



OPEN ACCESS

EDITED BY

Maike Liu,
Nanjing Normal University, China

REVIEWED BY

Rubia Cobo-Rendon,
University for Development, Chile
Rahmat Aziz,
Universitas Islam Negeri Maulana Malik
Ibrahim, Indonesia

*CORRESPONDENCE

Oscar Mamani-Benito
✉ mamanibe@uss.edu.pe

RECEIVED 26 January 2024

ACCEPTED 13 May 2024

PUBLISHED 24 May 2024

CITATION

Torres-Miranda JS, Ccama CA,
Niño Valiente JR, Turpo-Chaparro JE,
Castillo-Blanco R and Mamani-Benito O
(2024) Adaptation of the internet business
self-efficacy scale for Peruvian students with
a commercial profile.
Front. Educ. 9:1370490.
doi: 10.3389/feduc.2024.1370490

COPYRIGHT

© 2024 Torres-Miranda, Ccama, Niño
Valiente, Turpo-Chaparro, Castillo-Blanco
and Mamani-Benito. This is an open-access
article distributed under the terms of the
[Creative Commons Attribution License
\(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or reproduction
in other forums is permitted, provided the
original author(s) and the copyright owner(s)
are credited and that the original publication
in this journal is cited, in accordance with
accepted academic practice. No use,
distribution or reproduction is permitted
which does not comply with these terms.

Adaptation of the internet business self-efficacy scale for Peruvian students with a commercial profile

Julio Samuel Torres-Miranda¹, Celinda Aroni Ccama¹,
Juana Rosa Niño Valiente¹, Josué Edison Turpo-Chaparro²,
Ronald Castillo-Blanco³ and Oscar Mamani-Benito^{4*}

¹Escuela Profesional de Administración, Universidad Peruana Unión, Juliaca, Perú, ²Escuela de Posgrado, Universidad Peruana Unión, Lima, Perú, ³Facultad de Ciencias de la Salud, Carrera de Psicología, Universidad Científica del Sur, Lima, Perú, ⁴Facultad de Ciencias de la Salud, Universidad Señor de Sipán, Chiclayo, Perú

Introduction: Given the lack of instruments to evaluate the sense of efficacy regarding entrepreneurial capacity in Peruvian university students, this study aims to translate into Spanish, adapt, and validate the Internet Entrepreneurial Self-efficacy Scale in Peruvian university students with a commercial profile.

Method: An instrumental study was conducted where 743 students between 18 and 42 years old participated in careers with a commercial profile (Administration, Accounting, Economics, and other related careers) from the three regions of Peru (Coast, Mountains, Jungle). For analyzing content-based validity, Aiken's V coefficient was used, Cronbach's Alpha coefficient was used for reliability, and internal structure was used through confirmatory factor analysis.

Results: A reverse translation was achieved in the appropriate time and context. All items proved to be valid ($V > 0.70$), and the reliability of the instrument was very good ($\alpha = 0.96$). Concerning the results of the confirmatory factor analysis, the three-dimensional structure of the instrument was evaluated, finding an adequate fit [$\chi^2(87) = 279.6, p < 0.001, CFI = 0.972, RMSEA = 0.049, SRMR = 0.025$], based on this, the original internal structure was corroborated. In complementary analyses, it was found that the instrument is invariant according to sex and university. Finally, it demonstrates significant correlations with scales that measure similar constructs.

Conclusion: The Entrepreneurial Self-efficacy Scale on the Internet shows adequate psychometric properties; therefore, it can be used as a management tool to analyze the entrepreneurial capacity of university students with a commercial profile. These findings allow universities to evaluate the entrepreneurial capabilities of students who can promote sustainable businesses, which in turn improves the relationship between the University, state, and company.

KEYWORDS

entrepreneurial self-efficacy, validation study, entrepreneurship, university students, Peru

1 Introduction

The impact of the COVID-19 pandemic has caused commercial activity to move to a more virtual scenario (Sheng and Chen, 2022). Thus, many businesses had to adapt to a new reality based on virtuality (García-Madurga et al., 2021), thus posing new challenges for the university population that is trained in the field of business (Bustanza-Vargas, 2022). It is in this context that the Global Entrepreneurship Monitor (GEM, 2023) in its report that measures entrepreneurial activity in the world, it has shown that after the COVID-19 pandemic, many entrepreneurs have had more opportunities for growth and development and that internet use skills are required, as indicated by the Adult Population Survey (EPA). In this scenario, Peru is in 4th place in entrepreneurial activity, and 75% perceive they have better opportunities than data before the pandemic. For its part, the OECD (2023), SME and Entrepreneurship Outlook (2023), in its report on entrepreneurship and development, indicates that companies, faced with the uncertainty of COVID 19, have developed elements of innovation based on the creative use of technology, that is, they are not It requires a more significant investment (assets) to be able to operate in the competitive market. On the contrary, starting an innovative venture and being geographically present in a single place and throughout the world is possible. Faced with this, researchers such as Ratten and Jones (2021) emphasize that a large part of the population studying a career related to business management (administration, accounting, economics, commercial engineering) does not have an adequate commercial profile to promote future sustainable businesses on a technological and social basis.

Regarding this issue, the university, the state, and the company play an indispensable role in the training of future entrepreneurs, who, it is assumed, must be able to generate development through sustainable ventures with a vision of the future based on technology (Lechuga Sancho et al., 2022), developing their entrepreneurial intention from the university stage (Sulú et al., 2022). In this case, entrepreneurial education refers to any educational program that promotes entrepreneurial attitudes and skills since the primary purpose of business education and management education is to prepare students to be future managers and highlight the technical knowledge required to direct and manage a company, promote risk decision-making associated with the entrepreneurial process (Pérez-Pérez et al., 2021).

Salhieh and Al-Abdallat (2021) state that the willingness to start a new technology-based company is the main characteristic that differentiates a techno-entrepreneur from others. Thus, a person with such a will has “techno-business intentions” comparable to business intentions since we live in an increasingly globalized world that has brought technological advances and innovative business models (Al-Awlaqi et al., 2021). However, this new global situation poses new challenges for university students, entrepreneurs, and small business owners (Li et al., 2022), given that there is a large part of this group who tend to feel less competent in the use of ICT, especially about self-efficacy with the Internet (Padilla-Carmona et al., 2022).

The term self-efficacy was coined by Albert Bandura, who defines it as beliefs related to the sense of efficiency that an individual can show when fulfilling certain functions. In this regard, the literature shows that in recent years, the interest in

research on this variable has been directed to various areas such as health, education, work, sports, and new technologies (Calderón-De la Cruz et al., 2017). Thus, self-efficacy allows one to believe that one is competent, with the skills to carry out activities and achieve specific results. In business, a self-efficacious person believes they can successfully run a new business (Vargas, 2007), an essential component for entrepreneurial behavior, present from the beginning of the business activity until the development of the business and even determining its closure (Wang et al., 2019).

Throughout history, entrepreneurs have been the subject of research in various areas, especially business and management, as they represent people who can create opportunities, take risks, and solve problems within the company (Carranza Quimi et al., 2021). In this case, entrepreneurial self-efficacy is directly related to the variables of coping and problem-solving, which indicates that to prosper in one's own business, the subject must have the capacity and ability to be able to solve any problem that may arise (Morales-Rodríguez et al., 2018). This fact guides us to recognize the importance of studying perceived self-efficacy, which functions as an essential element of human capacity and is mainly associated with the choice of activities, motivation in the face of difficulties, effort, persistence, and patterns of thought (Yurrebaso Macho et al., 2020).

In this stage, Moriano et al. (2006) already warned that the quantitative study of entrepreneurial behavior through measurement scales is of great help because it offers reliable and valid information on the psychological variables that explain this behavior. However, a literature review associated with the availability of instruments in the Peruvian context shows the lack of measures for such purposes. On the other hand, alternatives are observed, such as an Entrepreneurial Attitude scale (EAO) (Vargas-Merino et al., 2022), another measure to evaluate the entrepreneurial profile of university students (Castillo-Saavedra et al., 2021), a scale of attitudes towards entrepreneurship (Saenz, 2021), which represent interesting alternatives because they aim to evaluate the predisposition in relation to entrepreneurial behavior (Pidduck et al., 2021). However, unlike attitude scales, entrepreneurial self-efficacy is aimed at evaluating the belief system that supports a person's attitudes, capabilities, and cognitive skills (Marshall et al., 2020).

This gap in knowledge drives this research precisely because it is often thought that entrepreneurial potential is discovered once you graduate from university. However, reality indicates that great entrepreneurs have not even had to set foot at a university, or, in any case, they have demonstrated it from the first years of the university stage (Yin et al., 2022). Faced with this, considering that in Peru, university students show more ambition to be entrepreneurs compared to past generations (Flores et al., 2024), it is necessary to evaluate the tendencies of thought, attitudes, and beliefs regarding entrepreneurial behavior. This is where psychometric studies become relevant, given that they offer the possibility of analyzing the adjustment in the understanding of certain items for a specific population. This could result in reliable results for making decisions in the area of educational policies aimed at promoting entrepreneurship at universities.

In this sense, the present researchers have seen fit to explore the psychometric performance of a measure developed in another context. In this case, we talk about the Internet Entrepreneurial Self-efficacy Scale, what is an instrument developed for university

students in Taiwan, composed of 16 items distributed in 3 dimensions (leadership, use of technology and internet marketing and electronic commerce). According to the authors who created this measure, the results of this study were helpful in the construction of business theories on the Internet and to strengthen, in the educational field, the evaluation and promotion of self-efficacy and business behavior in populations such as university students (Wang et al., 2019).

For all the above, this research aims to translate into Spanish, adapt, and validate the entrepreneurial self-efficacy scale on the Internet in Peruvian university students with a commercial profile.

2 Materials and methods

2.1 Design and participants

This study has a psychometric and adaptive approach since the objective is to obtain the translation of the Internet Entrepreneurial Self-efficacy Scale from the original language to Spanish because this category covers the development, design, and adaptation of measurement instruments in psychology (Montero and León, 2002).

The type of sampling applied was non-probabilistic, convenience, and cross-sectional, according to (Ñaupas et al., 2014). In this sense, 743 students participated voluntarily, among them 60% women and 40% men, aged between 18 to 42 years, from the different universities of the three regions of Peru and the professions of Administration, Accounting, Economics, and other professions related to the business field. Distributed in Administration (24%), Accounting (33%), Commercial Engineering (0.7%), Industrial Engineering (2.4%), other related careers (39.9%), with face-to-face (69%), blended (25%), virtual (6.0%), studying at a public university (23.3%), private (76.7%), with different religions such as Adventist (27.5%), Catholic (54%), evangelicals (11%), and others (7.5%)

2.2 Instruments

The instrumented object of validation was the Internet Entrepreneurial Self-Efficacy Scale, whose authors were Wang et al. (2019). This test comprises 16 items distributed in three dimensions: leadership, use of technology, Internet and marketing, and electronic commerce. Having response options in Likert format where 7 = Totally agree, 6 = Agree, 5 = A little agree, 4 = Neutral, 3 = Somewhat, 2 = Disagree, 1 = Totally disagree. Likewise, for the qualification, the scores are added; therefore, the higher the score, the greater the probability of business self-efficacy.

The theoretical basis of this instrument originates in the postulates of the theory of self-efficacy (Bandura, 1978), where it is revealed that perceived self-efficacy directly affects action and the environment. In this case, in the context of e-commerce, when people have strong beliefs about their effectiveness or confidence in handling business activities, they tend to have high entrepreneurial intention, even if the business activities have a high risk of failure.

At baseline, the scale was composed of a total of 38 items covering the dimensions of leadership, technology utilization,

online customer service, Internet marketing, and business operation. After the application of an exploratory factor analysis [EFA, $\chi^2(630) = 6,127,254$, $p < 0.001$, with a high Kaiser–Meyer–Olkin value = 0.96], the iterative process of EFA and item elimination gave, as a result, a scale of 16 items that represent three different factors, which complies with the simple factor structure. Subsequently, the confirmatory factor analysis showed an adequate fit of the three-factor model ($\chi^2 = 206.29$; $df = 101$; $p < 0.001$; $\chi^2/df = 2.04$; CFI = 0.97; NNFI = 0.96; RMSEA = 0.077; SRMR = 0.063), where the factor loadings were greater than 0.70, indicating adequate construct reliability.

Finally, internal consistency was also evidenced through Cronbach's Alpha coefficient, obtaining a value of 0.94 for the total scale, 0.87 for the leadership dimension, 0.92 for the technology use dimension, and 0.95 for internet marketing and electronic commerce. On the other hand, convergent and discriminant validity was also evaluated through a correlation matrix; in this case, all correlations within the factors were significantly different from 0 (p values < 0.001). Along the same lines, it was decided to evaluate the criterion validity, in this case, correlating the scores with those of a scale to measure business self-efficacy, obtaining results that revealed positively significant correlations with leadership ($r = 0.51$, $p < 0.001$), technology utilization ($r = 0.55$, $p < 0.001$) and Internet marketing and e-commerce ($r = 0.85$, $p < 0.001$).

2.3 Procedure

In the first stage, the selection of 6 translators was carried out. The original instrument was sent by email and WhatsApp after a reasonable time, the translation into Spanish was obtained, the comparison was carried out, and similarities were observed in terms of some words. Moreover, by unifying criteria, modifications were made to each item to obtain the most understandable and best-translated version.

In the second stage, the translated version was sent to the judges, with the support of 6 judges with experience in entrepreneurship issues and university professors with a Ph.D. degree, who carried out the validity analysis based on the content evaluating 3 criteria: the degree of clarity that indicates whether the item is understandable, clear, and comprehensible; the degree of representativeness that refers to whether the item is related to the construct it is measuring; and, the degree of relevance that indicates whether the item is essential and, therefore, should be included to evaluate the construct. The modality by which these three criteria were evaluated was through a validation format created by Ventura-León (2022). With a rating scale of 0 to 3, each criterion.

The instrument was applied to 743 students online through a Google form in the third stage. This resource was available from October 12 to November 24, 2022. In the first part, the research objective and the request for consent were announced, considering the guidelines for research with people.

2.4 Ethical considerations

The study was approved by the Universidad Peruana Unión ethics committee, with Number 2022-CEFCE-0007, on November

9, 2022. Before data collection, confidentiality guidelines and those established in the Helsinki Declaration were considered. Participants were informed about the purpose of the research and gave their informed consent.

2.5 Analysis

For the confirmatory factor analysis, the numerical nature of the items was considered, as they had seven response options. Thus, the MLR estimator was used, which, in addition to being recommended for numerical variables, is also robust to deviations from inferential normality (Muthen and Muthen, 2017). The fit assessment was performed using the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). CFI values > 0.90 are interpreted (Bentler, 1990), as well as those of RMSEA < 0.080 (MacCallum et al., 1996) and SRMR < 0.080 (Browne and Cudeck, 1992) as evidence in favor of the adjustment of the measurement model. For the measurement invariance analysis, four levels of hierarchical restrictive models were evaluated: (1) configural invariance, in which the same structure was specified for the groups; (2) metric invariance, in which the factor loadings between groups are made equivalent; (3) scalar invariance, this level being necessary to compare means, evaluating the equivalence of intercepts; and (4) strict invariance, in which the equivalence of the item residuals is evaluated. Furthermore, the change of CFI < 0.010, RMSEA < 0.015, or SRMR < 0.005 was evaluated to analyze the previous successive invariance models (Chen, 2007), at least in two of the previous cases. Finally, for the reliability analysis, the internal consistency method was considered with the omega coefficient (ω), considering values greater than 0.70. The statistical analysis was carried out using the “R” program, version 4.2.3, specifically with the “lavaan” library in version 0.6–15 (Rosseel, 2012).

3 Results

This section presents the results obtained from the validation process by expert judges, where Aiken’s V coefficient shows the level of clarity, representativeness, and relevance of the items. Likewise, the preliminary analysis results are presented, which indicate the items’ behavior according to descriptive and correlation statistics. Finally, the confirmatory factor analysis findings and the invariance analysis according to sex are presented.

Table 1 shows the results of the translation and adaptation process.

The results of the content-based validity analysis resulting from the expert analysis are observed. **Table 2** shows the Aiken V coefficient of the items on the entrepreneurial self-efficacy scale. Thus, according to the experts’ opinion, item five is the most relevant ($V = 01$, 95% CI = 3.00). It is also observed that items six, eight, and nine are considered the most representative ($V = 01$, 95% CI = 3.00). Finally, items eleven and twelve are recognized as clearer or more understandable ($V = 01$, 95% CI = 3.00).

Before the structural analysis, the descriptive results and the correlation matrix of the items were obtained, as shown in the

Table 3. Initially, the values of asymmetry (g1) and kurtosis (g2), which are within the suggested values, are observed (Kline, 2016). Regarding the intercorrelations, these are between the values of 0.61 and 0.87.

In the confirmatory factor analysis, the original structure of three correlated factors of the instrument was evaluated, finding an adequate fit, $\chi^2(87) = 279.6$, $p < 0.001$, CFI = 0.972, RMSEA = 0.049, SRMR = 0.025. For this model, the resulting factor loadings were found between 0.87 and 0.93, and this is displayed in **Table 4**. Furthermore, the internal consistencies of the dimensions had values between 0.94 and 0.97.

In the measurement invariance analysis (**Table 5**), the fit for the two groups determined by gender was initially evaluated. Then, these were put together to estimate and assess the first level of invariance. Configural invariance resulted in an acceptable fit, $\chi^2(202) = 496.1$, $p < 0.001$, CFI = 0.963, RMSEA = 0.088, SRMR = 0.027, continuing with the proposed levels of invariance and observing that the criteria for changes in the CFI, RMSEA, and SRMR were met (Chen, 2007) up to the strict level. These results can be seen in **Table 3**. In the same table, you can see the results of measurement invariance for the groups determined by the type of university. Also, there is a good configural adjustment, $\chi^2(202) = 454.2$, $p < 0.001$, CFI = 0.968, RMSEA = 0.081, SRMR = 0.026, and also with adequate values in the CFI, RMSEA, and SRMR changes up to the strict level.

Finally, the correlations of entrepreneurial self-efficacy with academic procrastination were evaluated as evidence of validity based on the relationship with other variables, $r = -0.33$, $p < 0.001$, and academic self-efficacy, $r = 0.38$, $p < 0.001$, these correlations being moderate (Cohen, 1988). These results can also be seen in **Table 6**.

4 Discussion

The constant evolution of electronic and mobile commerce is decisively promoting cyber entrepreneurship (Chang et al., 2018; Tseng et al., 2022). In the educational field, universities have increasingly incorporated digital skills into their study plans (Bustanza-Vargas, 2022), and the effect of COVID-19 has reconfigured the business intentions of students (Sheng and Chen, 2022). Likewise, there is an urgent need in Latin America for studies promoting new forms of entrepreneurship in university students that help reduce the COVID-19 effect (Hernández-Sánchez et al., 2020). Therefore, it is vitally important to have evaluation tools that measure entrepreneurial self-efficacy on the Internet. In this sense, this research aimed to translate, adapt, and validate the Entrepreneurial Self-efficacy Scale in Peruvian university students.

The translation and adaptation of the Internet Entrepreneurial Self-efficacy Scale in Peruvian university students was developed under a psychometric methodology (Ato et al., 2013). The Peruvian version of the Entrepreneurial Self-efficacy Scale on the Internet showed good clarity of language considering a target population of university students between 17 and 42 years old with direct approval of the 16 items and instructions. Likewise, the CFA findings confirm the three-dimensional structure of the instrument in Spanish, with items that present factor loadings according to what is recommended (Dominguez-Lara, 2018). These results are

TABLE 1 Original version and translated and adapted version of the internet entrepreneurial self-efficacy scale.

Item	Original version	Translated and adapted version
1	I possess the ability to be a leader	Tengo la capacidad para ser líder empresarial.
2	I can make others agree with my thoughts	Puedo convencer a otros para estar de acuerdo con mis ideas de negocio.
3	I can find work partners who complement my ability	Puedo encontrar socios que complementen mis habilidades empresariales.
4	I can have pleasant conversations with my work partners	Puedo sostener conversaciones productivas con mis socios y compañeros de trabajo.
5	I have the ability to make decisions after deliberation	Tengo la capacidad de tomar decisiones después de someter a debate ideas de negocio u otros proyectos comerciales.
6	I have a basic ability in computer file management	Tengo la capacidad para gestionar un negocio/empresa a través de redes sociales u otros medios digitales.
7	I can install and manipulate basic types of computer hardware to help my business.	Puedo instalar y maniobrar equipos informáticos (Laptop, PC y tablet), para ayudar en mi negocio/ trabajo
8	I can use multi-media hardware to help my business	Puedo utilizar equipos de audio, video y edición, para ayudar en el crecimiento de mi negocio.
9	I have the ability to install and use website applications	Tengo la habilidad para instalar y usar las aplicaciones de internet.
10	I can formulate an innovative Internet marketing strategy (such as viral marketing)	Tengo la habilidad de formular una estrategia innovadora de marketing digital en internet (marketing viral).
11	I can create a unique electronic commerce website	Puedo crear un sitio web exclusivo de comercio electrónico.
12	I know how to formulate a pricing strategy for my e-shop	Puedo formular una estrategia de precios para mi tienda electrónica.
13	I can analyze the cost structure of my e-shop	Puedo analizar la estructura de costos de mi tienda electrónica.
14	I can propose a profitable business model for electronic commerce	Puedo proponer un modelo de negocio rentable para el comercio electrónico.
15	I can easily gain access to the resources needed to operate my e-shop	Puedo acceder fácilmente a los recursos necesarios para el funcionamiento de mi tienda electrónica
16	I can solve tariff problems pertaining to importing and exporting	Puedo solucionar problemas de impuestos relacionados a importación y exportación.

TABLE 2 Aiken's V of the items of the entrepreneurial self-efficacy scale.

Items	Relevance (n = 6)				Representativeness (n = 6)				Clarity (n = 6)			
	M	SD	V	CI 95%	M	SD	V	CI 95%	M	SD	V	CI 95%
Item 1	2.25	0.82	0.89	1.85–2.65	2.25	0.82	0.89	1.85–2.65	2.25	0.82	0.89	1.85–2.65
Item 2	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97
Item 3	2.25	0.82	0.89	1.85–2.65	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00
Item 4	1.8	1.03	0.78	1.29–2.31	1.8	1.03	0.78	1.29–2.31	2.12	0.84	0.83	1.71–2.53
Item 5	3	0	1	3.00–3.00	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00
Item 6	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00	2.77	0.41	0.94	2.57–2.97
Item 7	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97
Item 8	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00	2.77	0.41	0.94	2.57–2.97
Item 9	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00	3	0	1	3.00–3.00
Item 10	2.12	0.84	0.83	1.71–2.53	2.57	0.52	0.89	2.32–2.82	2.77	0.41	0.94	2.57–2.97
Item 11	2.25	0.82	0.89	1.85–2.65	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00
Item 12	2.25	0.82	0.89	1.85–2.65	2.77	0.41	0.94	2.57–2.97	3	0	1	3.00–3.00
Item 13	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97	2.57	0.52	0.89	2.32–2.82
Item 14	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97	2.12	0.84	0.83	1.71–2.53
Item 15	2.25	0.82	0.89	1.85–2.65	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97
Item 16	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97	2.77	0.41	0.94	2.57–2.97

M, mean; SD, standard deviation; V, Aiken's V coefficient; 95% CI, confidence interval of Aiken's V.

TABLE 3 Descriptives and correlations of the items of the entrepreneurial self-efficacy scale on the internet.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Item 1	–															
Item 2	0.85	–														
Item 3	0.81	0.82	–													
Item 4	0.82	0.82	0.85	–												
Item 5	0.83	0.83	0.82	0.85	–											
Item 6	0.81	0.79	0.79	0.79	0.81	–										
Item 7	0.73	0.71	0.72	0.74	0.76	0.76	–									
Item 8	0.75	0.74	0.72	0.76	0.77	0.78	0.82	–								
Item 9	0.72	0.7	0.68	0.72	0.75	0.76	0.82	0.81	–							
Item 10	0.74	0.72	0.73	0.74	0.75	0.77	0.76	0.81	0.82	–						
Item 11	0.64	0.61	0.65	0.66	0.67	0.71	0.69	0.71	0.72	0.8	–					
Item 12	0.73	0.71	0.74	0.74	0.77	0.78	0.72	0.78	0.77	0.85	0.82	–				
Item 13	0.73	0.7	0.73	0.72	0.76	0.76	0.72	0.74	0.73	0.81	0.81	0.87	–			
Item 14	0.75	0.73	0.74	0.74	0.79	0.77	0.72	0.76	0.72	0.8	0.78	0.84	0.86	–		
Item 15	0.74	0.71	0.72	0.74	0.76	0.76	0.74	0.75	0.73	0.79	0.75	0.81	0.84	0.84	–	
Item 16	0.7	0.66	0.7	0.69	0.71	0.71	0.7	0.69	0.67	0.76	0.76	0.77	0.8	0.82	0.82	–
<i>M</i>	5.3	5.3	5.2	5.3	5.3	5.2	5.2	5.3	5.3	5.1	4.9	5.1	5.1	5.1	5	5
<i>SD</i>	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5
g1	–1.1	–1.1	–1	–1.1	–1.2	–1	–0.9	–1	–1	–0.9	–0.7	–1	–0.9	–0.9	–0.9	–0.7
g2	0.8	0.9	0.5	0.8	1.1	0.6	0.2	0.6	0.6	0.4	0	0.4	0.3	0.3	0.3	–0.1

TABLE 4 Factor loadings, correlations, and internal consistencies of the standardized solution of confirmatory factor analysis.

Item	F1	F2	F3
01. I possess the ability to be a leader	0.91		
02. I can make others agree with my thoughts	0.91		
03. I can find work partners who complement my ability	0.90		
04. I can have pleasant conversations with my work partners	0.92		
05. I have the ability to make decisions after deliberation	0.92		
06. I have a basic ability in computer file management		0.89	
07. I can install and manipulate basic types of computer hardware to help my business.		0.88	
08. I can use multi-media hardware to help my business		0.90	
09. I have the ability to install and use website applications		0.88	
10. I can formulate an innovative Internet marketing strategy (such as viral marketing)			0.90
11. I can create a unique electronic commerce website			0.87
12. I know how to formulate a pricing strategy for my e-shop			0.93
13. I can analyze the cost structure of my e-shop			0.93
14. I can propose a profitable business model for electronic commerce			0.92
15. I can easily gain access to the resources needed to operate my e-shop			0.90
16. I can solve tariff problems pertaining to importing and exporting			0.87
Correlations between factors			
F1. Leadership	(0.96)		
F2. Use of technology	0.92	(0.94)	
F3. Internet marketing and e-commerce	0.88	0.92	(0.97)

In parentheses, the internal consistency coefficients omega (ω).

similar to those reported by the original author (Wang et al., 2019), where the three-factor structure was the most consistent considering the dimensions of leadership, use of technology and internet marketing, and electronic commerce. On the other hand, when the dimensions of offline business self-efficacy are analyzed, it is observed that the exact dimensions are used in leadership, marketing, and electronic commerce (McGee et al., 2009). This result is different from the proposal of Spagnoli et al. (2017), who consider a 5-factor model when referring to entrepreneurial self-efficacy. Likewise, in the Peruvian version, the RMSEA values are better than those of the original author, Wang et al. (2019), which shows the good psychometric values achieved in the study.

It is also important to consider that the results supported measurement invariance about gender at the strict level through the factorial invariance of the measure of entrepreneurial self-efficacy on the Internet in a sample composed of male and female university students. The configural, metric, scalar, and strict invariance of the

Internet Entrepreneurial Self-Efficacy Scale was acceptable in the present study. It can be assessed with the same precision in groups of male and female university students. These results are essential considering the psychological nature of the male and female populations, which could have differences in their perceptions (Hyde, 2014). Recent studies reported that male university students showed higher entrepreneurial self-efficacy than women in the business environment (Adelowo and Akinwale, 2023). This result is consistent with the North American study where female students showed lower self-efficacy and entrepreneurial intention scores than males (Neumeyer, 2022). However, another study in a university population reported no differences in entrepreneurial self-efficacy between genders despite gender inequality in business activities (Hutasuhut et al., 2021). Furthermore, future studies could consider exploring the strict invariance of the Internet Entrepreneurial Self-Efficacy Scale about age and exploring other population groups at the ethnic, cultural, and clinical levels.

These findings suggest both theoretical and practical implications. The results of this study confirm the application of self-efficacy theory in the context of internet entrepreneurship. Under the proposal of Bandura (1978), Internet business knowledge represents personal self-control experiences, a key self-efficacy factor. A three-dimensional scale can evaluate entrepreneurial self-efficacy on the Internet, and using this scale will encourage the improvement of entrepreneurial self-efficacy on the Internet throughout the business life cycle (Murwani et al., 2017). On the other hand, this scale has 16 items, which ensure speed and practicality in its application, promoting research into this construct. This scale aims to motivate Peruvian university students to develop online entrepreneurial skills. As a result, university students are expected to become more involved in online entrepreneurship activities, developing companies and micro-businesses, which will result in a better personal and social economy (Sulú et al., 2022). Likewise, this Scale is a solid tool to help universities find students with innovation, creation, and entrepreneurship capabilities. Therefore, the Internet Entrepreneurial Self-efficacy Scale should become a fundamental axis in university evaluations that seek to understand virtual student entrepreneurship. Finally, this study can help other researchers interested in understanding Internet entrepreneurial self-efficacy, which can help teachers find the determinants of Internet entrepreneurship and increase its levels.

In this sense, the main contribution of the current study is that it provides a tool that can help researchers study and evaluate entrepreneurial self-efficacy on the Internet in a Peruvian context, which is a current need (Vargas, 2007; Morales-Rodríguez et al., 2018; Padilla-Carmona et al., 2022). Therefore, this Internet Entrepreneurial Self-Efficacy Scale can be used to help develop public policies aimed at directly addressing students' entrepreneurial capabilities. In this sense, this questionnaire makes it possible to collect information that supports actions to improve the business capabilities of students during their university years, as well as guide interventions to improve student entrepreneurship. Likewise, the information collected with the questionnaire can be used to help better understand and explore students' entrepreneurial learning sources.

This research is not without some limitations. First, most of the participants are from private universities, with (76.7%) representing only a single university sector in the country, so it is

TABLE 5 Measurement invariance of the measurement model considering gender and type of university.

Invariance model	χ^2	<i>gl</i>	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Sex								
Configural	496.1	202	0.963	0.088	0.027			
Metric	517.9	215	0.963	0.085	0.029	0	0.003	0.002
Scalar	542.8	228	0.963	0.083	0.03	0	0.002	0.001
Strict	533	244	0.964	0.079	0.03	0.001	0.004	0
Type of University								
Configural	454.2	202	0.968	0.081	0.026			
Metric	477.6	215	0.968	0.079	0.03	0	0.002	0.004
Scalar	500.9	228	0.968	0.077	0.03	0	0.002	0
Strict	507	244	0.968	0.074	0.03	0	0.003	0

CFI, comparative fit index; RMSEA, root mean standard error of approximation; SRMR, square root mean residual. All statistical significance values correspond to $p < 0.001$.

TABLE 6 Correlations between entrepreneurial self-efficacy, procrastination and academic self-efficacy.

Measurements	Academic procrastination	Academic self-efficacy
Leadership	-0.33	0.36
Use of technology	-0.30	0.36
Internet marketing and e-commerce	-0.31	0.38
Entrepreneurial self-efficacy on the internet	-0.33	0.38

All correlations are statistically significant ($p < 0.001$).

important to develop studies with a more significant presence of university students from public universities.

Data collection was online with 702 participants, and 41 students participated in person, which could generate some biases, unlike if the data had been collected in print and person. These biases could be because it was impossible to control for confounding, noise, or other factors that could have arisen during testing. Likewise, the empirical investigation of the proposed instrument is limited only to university students; additional studies could expand this scope to measure beyond the educational intervention in entrepreneurs or active business people. Finally, considering the sample gender, 60% of the participants were women, so it is advisable to repeat the study with a more balanced sample in terms of distribution by sex. Finally, developing similar research by adding interviews and focus group discussions is important.

Among future studies of this research and considering the psychometric properties of the Entrepreneurial Self-efficacy Scale on the Internet, this could be used as an evaluation measure for research purposes in educational contexts. Furthermore, on a practical level, this questionnaire allows you to quickly measure the relationship between entrepreneurial self-efficacy and business profiles. Likewise, it allows its inclusion in more complex network models that involve a large number of variables. Finally, researchers and professionals in the business field interested in identifying specific relationships or evaluating the effectiveness of an intervention aimed at specific relationships between

entrepreneurial self-efficacy and the business profile of university students will find this questionnaire useful.

5 Conclusion

In conclusion, the results showed that the Internet Entrepreneurial Self-Efficacy Scale shows adequate internal and external validity, based on content analysis and Confirmatory Factor Analysis, with evidence of convergent and discriminant validity and proper reliability. Strict factorial invariance was demonstrated for gender, an important contribution to measuring college students. It is concluded that the Internet Entrepreneurial Self-Efficacy Scale in university students presents adequate psychometric properties and allows for the significant evaluation of students' intention to develop entrepreneurial self-efficacy skills on the Internet.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was approved by the Universidad Peruana Unión Ethics Committee, with Number 2022-CEFCE-0007. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JT-M: Conceptualization, Investigation, Methodology, Validation, Writing – original draft, Writing – review and editing. CC: Conceptualization, Funding acquisition, Investigation,

Methodology, Writing – original draft, Writing – review and editing. JN: Conceptualization, Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review and editing. JT-C: Investigation, Methodology, Validation, Writing – original draft, Writing – review and editing. RC-B: Data curation, Formal analysis, Investigation, Visualization, Writing – original draft, Writing – review and editing. OM-B: Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

References

- Adelowo, C., and Akinwale, Y. (2023). Gender differences in entrepreneurial interest and practice among undergraduate students in Nigeria. *Problems Perspect. Manag.* 21, 482–492. doi: 10.21511/ppm.21(2).2023.45
- Al-Awlaqi, M. A., Aamer, A. M., and Habtoor, N. (2021). The effect of entrepreneurship training on entrepreneurial orientation: Evidence from a regression discontinuity design on micro-sized businesses. *Int. J. Manag. Educ.* 19:100267. doi: 10.1016/j.ijme.2018.11.003
- Ato, M., López-García, J. J., and Benavente, A. (2013). Un sistema de clasificación de los diseños de investigación en psicología. *An. Psicol.* 29, 1038–1059. doi: 10.6018/analesps.29.3.178511
- Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. *Adv. Behav. Res. Ther.* 1, 139–161. doi: 10.1016/0146-6402(78)90002-4
- Bentler, P. (1990). Comparative fit indices in structural models. *Psychol. Bull.* 107, 238–246.
- Browne, M. W., and Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociol. Methods Res.* 21, 230–258. doi: 10.1177/0049124192021002005
- Bustanza-Vargas, J. V. (2022). Gestión social de las tecnologías de información y comunicación en estudiantes. *Rev. Venezol. Geren.* 27, 530–548. doi: 10.52080/rvgluz.27.98.10
- Calderón-De la Cruz, G. A., Domínguez-Lara, S. A., and Arroyo-Rodríguez, F. (2017). Análisis psicométrico preliminar de una medida breve de autoeficacia profesional en trabajadores peruanos: AU-10. *Psicogente* 21, 124–137. doi: 10.17081/psico.21.39.2819
- Carranza Quimi, W. D., Carranza Quimi, E. J., and Manosalvas Vaca, L. O. (2021). Evaluación de la autoeficacia de emprendimiento y las capacidades de innovación en emprendedores del servicio turístico. *INNOVA Res. J.* 6, 190–210. doi: 10.33890/innova.v6.n3.2021.1743
- Castillo-Saavedra, E. F., Ayala Jara, C. I., Salas Sánchez, R. M., and Reyes Alfaro, C. E. (2021). Entrepreneur profile scale in Peruvian university students. *Rev. Venezol. Geren.* 26, 840–858.
- Chang, S.-H., Wang, C.-L., Lee, J.-C., and Yu, L.-C. (2018). Who Needs Entrepreneurial Role Models? Driving Forces of Students' Cyber-Entrepreneurial Career Intention. *Eurasia J. Maths. Sci. Technol. Educ.* 14, 3083–3098. doi: 10.29333/ejmste/91625
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct. Equat. Model. Multidiscip. J.* 14, 464–504. doi: 10.1080/10705510701301834
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*, 2nd Edn. Mahwah, NJ: Lawrence Erlbaum.
- Domínguez-Lara, S. (2018). Propuesta de puntos de corte para cargas factoriales: Una perspectiva de fiabilidad de constructo. *Enferm. Clín.* 28, 401–402. doi: 10.1016/j.enfcli.2018.06.002
- Flores, M., Otiniano, M., Alvarez, T., and Chavez, P. (2024). Factors associated with entrepreneurial behavior in students of a Peruvian university. *J. Educ. Soc. Res.* 14:183. doi: 10.36941/jesr-2024-0035
- García-Madurga, M. -Á., Grilló-Méndez, A. J., and Morte-Nadal, T. (2021). La adaptación de las empresas a la realidad COVID: Una revisión sistemática. *Retos* 11, 55–70.
- GEM (2023). *Global entrepreneurship monitor 2023/2024 global report: 25 years and growing*. London: Global Entrepreneurship Research Association, London Business School, Regents Park.
- Hernández-Sánchez, B. R., Cardella, G. M., and Sánchez-García, J. C. (2020). Psychological factors that lessen the impact of COVID-19 on the self-employment intention of business administration and economics' students from Latin America. *Int. J. Environ. Res. Public Health* 17:5293. doi: 10.3390/ijerph17175293
- Hutasuhut, S., Thamrin, T., and Aditia, R. (2021). Factors affecting students' entrepreneurial intentions and their differences based on gender, tribe, and parents' occupation: A cross-sectional study. *F1000Res* 10:438. doi: 10.12688/f1000research.52047.1
- Hyde, J. S. (2014). Gender similarities and differences. *Annu. Rev. Psychol.* 65, 373–398. doi: 10.1146/annurev-psych-010213-115057
- Kline, R. B. (2016). *Principles and practice of structural equation modeling*, 4th Edn. New York, NY: Guilford Press.
- Lechuga Sancho, M. P., Ramos-Rodríguez, A. R., Vega, M., and de los, Á. (2022). The influence of university entrepreneurship-oriented training in the transformation of intentions into new businesses. *Int. J. Manag. Educ.* 20:100631. doi: 10.1016/j.ijme.2022.100631
- Li, J., Demirkan, I., Lee, Y., and Cortes, A. F. (2022). Guest editorial new trends in entrepreneurship: A global context. *N. Engl. J. Entrepreneursh.* 25, 2–4. doi: 10.1108/NEJE-07-2022-064
- MacCallum, R. C., Browne, M. W., and Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling of fit involving a particular measure of model. *Psychol. Methods* 13, 130–149.
- Marshall, D., Meek, W., Gabrielle, R., and Markin, E. (2020). Access to resources and entrepreneurial well-being: A self-efficacy approach. *J. Bus. Res.* 120, 203–212. doi: 10.1016/j.jbusres.2020.08.015
- McGee, J. E., Peterson, M., Mueller, S. L., and Sequeira, J. M. (2009). Entrepreneurial Self-efficacy: Refining the measure. *Entrepreneursh. Theory Pract.* 33, 965–988. doi: 10.1111/j.1540-6520.2009.00304.x
- Montero, I., and León, O. G. (2002). Clasificación y descripción de las metodologías de investigación en psicología. *Int. J. Clin. Health Psychol.* 2, 503–508.
- Morales-Rodríguez, F. M., Giménez-Lozano, J. M., and Morales-Rodríguez, A. M. (2018). Associations between entrepreneurial self-efficacy and other psycho-educational variables. *Eur. J. Invest. Health Psychol. Educ.* 8, 91–102. doi: 10.30552/ejihpe.v8i2.247
- Moriano, J. A., Palaci, F. J., and Morales, J. F. (2006). Adaptación y validación en España de la escala de autoeficacia emprendedora. *Rev. Psicol. Soc.* 21, 51–64. doi: 10.1174/021347406775322223
- Murwani, F. D., Soetjipto, B. E., Wahjudono, D. B. K., Antonio, T., Djatmika, E. T., Hermawan, A., et al. (2017). Psychometric properties of the Indonesian version of the academic self-concept and the entrepreneurial self-efficacy scales. *Int. J. Econ. Res.* 14, 269–280.
- Muthen, L., and Muthen, B. (2017). *MPlus user' guide*, 8th Edn. Available online at: <https://www.statmodel.com/html Ug.shtml> (accessed November 23, 2023).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Naupas, H., Mejía, E., Novoa, E., and Paucar, V. (2014). *Metodología de la investigación cuantitativa – cualitativa y redacción de la tesis*, 4th Edn, Vol. 4. Bogotá: Ediciones de la U.
- Neumeyer, X. (2022). Inclusive high-growth entrepreneurial ecosystems: Fostering female entrepreneurs' participation in incubator and accelerator programs. *IEEE Trans. Eng. Manag.* 69, 1728–1737. doi: 10.1109/TEM.2020.2979879
- OECD (2023). *SME and entrepreneurship outlook*. Paris: OECD Publishing.
- Padilla-Carmona, T., Gil-Flores, J., and Rísquez, A. (2022). Self-efficacy in the use of ICT amongst mature students. *Educ. XXI* 25, 19–40. doi: 10.5944/educxx1.30254
- Pérez-Pérez, C., González-Torres, T., and Nájera-Sánchez, J.-J. (2021). Boosting entrepreneurial intention of university students: Is a serious business game the key? *Int. J. Manag. Educ.* 19, 1–14. doi: 10.1016/j.ijme.2021.100506
- Pidduck, R., Clark, D., and Tumpkin, G. (2021). Entrepreneurial mindset: Dispositional beliefs, opportunity beliefs, and entrepreneurial behavior. *J. Small Bus. Manag.* 61, 1–35. doi: 10.1080/00472778.2021.1907582
- Ratten, V., and Jones, P. (2021). Covid-19 and entrepreneurship education: Implications for advancing research and practice. *Int. J. Manag. Educ.* 19:100432. doi: 10.1016/j.ijme.2020.100432
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *J. Stat. Softw.* 48, 1–93. doi: 10.18637/jss.v048.i02
- Saenz, M. (2021). *Propiedades psicométricas de una escala de medición de actitudes hacia el emprendimiento en MYPES de la ciudad de Huancayo*. Lima: Universidad Peruana Cayetano Heredia.
- Salhieh, S. M., and Al-Abdallat, Y. (2021). Technopreneurial intentions: The effect of innate innovativeness and academic self-efficacy. *Sustainability* 14:238. doi: 10.3390/su14010238
- Sheng, F., and Chen, Y. (2022). The effect of COVID-19 on college students' entrepreneurial intentions. *Front. Psychol.* 13:870705. doi: 10.3389/fpsyg.2022.870705
- Spagnoli, P., Santos, S. C., and Caetano, A. (2017). A contribution toward the adaptation and validation of the entrepreneurial self-efficacy scale in Italy and Portugal. *J. Career Assess.* 25, 670–687. doi: 10.1177/1069072716664302
- Sulú, N. V. S., Fernández, A. P., and Hernández, L. F. P. (2022). Una visión sobre el emprendimiento en jóvenes universitarios: El caso de la facultad de ciencias económicas administrativas de la universidad autónoma del carmen. *CPAH Sci. J. Health* 5, 3325–3340. doi: 10.56238/cpahjournalv5n1-011
- Tseng, T. H., Wang, Y.-M., Lin, H.-H., Lin, S., Wang, Y.-S., and Tsai, T.-H. (2022). Relationships between locus of control, theory of planned behavior, and cyber entrepreneurial intention: The moderating role of cyber entrepreneurship education. *Int. J. Manag. Educ.* 20:100682. doi: 10.1016/j.ijme.2022.100682
- Vargas, G. (2007). *Influencia de la motivación de logro, actitud emprendedora, y autoeficacia emprendedora, sobre la intención emprendedora en los estudiantes del área de ciencias empresariales de la universidad nacional San Antonio abad del cusco: Unidad De Post Grado*. Lima: Universidad Nacional Mayor de San Marcos.
- Vargas-Merino, J. A., Vicente, J. S. Y., Lozano, M. L., and Dávalos, M. A. V. (2022). Entrepreneurial profile. A confirmatory factor analysis of entrepreneurial attitude orientation scale (EAO) in Peruvian university students. *WSEAS Trans. Environ. Dev.* 18, 595–603. doi: 10.37394/232015.2022.18.58
- Ventura-León, J. (2022). Back to content-based validity. *Adicciones* 34, 323–325. doi: 10.20882/adicciones.1213
- Wang, Y.-S., Tseng, T. H., Wang, Y.-M., and Chu, C.-W. (2019). Development and validation of an internet entrepreneurial self-efficacy scale. *Internet Res.* 30, 653–675. doi: 10.1108/INTR-07-2018-0294
- Yin, Z., Liu, Z., and Tong, P. (2022). Core entrepreneurial competences of Chinese college students: Expert conceptualisation versus real-life cases. *Asia Pac. Educ. Res.* 31, 781–801. doi: 10.1007/s40299-022-00656-3
- Yurrebaso Macho, A., Rodríguez-Parets Carabaza, C., Jáñez González, Á, Picado Valverde, E. M., Guzmán Ordaz, R., and Pérez Iglesias, J. L. (2020). Personalidad emprendedora y género. *Cuadernos Relac. Lab.* 38, 85–103. doi: 10.5209/crla.68869