesis 2), and presents adequate reliability magnitudes (hypothesis 3).

Materials and method

Design

This is a non-experimental and cross-sectional study. Specifically, it is an instrumental study (Ato *et al.*, 2013) that analyzes the psychometric properties, particularly evidence of content validity and internal structure, as well as reliability, of ICS in Peruvian workers.

Participants

273 Peruvian workers between 22 and 76 years of age were evaluated (*Average* = 45,224; Standard deviation = 12,794). Of the total, 75,092% (n = 205) worked in private for-profit companies. The characteristics of gender, occupation of the

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participants, type of employment contract, range of years working in the institution, modality of work and number of workers in the company are shown (table 1).

Table 1
Characteristics of participants

Socio-demographic variable	Categories	Frequency (n)	Percentage (%)
Gender	Male	139	50.9
	Female	133	48.7
	I prefer not to say	1	0.4
Occupation	Analyst	16	5.9
	Assistant	29	10.6
	Specialist	62	22.7
	Coordinator / Supervisor	37	13.6
	Area Chief	34	12.4
	Manager / Manager	94	34.4
	Other	1	0.4
Employment contract	Fixed-term contract	71	26.0
	Contract indefinite term	130	47.6
	Entrepreneur	37	13.6
	Freelance or by product	18	6.6
	Other	17	6.2
Years working in the company or in the institution	1 to 5 years	114	41.7
	6 to 10 years	67	24.5
	11 to 15 years	39	14.2
	Ages 16 to 20	20	7.3
	Over 20 years	33	12.3
Modality of work	100% Presential	26	51.3
	Mixed or hybrid non-flexible	26	9.5
	Flexible hybrid	68	24.9
	Remote 100%	37	13.6
	Other	2	0.7
Number of workers in company	Self-employed	7	2.6
	Up to 10 (micro-enterprise)	47	17.2
	Up to 50 (small business)	51	18.7
	Up to 200 (medium-sized enterprise)	45	16.5
	More than 200 (large company)	123	45.0

Instruments

The Innovation Climate Scale created by Scott and Bruce (1994) was used, which measures how employees perceive the organizational innovation climate. It consists of 22 items (Annex 1) that are integrated into the dimensions called innovation support (16 items), which evaluates whether employees see the organization as open to change, support for new ideas and tolerance for diversity of members, and provision of resources (6 items), which measures the degree to which resources in the organization are perceived to be adequate. Each item is answered in an ordinal range from *totally disagree* (1) to *totally agree* (5).

Procedure

The translation was carried out according to specialized recommendations (Muñiz *et al.*, 2013). Permission was initially sought from the authors of the instrument to translate it into the Spanish language as spoken in Peru. Subsequently, the back-translation method was used, which consists of having a first translation of the instrument, including instructions, writing of items and response options of two Peruvian professionals, and then that version was translated again into English with two translators of English.

The evaluation protocol was built as a Google form. The first page included an informed consent, where in addition to the objective of the investigation, other aspects of the data collection process were mentioned, such as confidentiality in data handling, voluntary and anonymous participation, as well as the possibility of abandoning the evaluation if the person considers it so. The second section comprised the target scale of this work.

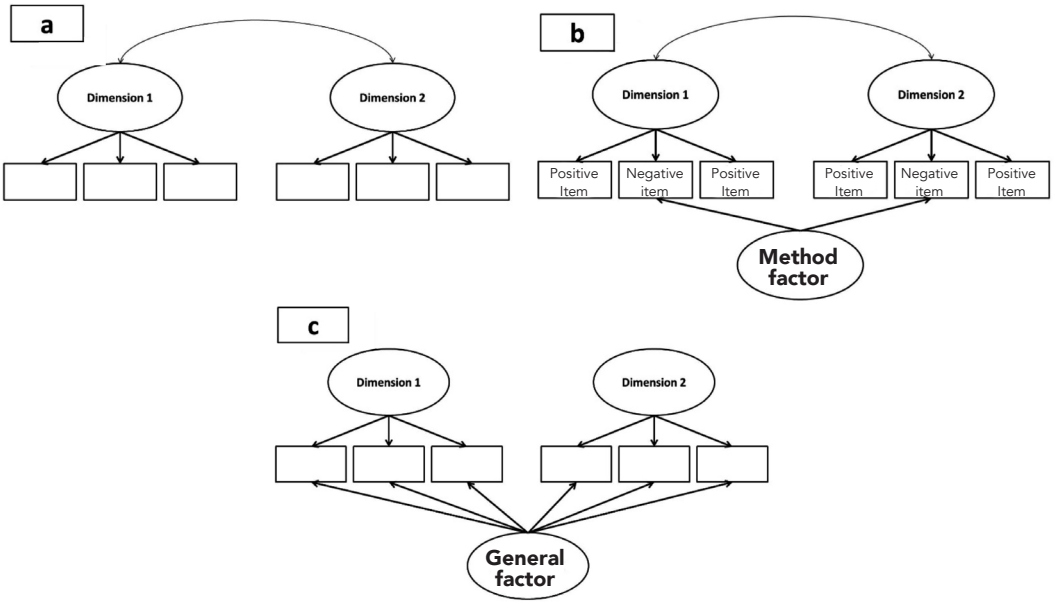
The evaluation was carried out according to the norms of the Helsinki Declaration (World Medical Association, 2017), as well as the code of ethics of the College of Psychologists of Peru (2018), and the Standards for Educational and Psychological Testing (American Educational Research Association *et al.*, 2014).

Data analysis

Validity findings based on the content of the items were explored based on the opinion of expert judges regarding clarity and relevance, and this opinion was quantified using the Aiken V coefficient including confidence intervals (CI; Penfield and Giacobbi, 2004). In both cases, the perceived clarity and relevance were significant when the lower limit of the CI was above .50 and the calculation was performed with a specialized module (Merino-Soto and Livia-Segovia, 2009).

The internal structure of the scale was analyzed under a factorial analytical approach, but in a preliminary way the presence of atypical scores (*outliers*) multivariate with the Mahalanobis distance and with *p*-values less than .001 were eliminated from the database. On the other hand, the univariate normality of the items was explored with asymmetry (< 2; Finney and DiStefano, 2006) and kurtosis (< 7; Finney and DiStefano, 2006), and the multivariate normality was evaluated with the Mardia's multivariate kurtosis coefficient (G2 < 70; Dominguez-Lara *et al.*, 2022).

Figure 1
Abbreviated representation of measurement models



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To assess the overall fit of the models, the magnitude of the ICS (> .90; McDonald and Ho, 2002), the RMSEA (< .08; Browne and Cudeck, 1993), and the SRMR. (< .08; Hu and Bentler, 1999) were considered. In addition, the convergent internal validity was evaluated with factor loads (> .50; Dominguez-Lara, 2018) and with the *average variance extracted by factor* (AVE > .37; Moral-de la Rubia, 2019), which represents the proportion of the variance explained by the construct. Likewise, the internal discriminant validity was evaluated according to the magnitude of the interfactorial correlations (φ < .80; Brown, 2015), and the comparison between the square of the interfactorial correlation (φ2), which indicates the shared variance between factors, and the *AVE*.

On the other hand, the relevance of GF in the bifactor model, i.e., if it explains more variance than the specific factors, was analyzed with complementary indicators: hierarchical omega of GF (ωH; > .75; Rodríguez *et al.*, 2016), hierarchical omega of the specific factors (ωHS; < .30; Smits *et al.*, 2015), and common variance explained (CVE > .60; Rodríguez *et al.*, 2016).

Finally, the coefficient α (> .70; Ponterotto and Charter, 2009) was used to assess the reliability of the scores, while the construct reliability was estimated with the coefficient ω (> .80; Raykov and Hancock, 2005).

Results and discussion

As for the evidence of item content validity, the judges indicate that the items are clear and relevant to the evaluation of the construct (Table 2). Hypothesis 1 (*the items are representative of the construct*) received support, and this would contribute to the operationalization of the construct in Peru, since according to experts the items appropriately reflect the main characteristics of the innovation climate.

Table 2
Validity of Innovation Climate Scale content

Innovation climate	Aiken´s V	
	Clarity (CI 95%)	Relevance
Support for innovation		
Item 1	.925 (.823, .970)	.980 (.900, .996)
Item 2	.888 (.777, .948)	.962 (.873, .989)
Item 3	.852 (.734, .923)	.980 (.900, .996)
Item 4	.852 (.734, .923)	.685 (.552, .793)
Item 5	.667 (.534, .778)	.740 (.610, .838)
Item 6	.962 (.873, .989)	.943 (.847, .980)
Item 7	.795 (.670, .881)	.777 (.649, .867)
Item 8	.907 (.800, .959)	.962 (.873, .989)
Item 9	.907 (.800, .959)	.925 (.823, .970)
Item 10	.980 (.900, 996)	.870 (.755, .936)
Item 11	.925 (.823, .970)	.740 (.610, .838)
Item 12	.925 (.823, .970)	.980 (.900, 996)
Item 13	.833 (.713, .910)	.907 (.800, .959)
Item 14	.943 (.847, .980)	.962 (.873, .989)
Item 15	.925 (.823, .970)	.943 (.847, .980)
Item 16	.777 (.649, .867)	.907 (.800, .959)
Provision of resources		
Item 1	.943 (.847, .980)	.943 (.847, .980)
Item 2	.943 (.847, .980)	.980 (.900, 996)

Innovation climate	Aiken´s V	
	Clarity (CI 95%)	Relevance
Provision of resources		
Item 3	.925 (.823, .970)	.925 (.823, .970)
Item 4	.925 (.823, .970)	.925 (.823, .970)
Item 5	.888 (.777, .948)	.777 (.649, .867)
Item 6	.907 (.800, .959)	.925 (.823, .970)

Note. M: Mean; SD: Standard deviation; g1: Asymmetry; g2: Kurtosis.

Preliminary ICS analysis suggests eliminating 11 cases that were considered multivariate outliers. After that, the items approach the univariate (table 3) and multivariate (G2 = 72,502) normality. This informs that the items usually do not show empirical distributions that significantly affect the estimation of the measurement models.

Table 3
Descriptive statistics of the Innovation Climate Scale

	M	*OF*	**g1**	**g2**		*M*	*OF*	**g1**	**g2**
Item 1	3.879	1.009	-0.620	-0.231	Ítem 12	2.795	1.321	0.142	-1.084
Item 2	4.048	0.932	-0.863	0.339	Ítem 13	2.674	1.364	0.256	-1.228
Item 3	4.103	0.893	-0.857	0.352	Ítem 14	3.271	1.188	-0.286	-0.676
Item 4	3.905	0.882	-0.331	-0.727	Ítem 15	3.425	1.253	-0.416	-0.877
Item 5	2.974	1.341	0.056	-1.191	Ítem 16	2.777	1.282	0.130	-1.021
Item 6	3.934	1.012	-0.874	0.330	Ítem 17	3.656	1.053	-0.645	-0.162
Item 7	2.766	1.354	0.245	-1.065	Ítem 18	3.260	1.145	-0.227	-0.643
Item 8	2.853	1.317	0.098	-1.062	Ítem 19	3.278	1.155	-0.228	-0.762
Item 9	2.901	1.321	0.010	-1.111	Ítem 20	3.176	1.215	-0.217	-0.796
Item 10	3.923	1.049	-0.808	0.010	Ítem 21	3.015	1.200	0.010	-0.826
Item 11	3.198	1.280	-0.312	-0.966	Ítem 22	3.267	1.178	-0.274	-0.709

Note. M: Mean; SD: Standard deviation; g1: Asymmetry; g2: Kurtosis.

The first model with two oblique factors (model 1), obtained unacceptable adjustment indices (table 4), as well as lower than expected factor loads (table 5). Subsequently, the model that included a MF (model 2) was evaluated and although it obtained adjustment indexes with adequate magnitudes compared to the previous model (table 4). It is noted that some items decrease their factorial load drastically in the presence of MF (e.g., item 4; table 5) and even reach negative magnitudes (e.g., item 5; table 5), which reflects the empirical strength of the MF. In this case, the items that make up the MF were eliminated. In this sense, it was corroborated that inverted items usually have insufficient psychometric evidence to retain them as elements of assessment of the construct (Dominguez-Lara *et al.*, 2019; Sánchez-Villena *et al.*, 2021; Suárez-Álvarez *et al.*, 2018).

In addition, it should be noted that although experts argued that the items were relevant for assessing the two dimensions of the innovation climate (*support for innovation* and *provision of resources*), when performing the empirical testing some did not show the association with the other items that allow the presence of well-defined dimensions to be inferred. For this reason, it is necessary to analyze the data beyond expert judgment, since it is only a source of evidence and does not determine the configuration of the instrument.

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Table 4

Adjustment rates of measurement models

Measurement model	ICS	RMSEA	90% CI	SRMR.
Model 1	,391	,346	,339; ,353	,333
Model 2	,921	,128	,121; ,136	,067
Modified Model 2	,971	,142	,126; ,158	,043
Model 3	,993	,080	,061; ,100	,019

Table 5

Factor parameters of the Innovation Climate Scale items: Oblique and method factor model

	Model of two oblique factors		Two-factor model with a method factor		
	F1	F2	F1	F2	FM
Ítem 1	.770		.864		
Ítem 2	.796		.896		
Ítem 3	.592		.756		
Ítem 4	.369		.168		.520
Ítem 5	.441		-.255		.739
Ítem 6	.761		.880		
Ítem 7	.552		-.402		.806
Ítem 8	.678		-.308		.841
Ítem 9	.669		-.259		.836
Ítem 10	.772		.900		
Ítem 11	.402		.228		.560
Ítem 12	.420		-.359		.777
Ítem 13	.412		-.342		.783
Ítem 14	.793		.813		
Ítem 15	.818		.864		
Ítem 16	.445		-.066		.737
Ítem 17		.861		.887	
Ítem 18			.912		.899
Ítem 19		.882		.894	
Ítem 20		.138		-.107	.539
Ítem 21		.189		-.046	.530
Ítem 22		.629		.622	
R	.771		.885		
AVE	.394	.467	.365	.466	.502

Note. F1: Support for innovation; F2: Resource provision; FM: Factor Method; MEV: Mean variance extracted by factor.

Oblique model fitting without inverse items (modified model 2) improved, except for RMSEA (table 4), and while factor loads were moderate and high in all cases (table 6), the interfactor correlation was high and there is no empirical distinction between factors (φ^2 > AVE; table 6). The two-factor model (model 3) presented the best fit among all the evaluated models (table 4), and the statistics associated with the GF indicate that it has enough support to consider a total score obtained from the 11 items (table 6). Hypothesis 2 (*a two-dimensional internal structure predominates*)

received no empirical support, as it is a one-dimensional scale. In this way, it is inferred that some items (*e. g.*, item 20) had no empirical relationship with the construct, while the positive items that were maintained after eliminating the inverted items, due to their psychometric malfunction, configured factors that presented a high association. Evidence was obtained by bifactor modeling that a more abbreviated and one-dimensional version of 11 items is recommended, which would be the definitive version. In this sense, at least in the study sample, the original dimensions (support for innovation and supply of resources) appear together, so it follows that the innovation climate requires both the support and the resources of the company to implement innovative ideas.

Table 6

Factor parameters of the Innovation Climate Scale items: Modified oblique and bifactor model

	Modified model of two oblique factors		Two-factor model		F2
	F1	F2	GF	F1	
Ítem 1	.858		.822	.822	
Ítem 2	.891		.802	.802	
Ítem 3	.742		.640	.640	
Ítem 6	.869		.826	.826	
Ítem 10	.887		.854	.854	
Ítem 14	.826		.859	.859	
Ítem 15	.864		.884	.884	
Ítem 17		.876	.837	.837	.160
Ítem 18		.903	.831	.831	.356
Ítem 19		.894	.810	.810	.471
Ítem 22		.642	.594	.594	.258
VME	.722	.699			
ϕ	.903				
ϕ2	.815				
ECV			.851		
ωh			.921		
ωhs				.064	.128

Note. F1: Support for innovation; F2: Resource supply; GF: Overall factor; AVE: Average variance extracted by factor; ϕ: Interfactorial correlation; ϕ2: Shared variance between factors; CVE: Common variance explained; ωH: Hierarchical omega; ωHS: Hierarchical omega of specific factors.

Finally, the reliability was high at the level of scores (α = .939) and construct (ω = .960), which supports hypothesis 3 (*has adequate reliability magnitudes*), indicating that the measure is necessary to assess the innovation climate.

Regarding the implications for the applied field, the evaluation of the innovation climate through a brief, one-dimensional measure and solid psychometric properties is important because it provides the company with information that would allow it to make decisions regarding the development of effective strategies to create work contexts that promote creativity and innovation, including the design of self-employment and challenging work, supporting creative activities, as well as granting benefits and rewards, all within a positive environment and effective climate for improving the quality of leadership and a work environment without negative conditions (Ye *et al.*, 2022).

For that reason, people in managerial positions could invest in the development of their human resources for a rapid adaptation of the

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company to changing environments, inspiring employees through the explanation and creation of collective objectives, promoting achievement goals, and building friendly and trusting relationships (Usmanova *et al.*, 2023). Then, business practices could also be designed that allow employees to develop a knowledge management system associated with positive innovative behavior (Huang and Li, 2021), given the impact that knowledge sharing has on innovative behavior, where information technology can help reduce or eliminate communication barriers among employees, through an interactive platform for sharing knowledge (Ye *et al.*, 2022).

In this way, members of an institution with a favorable innovation climate would be more willing to disseminate their innovative ideas, promote innovative behaviors and participate in innovation programs (Jiang *et al.*, 2023). In summary, in a favorable organizational innovation climate, the behavior of sharing and disseminating knowledge is usually valued and recognized by leaders and organizations (Liu *et al.*, 2019).

Conclusions

It is concluded that the ICS is a positive tool of validity in terms of its content and its internal structure, as well as its high reliability. Despite the relevance of the innovation climate in the innovative behavior of workers and in the adaptation of companies, there are not adapted instruments in Peru that allow to evaluate it, hence study scales are used with psychometric information of the moment and context in which they were built. Therefore, as the ICS is a short and robust measure based on the social interactionism model, its application could allow companies to understand the benefits and disadvantages that the innovation climate exerts on organizations and their employees, and develop actions to promote innovation within the organization, through the areas of human resources and business management (Newman *et al.*, 2020).

As for the limitations, the sample does not belong to a single category of work, professional or service performance, and given that the sampling and institutional characteristics are influential aspects in the psychometric behavior of the items, this can be reflected in the definitive internal structure of the instrument. Similarly, because the data were collected through a questionnaire and online, through the *Google Forms* platform, some bias (*e.g.*, social desirability) could have been presented in the respondents' response.

For future studies, it is recommended to have specific occupational samples, as well as to use additional strategies to obtain other evidence of validity (*e.g.*, due to its relationship with other variables), that support the adequacy of its psychometric properties and its predictive power. On the other hand, the innovation climate has been evaluated at an individual level of analysis, i.e., considering how employees perceive the innovation climate in their organizations, so it would also be relevant to compare it with a measure of the evaluation of the climate at the organizational level to have information about the correspondence with the shared perceptions of workers. Likewise, it is necessary to develop empirical works that include related aspects such as the creative climate and the organizational culture of the institution (Newman *et al.*, 2020).

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Annex 1

Innovation Climate Scale

Answer your agreement or disagreement with the following statements regarding your workplace, considering the scale presented below.

1	2	3	4	5
Completely at odds	At odds	Neither agree nor disagree	All right	Completely agree

In this company, creativity is promoted.	1	2	3	4	5
Bosses respect our ability to work creatively.	1	2	3	4	5
In this company, people are allowed to try to solve problems in different ways.	1	2	3	4	5
The main function of the members of this organization is to follow the directives provided by the established means.	1	2	3	4	5
In this company, you can get into a lot of trouble by doing your job differently.	1	2	3	4	5
This organization can be described as flexible because it continually adapts to change.	1	2	3	4	5
One cannot do things that are very different in this company because it causes anger.	1	2	3	4	5
The best way to *get al*ong in this organization is to think like the rest of the group.	1	2	3	4	5
In this company, all people are expected to face problems in the same way.	1	2	3	4	5
This organization is open and receptive to change.	1	2	3	4	5
The people in charge at this company are usually recognized for the ideas of others.	1	2	3	4	5
In this organization we do things as they were done in the past.	1	2	3	4	5
This company seems more interested in continuing with the current state of affairs than in change.	1	2	3	4	5
In this organization, the rewards system promotes innovation.	1	2	3	4	5
This organization publicly recognizes innovators.	1	2	3	4	5
In this company, the rewards system mainly benefits those who do not go against the rules.	1	2	3	4	5
Support to develop new ideas is available when needed.	1	2	3	4	5
Sufficient resources are allocated to innovation in this organization.	1	2	3	4	5
Sufficient time is available to develop creative ideas in this company.	1	2	3	4	5
In this organization, the lack of funds to explore creative ideas is a problem.	1	2	3	4	5
In this organization, the shortage of personnel hinders innovation.	1	2	3	4	5
During the working day I have free time to develop creative ideas.	1	2	3	4	5

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