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Examining university teachers' attitudes towards the use of gamification in entrepreneurship education

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Abstract: Universities increasingly integrate entrepreneurial skills into education, with gamification emerging as a key method. This study uses quantitative methods to explore 95 instructors' perceptions of gamification. Results show perceived usefulness as the strongest predictor of positive attitudes, outweighing perceived ease of use. Demographics like age and gender, and the learning climate, have no significant impact. Findings highlight the need for teacher training focusing on gamification's practical benefits rather than technical skills. This study contributes to entrepreneurship education by emphasising educators' roles in adopting gamification, offering valuable insights into fostering innovative teaching methods.

Keywords: entrepreneurship; gamification; attitude; TAM; technology acceptance model.

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1 Introduction

In recent years, gamification has emerged as one of the most innovative and promising methodologies for educational transformation, widely recognised for its potential to motivate and engage students in ways that significantly enhance their overall learning experience, engagement, and self-efficacy (Isabelle, 2020). It also encourages collaboration in different contexts, such as customer engagement, employee performance and social loyalty (Dichev and Dicheva, 2017). Gamification fosters entrepreneurial mindsets, critical skills like problem-solving, and adaptability while promoting interactive, accessible learning that democratises education and supports lifelong learning. Studies confirm its effectiveness in boosting motivation and entrepreneurial competencies (Galvão et al., 2018; Hamari et al., 2014), aligning gamification with the goals of managing technological innovations and advancing societal benefits.

Research has increasingly demonstrated gamification's effectiveness in a variety of educational contexts, with notable achievements reported particularly in business education, where this approach has succeeded in fostering critical thinking and problem-solving skills (Thomas and Baral, 2023). As the need for entrepreneurial skills grows, universities are tasked with prioritising initiatives that cultivate entrepreneurial mindsets among students, equipping them with a versatile skill set to navigate complex, uncertain futures and drive economic innovation (Nowak, 2016).

Universities are increasingly recognised as vital contributors to economic and social progress, with a responsibility to enhance the employability and entrepreneurial capabilities of their graduates (Tajpour et al., 2020). Through Entrepreneurship Education (EE) programs, universities can play a transformative role in preparing students not only to enter the workforce but also to drive economic innovation by creating their own business ventures. These programs are designed to support broader economic development goals by equipping students with the skills, mindsets, and foundational knowledge essential for business creation and growth (Bosma et al., 2008; Nabi and Liñán, 2011; Rideout and Gray, 2013). Studies, such as Trivedi et al. (2009), have already highlighted the significant influence of entrepreneurial competence and education on entrepreneurial growth. By fostering entrepreneurial attitudes and competencies, EE programs help students develop adaptability, resilience, and problem-solving abilities – qualities that are crucial in today's rapidly evolving business landscape (Greene and Saridakis, 2008). The development of these entrepreneurial skills has become increasingly important in fostering innovation and long-term economic growth, positioning universities as catalysts for both individual and societal advancement (Farrokhnia et al., 2022). Through effective Entrepreneurship Education, universities can bridge academic learning with real-world application, cultivating graduates who are ready to meet the demands of a dynamic economy.

From a pedagogical perspective, the adoption of gamification in education is driven by numerous benefits.

It enhances student motivation, enriches learning outcomes through game-based interactions, facilitates the development of practical skills, and generally improves learning effectiveness (Martina and Göksen, 2022; Lyons and Buckley, 2021; Wangi et al., 2021; Huizenga et al., 2017). According to the literature, personal attitudes serve as a mediating factor between the intention to establish a business and the commitment to its development, with the educational environment playing a pivotal role in nurturing positive attitudes towards entrepreneurship among students (Zeng et al., 2011). Notably,

research by Doanh (2021) underscores the significant impact of attitude on entrepreneurial intention. Consequently, recent studies have increasingly directed attention towards examining students' attitudes regarding the adoption of technology.

In entrepreneurship education, a field that encompasses a diverse range of content, skills, and competencies, the implementation of active methodologies such as gamification is especially pertinent. Gamification has shown promise in generating greater interest and participation among students compared to traditional instructional methods (Lovelace et al., 2016; Ranchhod et al., 2014).

The use of simulations and educational games has a long-standing history in entrepreneurship training, dating back to the 1970s. Today, a wide variety of serious games and simulations cater to different educational levels and target audiences, offering specialised tools for high school and college students (e.g., Industry Player, Innov8) and for professionals seeking advanced business training (e.g., GoVenture Small Business, Market Place, Sim Venture, or The Enterprise Game). These tools support a hands-on learning experience, enabling students to develop practical entrepreneurial skills within controlled environments that simulate real-world business dynamics.

However, despite the widespread recognition of gamification's potential in education, academic literature specifically addressing its role in entrepreneurship education remains limited. Existing studies predominantly focus on students' acceptance and engagement with gamification (Bai et al., 2020), whereas pedagogical applications of gamification for business creation and entrepreneurial training have been insufficiently explored (Isabelle, 2020). Furthermore, as suggested in the literature, personal attitudes serve as a crucial mediating factor between entrepreneurial intentions and actual business commitment, with the educational environment playing an essential role in cultivating positive entrepreneurial attitudes (Zeng et al., 2011). Therefore, understanding the factors that drive positive attitudes among students and educators toward gamification in entrepreneurship courses is imperative for designing effective EE programs.

The primary objective of this study is to contribute to the growing body of knowledge regarding the factors that shape university faculty attitudes towards gamification as an instructional method. This objective arises from a broader motivation: the pressing need for universities to actively foster entrepreneurial skills in students. To achieve this, universities must embrace innovative and engaging teaching methodologies that can enhance student learning outcomes and contribute to their overall success. This study, to our knowledge, represents the first investigation into the intention to adopt gamification from the perspective of entrepreneurship course instructors. By addressing this gap, the findings of this research offer substantial contributions to the literature, highlighting potential avenues for future studies and practical applications in EE.

This paper is organised as follows. After this introductory section, a review of the literature related to the study's area of focus is presented, accompanied by the formulation of research hypotheses. Section 3 details the methodology employed in the study, including the data collection processes and sources used. Subsequently, a comprehensive analysis of the results is provided, examining the findings in depth. Finally, the paper concludes with a discussion of the main conclusions drawn from the research and the broader implications for practice and future studies.

2 Literature review

2.1 Conceptual framework

The research model is grounded in the well-established technology acceptance model (TAM) (Davis, 1989). TAM has enjoyed extensive utilisation and validation in elucidating models aimed at understanding the acceptance of technological innovations. It has been rigorously examined in various contexts, including the acceptance of smart products driven by artificial intelligence (Sohn and Kwon, 2020), autonomous driving (Nastjuk et al., 2020), facial recognition payment (Zhong et al., 2021), electric vehicle purchase intention (Vafaei-Zadeh et al., 2022; Jaiswal et al., 2021) or the impact of Generative Artificial Intelligence (AI) hallucination within consumers' tourism decision-making processes (Christensen et al., 2024).

Moreover, TAM has been adapted to investigate diverse educational settings, such as online education (Unal and Uzun, 2020) the integration of virtual reality into language learning (Barrett et al., 2023), mobile learning initiatives (Buabeng-Andoh, 2021), metaverse-based learning platforms (Al-Adwan et al., 2023) or the use of Chat-GPT via ubiquitous learning (UL) procedure (Saif et al., 2024).

In the field of entrepreneurship education, we can also find cases such as the use of business games (Mesa-Cano et al., 2023; Sghari and Bouaziz, 2023) or the adoption of ICT in rural entrepreneurship (Geng et al., 2023).

Originally conceived to fore-cast the adoption of computer systems, TAM was conceptualised to delineate the key motivational factors mediating between system attributes and actual usage (Davis, 1986).

A comprehensive review of academic literature underscores the appropriateness of employing TAM in educational environments characterised by robust technological components, exemplified by educational video games (Zulfiqar et al., 2019; Rahman et al., 2018) or Metaverse-Based Learning Platforms (Al-Adwan et al., 2023).

The TAM comprises two primary antecedent variables that shape individuals' attitudes toward a particular technological innovation:

- a perceived usefulness
- b perceived ease of use (PEOU) (Davis, 1986).

Subsequently, attitude serves as a pivotal determinant variable affecting the actual adoption and usage of the system.

2.1.1 Perceived ease of use (PEOU)

According to Davis (1986) PEOU denotes the extent to which an individual believes that employing a particular system requires minimal physical or mental effort. In the context of this study, ease of use is understood as the absence of both physical and mental burdens experienced by teachers when adopting a new teaching methodology, such as gamification, in delivering entrepreneurship courses. Scholarly literature suggests that ease of use exerts a favourable influence on attitudes toward educational technologies. Several researchers have explored the factors influencing students' satisfaction and attitudes toward various modes of learning. Chetoui et al. (2024) emphasise that students' perceptions of online learning are shaped significantly by instructor performance, the usability of online platforms, the quality of information provided,

interactivity, and perceived usefulness. Similarly, Tan et al. (2024) illustrate that both the ease of use and the perceived usefulness of a system significantly impact students' favourable attitudes toward hybrid learning.

Moreover, Buabeng-Andoh (2021) discovered a positive correlation between PEOU and university students' attitudes toward mobile learning, a finding echoed among faculty members. Additionally, Chocarro et al. (2023) observed that primary and secondary school teachers' PEOU of chatbots correlated with increased acceptance and utilisation of chatbots in their classrooms. This relationship between ease of use and attitude has been corroborated across different educational levels.

Drawing from this body of evidence, we propose Hypothesis 1:

Hypothesis 1: *Perceived ease of use positively influences teachers' attitudes toward integrating gamification into entrepreneurship courses.*

2.1.2 Perceived usefulness (PU)

Just as in the preceding variable, we will adopt the conceptualisation outlined by Davis (1986) for perceived usefulness. It will be characterised as the extent to which an individual believes that utilising a specific system will enhance their performance. Consequently, this variable evaluates technology adoption by gauging users' expectations regarding the extent to which employing a particular technology will facilitate task completion. Within the context of this study, perceived usefulness is defined as the extent to which teachers perceive gamification as beneficial in enhancing the teaching of entrepreneurship to their students.

Previous research has indicated that users of technological innovations perceive them as beneficial for enhancing their daily work and class development (Cox et al., 1999). Recent events, such as the COVID-19 pandemic, have expedited the adoption of technology by both students and faculty, underscoring the importance of factors like ease of use and usefulness as perceived by students (Quadir and Zhou, 2021).

Recent investigations into emerging technologies such as Artificial Intelligence (AI) and the utilisation of ChatGPT have identified various determinants influencing a positive attitude towards their adoption. These determinants include ease of use, favourable attitudes towards the technology, social influence, perceived usefulness, behavioural and cognitive influences, as well as low perceived risks and anxiety (Abdaljaleel et al., 2024).

Similarly, Ebadi and Raygan (2023) discovered the significant predictive power of perceived usefulness concerning perceptions of mobile-assisted language learning (MALL). Furthermore, scholarly literature suggests that perceived usefulness exerts positive effects on both attitude and intention to use educational technology. For instance, Matarirano et al. (2021) observed that perceived usefulness positively influenced university faculty's attitudes toward the adoption of Learning Management Systems (LMS) in their courses. This influence on the intention to use technology within higher education contexts has also been noted (Sharma and Srivastava, 2019).

Moreover, Saeed Al-Marouf et al. (2020), identified that perceived usefulness positively impacts the intention for continued use of e-learning, as perceived by both faculty members and university students.

Consequently, we propose Hypothesis 2:

Hypothesis 2: Perceived usefulness positively influences teachers' attitudes toward integrating gamification into entrepreneurship courses.

2.1.3 Age

The academic literature suggests that age is a variable that may influence teachers' behavioural intentions regarding the use of technology. Older teachers tend to have more experience, and previous research has shown that this prior experience influences their actions (Pajares, 1992). Therefore, the academic literature suggests that age is a factor that can moderate teachers' behavioural intentions, including their use of technology. Platero Jaime et al. (2017) indicate that formal studies agree age negatively impacts the use of information and communication technologies (ICT). Specifically, Goodwyn et al. (1997) found that older teachers perceive ICT as a threat and a source of anxiety. Hamari and Nousiainen (2015) also found that age affects teachers' perceived value of educational video games. In contrast, studies such as Romero-Rodríguez et al. (2020) indicate a changing perspective, showing a direct correlation between age and both the attitude and predisposition to use technology. Consequently, there is mixed evidence regarding the effect of age, although being younger is generally associated with a greater predisposition to use technology.

Hypothesis 3: Age has a negative impact on the adoption of gamification into entrepreneurship courses.

2.1.4 Gender

Gender is an important variable in gamification-related contexts, including educational settings. Although gender differences seem to be decreasing among younger generations, men generally exhibit more positive attitudes towards video games than women (Bonanno and Kommers, 2008). Bressler and Bodzin (2013) observed distinct gender differences in the context of educational games. These differences can be traced back to various barriers to female entrepreneurship, including women's socio-cultural status, limited access to information and business networks, and restricted access to finance. Additionally, Ventura-Fernández and Quero-Gervilla (2013) noted that a greater number of variables influence women's entrepreneurial intentions compared to men. Specifically, outcome valuation is a critical factor for women, whereas self-confidence is often the primary factor for men. Therefore, the literature suggests that gender may influence teachers' behavioural intentions.

Hypothesis 4: Men exhibit more positive attitudes towards the adoption of new methodologies such as gamification of gamification into entrepreneurship courses.

2.1.5 Work climate

The concept of work climate traditionally refers to employees' perceptions of their organisations. However, contemporary definitions expand upon this notion, delineating work climate as the collective perceptions shared by employees regarding organisational events, practices, and procedures (Patterson et al., 2005). Initially, it was assumed that such perceptions were purely descriptive, devoid of affective or evaluative components (Schneider, 1983). Nonetheless, subsequent research suggests that employees do

incorporate evaluative and affective dimensions into their perceptions (Patterson et al., 2004).

In essence, work climate can be understood as the shared interpretation that organisational members attribute to the events, policies, practices, and procedures they encounter, as well as the behaviours they observe being rewarded, supported, and expected (Ehrhart et al., 2013).

The future landscape of work is poised to undergo substantial transformations, necessitating heightened attention from both employers and employees alike. These changes encompass various facets, including organisational design, the technological evolution of job roles and structures, advancements in artificial intelligence, robotics, and other technologies, as well as shifts in employee location, economic security, and skill sets (Tamers et al., 2020).

In light of these developments, the assessment of work climate and the adoption of new technologies by educators assume particular relevance. Two subdimensions stand out as especially crucial: firstly, the mechanisms organisations employ to facilitate the technological training of their staff, and secondly, the organisational climate fostering innovation and adaptability (Patterson et al., 2005).

Within the context of attitudes and intentions toward implementing gamification in teaching entrepreneurship, these subdimensions pertain to the resources and support mechanisms that educational institutions provide for training teachers in gamification techniques, as well as the organisational culture's receptiveness to innovation and adaptability regarding the integration of technological tools into teaching methodologies.

Work climate holds paramount significance within any organisation, as it encompasses critical aspects such as worker safety, health, and overall well-being. Emerging social, political, and economic trends, coupled with the profound effects of climate change and globalisation, alongside the escalating reliance on technology in the workplace, significantly influence the daily experiences of employees (Tamers et al., 2020).

Research on organisational development, employee attitudes, satisfaction, and commitment consistently highlights the significant impact of a positive work climate. González-Romá et al. (González-Romá et al., 2000) assert that fostering a positive work environment enhances both employee satisfaction and commitment. Similarly, Subramani et al. (2016) argue that a conducive organisational climate contributes to favourable attitudes among employees and fosters overall organisational development. Additionally, studies such as those by Dawson et al. (2008) have identified positive correlations between specific aspects of the work climate, such as quality and inclusiveness, and their influence on organisational performance.

When examining attitudes toward the adoption of new teaching technologies, Gonen and Lev-Ari (2016) suggest that a positive work climate significantly predicts both self-efficacy and favourable attitudes toward technology adoption.

The existing evidence underscores the direct positive relationship between the work climate and attitudes, prompting exploration into potential moderating effects between perceived usefulness or ease of use and attitudes. As a result, we propose the following hypotheses:

Hypothesis 5a: *The work climate, particularly technological training of employees, moderates the relationship between perceived ease of use and attitude.*

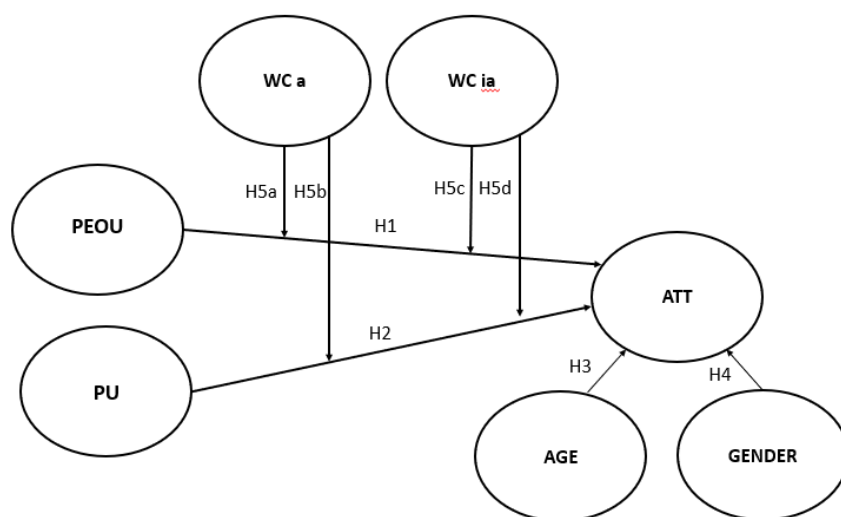
Hypothesis 5b: The work climate, particularly technological training of employees, moderates the relationship between perceived usefulness and attitude.

Hypothesis 5c: The work climate, specifically innovation and adaptability within the organisation, moderates the relationship between perceived ease of use and attitude.

Hypothesis 5d: The work climate, particularly innovation and adaptability within the organisation, moderates the relationship between perceived usefulness and attitude.

Figure 1 shows the proposed model. The TAM model has been adapted with attitude as the dependent variable and PEOU, perceived usefulness, gender, and age as independent variables. Work climate acts as a moderating variable. Hypotheses 1 and 2 represent the relationships with PEOU and perceived usefulness, respectively. Hypotheses 4 and 5 include gender and age, and Hypotheses 5a, 5b, 5c, and 5d address the moderation of work climate.

Figure 1 Attitude-to-use model



3 Materials and methods

3.1 Sample characterisation

The university professors who participated in the study were selected to teach subjects related to entrepreneurship or business creation. Additionally, those authors who research entrepreneurship education were also selected. We contacted the professors via email and encouraged them to participate in the study by responding to an online questionnaire, which was conducted in Spanish and English to have an international scope. Participation was voluntary and confidential, and we aggregated all data anonymously in an SPSS database.

In the proposed research design, we used non-probability purposive sampling, a method where the items selected for the sample are chosen at the researcher's judgement (Saunders et al., 2012). This method is effective when researchers facing time, cost, and

other constraint like target population is difficult to access or scattered (Martínez-Mesa et al., 2016). In the present study, only teachers who teach entrepreneurship, business creation or research about this topic are valid.

After completing the collection of questionnaires, we obtained a total sample of 95 valid subjects. In the following tables and figures, we summarised their sociodemographic characteristics.

Table 1 presents the sample demographics.

Table 1 Sample demographics

<i>Gender</i>	<i>Percentage</i>
Male	69.47%
Female	30.53%
<i>Age</i>	<i>Percentage</i>
25–35	17.89%
36–45	36.84%
46–55	33.68%
56–65	6.32%
More than 65	5.26%
<i>Nationality</i>	<i>Percentage</i>
Spain	56.84%
USA	6.32%
Netherlands	4.21%
Brazil	3.16%
Colombia	3.16%
Portugal	3.16%
UK	3.16%
Other	20.00%

3.2 Variables and measurements

Dependent variable.

- *Attitude toward use (ATT)*: We used the Davis scale (1986) for this variable. It is a 7-point Likert-type scale (1 = Strongly disagree; 7 = Strongly agree).

Predictor variables.

- *Ease of use (PEOU)*: We used the Davis scale (1986) for this variable. It is a 7-point Likert-type scale (1 = Strongly disagree; 7 = Strongly agree).
- *Perceived usefulness (PU)*: We used the Davis (1986) scale for this variable. It is a 7-point Likert-type anchor scale (1 = Strongly disagree; 7 = Strongly agree).
- *Gender (GEN)*: This is a variable dichotomous scale, where the male takes the value '0' and the female '1'.
- *Age (AGE)*: This variable has a continuous scale (years of the respondent's life).

Moderating variable.

- *Work climate*: For the two dimensions of this variable [work climate for learning (CLa) and work climate for innovation and adaptability (CLia)], we used the scales of Patterson et al. (2005) and Tremblay et al. (2009) Both Likert-type scales with seven anchor points (1 = Strongly disagree; 7 = Strongly agree).

The use of these variables is justified due to their importance in studies on attitudes and perceptions about innovative methodologies such as gamification. In addition, they allow us to assess specific constructs that are key to understanding teachers' attitudes in the context of entrepreneurial education.

We conducted two types of analyses to address the research hypotheses. First, we performed a stepwise regression model in SPSS to analyse the variance explained by each variable on our dependent variable. This approach helps to maximise the parsimony of the model, so we keep variables that explain a significant proportion of the variance. In addition, it also serves as a preliminary step for more complex models (such as moderation). Second, we used AMOS to test the moderation effect of the work climate variable on the relationships between perceived usefulness and attitude towards the attitude of use. Moderation analysis was incorporated to assess how the two types of climates influence the relationship between PEOU and PU, and ATT. This approach allows identifying the conditions under which the main effects are strengthened or weakened, adding depth to the theoretical model. This type of analysis has been widely used in the literature (Aguinis et al., 2017).

4 Results

First, we estimated the overall stability and consistency of the variables by using Cronbach's internal alpha (α) to test their reliability. The Cronbach's alpha for the variables 'Attitude towards use' (ATT), 'Perceived usefulness' (PU), and 'Perceived ease of use' (PEOU) were $\alpha = 0.961$, $\alpha = 0.980$, and $\alpha = 0.983$, respectively. Additionally, the two dimensions of the climate variable (work climate learning and work climate innovation and adaptability) had a Cronbach's alpha of $\alpha = 0.838$ and $\alpha = 0.912$, respectively, indicating excellent internal consistency of the sample.

Table 2 presents the main descriptive statistics of the variables in the research model.

Table 2 Descriptive statistics

	<i>ATT</i>	<i>PEOUT</i>	<i>PUT</i>	<i>AGE</i>
ATT				
PEOU	0.55**			
PU	92**	0.589**		
AGE	-0.17	-0.26	-0.18	-0.37**

The variables in the model are primarily on a Likert scale (except for age), with a range of 1 to 7. Regarding mean and standard deviation, the variables belonging to the TAM model have very similar means, close to 5, and similar standard deviations (between 1.5

and 1.7). The descriptive statistics of age and gender have been explained in the sample demographics table.

Focusing on the attitude variable, the data obtained are not symmetrical and are skewed to the right, confirming the positive attitude of teachers towards gamification. Thus, we can answer the first research question affirmatively.

Regarding the correlations, as shown in Table 3, most of them are significant, except for age with the dependent and independent variables.

Table 3 Descriptive statistics

	<i>N</i>	<i>Maximum</i>	<i>Minimum</i>	<i>Average</i>	<i>Standard deviation</i>
ATT	95	7	1	5.06	1.67
PEOU	95	7	1	4.46	1.49
PU	95	7	1	5.04	1.54
AGE	95	71	27	45.20	11.49

We observe that the dependent variable, ATT, is significantly related to the variables belonging to the TAM model (PEOU and Perceived Usefulness (PU)), but not with the age variable.

The stepwise linear regression model shows us the changes in R-squared when a variable is added. The joint estimation table of the model shows the significance of the regression in each of the steps introduced. In the first step, we included the variables age and gender, and found them to be insignificant. We then introduced the explanatory variables relating to the TAM models, testing them separately to contrast the high correlation between the dependent variable and perceived usefulness. In step 2, we introduced the variable ease of use, which was found to be significant. The same happened in step 3 with the incorporation of perceived usefulness; the introduction of both selected variables was found to be pertinent.

For model 1, we incorporated the demographic variables (age and gender), with an R-squared of 0.03. Model 2 includes PEOU, resulting in an R-squared of 0.31 and a change in $F = 37.12$ ($p < 0.001$). Finally, model 3 incorporates perceived usefulness, resulting in an R-squared of 0.85 and a change in $F = 310.80$ ($p < 0.001$).

In summary, the variables PEOU, PU, age, and gender explain 84.6% of the variance of ATT, with the model becoming highly explanatory from the incorporation of PEOU (31.3%) and even more so with the incorporation of PU (84.6%). The variables (age and gender) used are not explanatory. Table 4 shows the coefficients for each of these relationships.

In conclusion, perceived usefulness (PU) explains the attitude of university professors towards educational video games, with PEOU being explanatory when it is incorporated individually (31.3%). The variables used (age and gender) are not explanatory.

The results indicate that most of the relationships are not significant, with the only variable retaining its predictive power against the attitude of using being the Perceived Usefulness (PU) variable when all variables are in the model. The variables are not significant. However, in step 2, the Perceived Ease variable is relevant (0.55**). But when the perceived usefulness variable is introduced in step 3, its significance becomes completely void, with perceived usefulness being the only explanatory variable of the attitude towards the use of gamification (0.91**).

Table 4 Linear correlation coefficients of the model

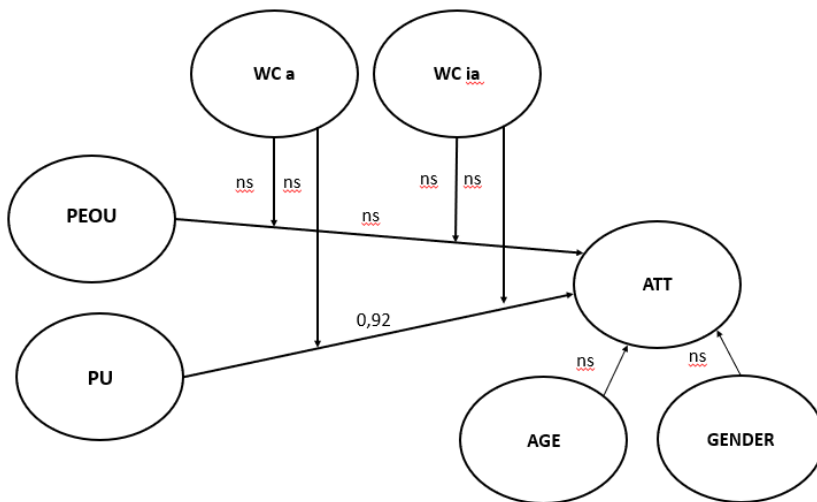
Model		B	B
1	AGE	0.25	0.07
	GEN	-0.02	-0.14
2	AGE	0.29	0.08
	GEN	0.00	0.01
	PEOU	0.62	0.55**
3	AGE	-0.13	-0.04
	GEN	-0.00	-0.01
	PEOU	0.02	0.02
	PU	1.00	0.91**

Finally, we performed a modulation analysis. The presented model is based on the TAM technology model Davis (1986), where attitude is a relevant factor. We used two types of work climate as moderators in the relationship between the independent variables (PEOU and perceived usefulness) and the dependent variable (Attitude towards use).

First, we would detail the model fit. Authors such as Hooper et al. (2008) suggest analysing values such as X2, RMSEA, CFI or SRMR.

The data confirms a good fit of the model since the indices are adequate. SRMR is equal to 0.08; the Chi2/df ratio is less than 3 (0.8); the GFI is equivalent to 0.95; the NFI is equal to 0.94, the IFI is equal to 0.73, TLI is equal to 0.91, CFI is equal to 0.97, and RMSEA is 0.07 (the only less adjusted value).

As for the results, and as can be seen in Figure 2, there is no modulation in the relationship between the dependent variable and the independent variables, with only the perceived usefulness variable, as indicated in previous sections, having a significant relationship with the dependent variable (0.92***).

Figure 2 Climate moderation – attitude towards use

The initial model to define the attitude towards the use of gamification in teachers who teach entrepreneurship subjects is as follows:

$$ATT = 0.189 - 0.127AGE - 0.01GEN + 0.019PEOU + 1.001PU$$

After eliminating the non-explanatory variables (all except PU), the model would be simplified to:

$$ATT = 0.189 + 1.001*PU$$

Table 5 presents a summary of the hypotheses raised throughout the study. Previous research by authors such as Saura et al. (2024) and Kang and Hwang (2022) support a positive relationship between PEOU and attitude, which is consistent with our findings. Similarly, prior studies by Matarirano et al. (2021), Altanopoulou and Tselios (2017) and Cox et al. (1999) have indicated a positive relationship between perceived usefulness and ATT, which is also supported by our results. Therefore, the first two hypotheses are accepted.

Table 5 Summary of the hypothesis

	<i>Causal relationship</i>	<i>Hypothesis</i>
H1	PEOU → ATT	ACCEPTED
H2	PU → ATT	ACCEPTED
H3	AGE → ATT	REJECTED
H4	GENDER → ATT	REJECTED
H5a	WC a → PEOU*ATT	REJECTED
H5b	WC a → PU*ATT	REJECTED
H6a	WC ia → PEOU*ATT	REJECTED
H6b	WC ia → PU*ATT	REJECTED

The same does not hold true for the moderating effect of the work climate variable. The study found that for university professors, the provision of means for training and incorporation of innovations required for teaching by the university did not affect the ease of use or perceived usefulness of their attitude towards gamification. Therefore, hypotheses 4 and 5 of the study are rejected.

Regarding the control variables used (age and gender), both hypotheses were also rejected. The first hypothesis, which proposed that age has a negative effect on the use of new research methodologies, was not supported by the model. While most of the academic literature consulted suggested that younger teachers have a greater predisposition to the use of new technologies, the relationship proposed in the model was not significant. Therefore, hypothesis number four is rejected.

Finally, the study confirmed that gender does not influence the intention of teachers to use gamification. However, previous research has shown that men have more positive attitudes towards gamification than women, contradicting hypothesis four.

5 Discussion and conclusions

The influence of games on the learning experiences of current generations may indeed be a critical factor in educational strategy, especially as it relates to teaching entrepreneurship (Schneider, 1983). Given the rapid changes in the global economy, including economic instability, rising educational costs, and the risks associated with creating actual start-ups, gamification offers a cost-effective, practical, and innovative teaching tool. Active learning methodologies like gamification engage students in experiential learning, allowing them to simulate real-world business challenges and develop entrepreneurial skills in a controlled, risk-free environment. This emerging pedagogical approach aligns with contemporary needs in education, where practical, engaging, and adaptive methods are increasingly valued.

The current body of literature on gamification in entrepreneurship education is still in its nascent stages, with a notable gap concerning its application by educators. As such, this study contributes new insights, particularly by focusing on the attitudes and behaviours of teachers toward gamification in entrepreneurship courses. By examining the factors influencing these attitudes, this work expands the existing body of entrepreneurship education literature and provides valuable implications for improving pedagogical practices and the broader acceptance of gamification in higher education.

Our proposed model offers a comprehensive explanation of the factors shaping teachers' attitudes toward gamification in entrepreneurship education. Findings indicate that perceived usefulness is the most influential technological factor in predicting teachers' attitudes, whereas PEOU plays a secondary role, becoming relevant only when usefulness is absent. The personal variables of age and gender appear insignificant, and moderating factors related to organisational climate, such as adaptability and innovation, do not significantly affect the relationship between independent and dependent variables in the model. This finding suggests that, for teachers, recognising the direct benefits of gamification for their courses outweighs the influence of ease of use or demographic and organisational factors in shaping a positive attitude toward adopting this methodology.

Our results indicate that teachers are more likely to adopt gamification if they perceive it as a beneficial tool for achieving their instructional goals. Thus, perceived usefulness directly correlates with teachers' intentions to integrate gamified methods in their courses. This aligns with previous studies, such as those by Jou et al. (2023), Saeed Al-Marouf et al. (2020), Sharma and Srivastava (2019), and Pando-García et al. (2016), all of which observed positive impacts of perceived usefulness on technology adoption intentions. In the absence of perceived usefulness, ease of use also plays a role in shaping attitudes, albeit to a lesser extent. However, when both variables are considered together, perceived usefulness overshadows ease of use, supporting evidence from Kang and Hwang (2022) and Buabeng-Andoh (2021) that ease of use may function as an antecedent to perceived usefulness.

The role of attitude in technology adoption, as demonstrated in this study, is consistent with findings from student-focused research, such as that by Raposo and Do Paço (2011), which suggests that strategies aimed at altering personal attitudes are more effective in promoting new methodologies than knowledge-based approaches alone. Accordingly, university policies designed to enhance gamification should prioritise training programs that emphasise the practical benefits of gamification and foster positive attitudes toward its use. Merely providing technical instruction on gamification is

unlikely to increase adoption unless it is accompanied by efforts to shift attitudes and highlight gamification's applicability in course content.

Interestingly, our findings did not support a moderating role of organisational climate in influencing the effects of perceived usefulness and ease of use on teachers' intentions to adopt gamification. This result diverges from previous studies, such as Gonen and Lev-Ari (2016), which highlighted the importance of organisational support and climate in fostering favourable attitudes toward technology adoption. This discrepancy may indicate that factors such as institutional support for innovation and adaptability are less critical in educational contexts where individual perceptions of usefulness dominate teachers' attitudes toward implementing new methodologies.

Regarding demographic control variables, age does not significantly impact the model, contrary to the findings of prior research, including Platero Jaime et al. (2017), Hamari and Nousiainen (2015), and Goodwyn et al. (1997), which generally suggested that older age negatively influences teachers' technology adoption. This result could imply that, in the specific context of gamification in entrepreneurship education, age-based differences may be diminishing, potentially due to increasing exposure to digital tools across age groups.

Furthermore, gender also proved insignificant in predicting teachers' attitudes toward gamification. Although our sample was unbalanced in terms of gender (with 30.53% female representation), this finding suggests that gender-based differences in attitudes toward gamification are minimal in this context. This contrasts with previous studies, such as Bonanno and Kommers (2008) and Bressler and Bodzin (2013), which found significant gender differences in technology adoption. Future research could explore this result further, examining whether gender-based attitudes toward educational technologies have evolved in recent years, especially as digital literacy becomes more widespread across both male and female educators.

6 Limitations and future research

This study has certain limitations that open up opportunities for future research. First, while the current sample provides valuable insights into faculty attitudes toward gamification in entrepreneurship courses, expanding the sample to include a more diverse and globally representative group of faculty could significantly enhance the depth and generalisability of the study's findings. Second, the research model employed in this study is an adaptation of the TAM. Future extensions could integrate elements from the extended TAM, the Unified Theory of Acceptance and Use of Technology (UTAUT), and Flow Theory, incorporating intention as a dependent variable. Methodologically, the inclusion of structural equation modelling (SEM) would allow for a more comprehensive analysis of the newly introduced variables and their relationships.

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