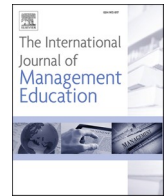


Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

The use of gamification strategies to enhance employees' attitudes towards e-training systems

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ARTICLE INFO

Keywords:

E-training

Gamification

Employees

Technology acceptance model

ABSTRACT

Organisations are increasingly using gamification strategies to enhance online training experiences and engage employees. Despite extensive research in the educational field, few studies have been carried out in the working setting. Drawing on the technology acceptance model (TAM), this study investigates whether and how game elements included in e-training systems enhance employees' attitudes towards e-training systems. Data from 1178 employees of a Germany-based international company were analysed using structural equation modelling. The results showed that some game elements, such as challenges and narrative, increased employees' enjoyment, while others, such as clear goals and feedback, had no significant influence. They also confirmed that employees' enjoyment of the gamified e-trainings increased their perceptions of ease of use and usefulness which, in turn, enhanced employees' attitude towards gamified e-training systems. The study provides theoretical and practical implications to support the development of more effective gamified e-training designs.

1. Introduction

Organisations operate in a competitive and dynamic business world, where employees have to continually expand and update their knowledge, skills and abilities. To deliver and manage training processes more effectively, different technologies-based approaches, such as e-learning and e-training, have been adopted (Batalla-Busquets & Martínez-Argüelles, 2014; Panigrahi et al., 2018; Stone et al., 2015). According to the [Training Industry Report \(2022\)](#), 93% of organisations deliver some of their mandatory and compliance training online, and 56% deliver it completely online. The size of the global corporate e-learning market, which reached a value of \$17.2 billion in 2019, and is expected to reach a value of over \$37 billion by 2026 (Statista, 2022), confirms the importance of this form of training.

E-learning/e-training platforms distribute content and provide anytime/anyplace access to learning. E-learning is also more effective than traditional learning methods for tailoring training content to learners' needs. In particular, the possibilities that e-training systems give, such as continuous access and learning personalization, enhance employees' commitment (Zareif & Navimipour, 2016). In addition, e-learning technologies may present materials in an interesting way to attract learners (Rawashdeh et al., 2021). However, learners face challenges when interacting with e-learning systems (Zhao et al., 2021). In fact, the dropout rate of e-learning is considered a critical issue for its sustainability (Zhou et al., 2020). E-learning methods are less likely than are face-to-face

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<https://doi.org/10.1016/j.ijme.2023.100892>

Received 19 June 2023; Received in revised form 21 September 2023; Accepted 24 October 2023

Available online 27 October 2023

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learning methods to engage learners during the training experience, given that they provide less opportunities to socialise, practice and receive feedback (Rawashdeh et al., 2021; Stone et al., 2015). E-learning favours self-directed learners, while individuals with low self-regulation and willpower find it difficult to maintain their motivation (Rawashdeh et al., 2021). Using technologies can also require additional effort and distract learners from understanding the learning content (Maatuk et al., 2022; Rawashdeh et al., 2021).

To overcome the challenges set by, and limitations of, e-training, many organisations have adopted gamification strategies. These strategies, which use game design elements such as points, leaderboards, stories, rewards, challenges, competitions in non-game contexts (Deterding et al., 2011), have been widely applied and analysed in the educational context at different levels, from primary/elementary school to university (e.g., Bouchrika, Harrati, Wanick, & Wills, 2019; Buckley & Doyle, 2016; Dindar et al., 2021; Hassan, Habiba, Majeed, & Shoaib, 2021; Huang et al., 2019; Li & Chu, 2021; Qiao et al., 2023; Sailer & Sailer, 2021; Yildirim & Sen, 2021). However, their effectiveness for, and impacts on, employee learning in the workplace remain unclear (Grünewald et al., 2019; Wang et al., 2022). Indeed, analysing the effects of gamification in the workplace is challenging.

Many prior studies suffer from methodological limitations, which limit the generalisability of their results. For example, some works use small sample sizes (Gerdenitsch et al., 2020; Mahat et al., 2022), while others use student samples (e.g., Alcivar & Abad, 2016; Kwak et al., 2019; Park et al., 2019; Petrykina et al., 2021; Santhanam et al., 2016) and, therefore, do not explore the real-life implementation of gamified training systems in organisations. In addition, previous studies into gamified professional training lack methodological rigour (as most use unvalidated measurement instruments) and theoretical foundations (Mahat et al., 2022). Moreover, more research is needed to assess the effectiveness of game elements (Mahat et al., 2022; Wang et al., 2022).

To address these gaps, drawing on the technology acceptance model (TAM; Davis, 1989), this study investigates the effect of gamification on employees' attitudes towards gamified e-training systems. In particular, this work proposes and tests a research model to analyse whether, and if so how, game elements embedded in e-training systems (i.e., clear goals, challenges, feedback and narrative) increase employees' enjoyment of the training experience and, in turn, how this enjoyment effects technology acceptance variables: perceived ease of use, perceived usefulness and employees' attitudes towards gamified e-training systems.

The structure of the article is as follows. First, the theoretical background and the proposed research model are presented. Subsequently, the methodology used and the results obtained are described. Finally, the main conclusions and the limitations and future research lines are discussed.

2. Gamification in the workplace

Gamification is the process of transforming any activity, system, service, product or organisational structure to provide game-like experiences, with the final aim of affecting users' behaviours (Koivisto & Hamari, 2019). Gamification has been widely applied by organisations to support human resources' processes, such as recruitment (e.g., Buil et al., 2020), training and education (e.g., Alcivar & Abad, 2016; Wang et al., 2022) and management systems (e.g., Silic et al., 2020).

Gamification in intra-organisational settings can affect employees' attitudes and behaviours (Wunderlich et al., 2020). Through affective pathways it promotes worker enjoyment, and through informational pathways it increases the visibility, comparability and immediacy of performance information (Cardador, Northcraft, & Whicker, 2017). Previous literature has identified several benefits of gamification: it facilitates online education in the organisational context (Pierce, 2019), encourages voluntary learning among employees (Kim, 2021; Wang et al., 2022), improves employees' motivation (Friedrich et al., 2020; Mitchell et al., 2020) and increases trainees' engagement and learning (Park et al., 2019) and their knowledge, skills, and abilities in organisational related tasks (Mahat et al., 2022). In summary, suitable, well-designed gamification-based employee training can produce positive employee learning outcomes (Armstrong & Landers, 2018).

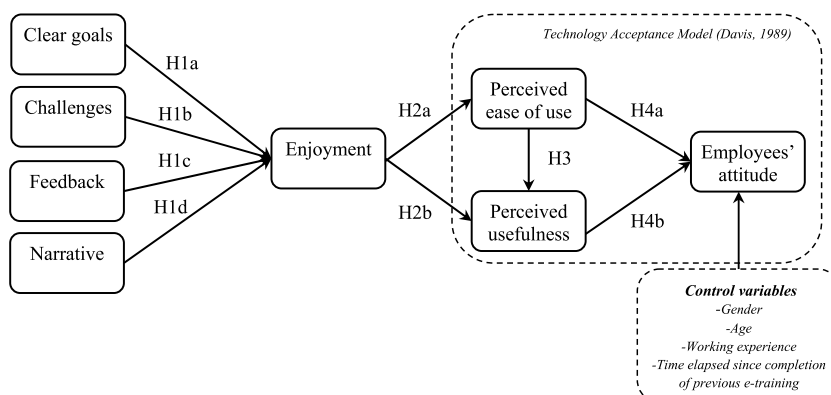


Fig. 1. Proposed model.

3. Theoretical background and research hypotheses

Over the last decades, much attention has been paid to the identification of the factors that drive the acceptance of new technologies. The technology acceptance model (TAM), proposed by Davis (1989), is widely applied in the context of e-learning (e.g., Granić & Marangunić, 2019; Szymkowiak & Jeganathan, 2022). The TAM suggests that individuals' attitudes towards specific technologies are predicted by two beliefs, their perceived usefulness, that is, the individual's belief that using a system will boost his/her performance, and their ease of use, that is, the individual's belief that interacting with the system will not demand additional effort (Davis, 1989).

The present study draws on this model to examine the effect of gamification on employees' attitudes towards a gamified e-training system. As depicted in Fig. 1, the research model predicts that game elements (i.e., clear goals, challenges, feedback and narrative) will lead to heightened enjoyment during the training experience and, subsequently, this enjoyment will affect technology acceptance variables: perceived ease of use, perceived usefulness and employees' attitudes towards gamified e-training systems.

Gamification in e-training systems can be formed by numerous game elements. This research examines the impact of four elements: clear goals, challenges, feedback, and narrative (Krath et al., 2021; Qian & Clark, 2016). First, an examination is made of the relationship between these elements and perceived enjoyment, that is, "the extent to which the activity of using the technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al., 1992, p. 1113).

Goals are considered to be central game mechanisms (Salen & Zimmerman, 2004). When designing educational games, it is important to include clear goals, as they help learners stay focused on the learning process (Kiili et al., 2014). Flow theory (Csikszentmihalyi, 1975) proposes that it is essential to clearly establish the goals of an activity for those who undertake it to experience flow and become immersed in the activity. In the e-learning setting, having clear goals helps learners reach flow states, which increases their hedonic value perceptions of online courses (Guo et al., 2016). Therefore, clear goals are design requirements for increased user enjoyment (de Almeida & dos Santos Machado, 2021).

Gamified systems set problem-solving challenges that demand effort to overcome (Werbach & Hunter, 2012). In e-learning environments, which lack personal interaction, when a balance is reached between the challenges set, and learners' skills, hedonic value perceptions increase due to the sense of flow experienced (Guo et al., 2016). Recent research has also found that the challenges set in gamified systems enhance users' enjoyment (Mulcahy et al., 2020).

Feedback is the provision of clear information about participants' performance (Fu et al., 2009) to bridge the gap between actual and expected performance. Feedback allows employees to understand how they are performing. Direct feedback on users' actions and progress can be provided by awarding points, displaying progress bars, and by sending instant messages (Krath et al., 2021). To increase players' enjoyment in gamified settings, such as serious games, they must be designed to provide immediate feedback to the participants (de Almeida & dos Santos Machado, 2021).

Finally, narrative is a dynamic element that presents a coherent ongoing story, or context, for learners (Aldemir et al., 2018). According to previous studies, visual narrative formats are more effective to acquire new concepts than traditional textbook formats (Rivo-López et al., 2022). Through storylines/narratives, learners experience increased feelings of competence and, in turn, their intrinsic motivation increases (Wee & Choong, 2019). In gamified learning environments, narrative may positively influence motivation, learning outcomes and immersion in the process (Aldemir et al., 2018).

Therefore, we propose:

H1a. Clear goals set in gamified systems positively influence employees' enjoyment of e-training.

H1b. Challenges set in gamified systems positively influence employees' enjoyment of e-training.

H1c. Feedback provided in gamified systems positively influences employees' enjoyment of e-training.

H1d. Narrative provided in gamified systems positively influences employees' enjoyment of e-training.

Systems perceived as enjoyable may be viewed as simple to use and productive (Venkatesh et al., 2002). Some studies have shown that perceived enjoyment positively influences users' perceptions of the ease of use of information systems (e.g., Laumer et al., 2012; Lee et al., 2019). Likewise, previous research has confirmed the existence of a positive association between users' enjoyment of, and fun gained from, a technology and their perceptions of the usefulness of the technology (e.g., Holdack et al., 2022; Laumer et al., 2012; Lee et al., 2019). Several studies have also demonstrated that users' perceptions of the ease of use and usefulness of e-learning systems are influenced by the enjoyment and fun they derive from them (e.g., Rizun & Strzelecki, 2020). Therefore, we posit:

H2. Employees' enjoyment of gamified e-training systems positively influences their perceptions of the (a) ease of use and (b) usefulness of the systems.

Attitude is defined as "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Davis, Bagozzi, & Warshaw, 1989, p. 984). In our context, employees' attitudes towards e-training systems refer to employees' affective feelings about the e-training systems. The TAM proposes that users' attitudes towards a particular technology will be more positive if they perceive it as easy to use and useful (Davis, 1989). In addition, the model proposes that if users perceive the technology is easy to use, they will regard it as effective and useful (Davis, 1989).

Previous studies have demonstrated that when a user perceives a technological system is easy to use, this creates in him/her the perception that the system itself is useful (e.g., Laumer et al., 2012; Lee et al., 2019; Manis & Choi, 2019; Venkatesh, 2000). For instance, prior research has found that if students perceive e-learning (Arteaga & Duarte, 2010; Szymkowiak & Jeganathan, 2022) or

learning management systems (Eraslan Yalcin & Kutlu, 2019) as easy to use, they will consider them as useful. Similarly, in the workplace, it has been confirmed that when employees believe that e-learning systems are easy to use, they tend to perceive they will increase their productivity and will be useful (Lee et al., 2011; Roca & Gagné, 2008).

Previous research has also supported the positive impact of the ease of use and the usefulness of technological systems on users' attitudes towards the systems (e.g., Arteaga & Duarte, 2010; Manis & Choi, 2019). For instance, students' attitudes towards learning management systems are influenced by their perceptions of system usefulness and ease of use (Moreno et al., 2017). Recent studies in the context of e-learning have also found that perceived usefulness and perceived ease of use positively affect students' attitude towards using distance learning tools (Rizun & Strzelecki, 2020) and e-learning (Mailizar et al., 2021). Similarly, Khan et al. (2023) analysed the adoption of e-learning technology during the COVID-19 pandemic from the academicians' perspective and found that perceived ease of use and perceived usefulness are significant factors in developing positive attitudes towards e-learning use among them.

Therefore, we propose:

H3. Perceived ease of use positively influences perceived usefulness.

H4a. Perceived ease of use positively influences employees' attitudes towards gamified e-training.

H4b. Perceived usefulness positively influences employees' attitudes towards gamified e-training.

4. Methodology

4.1. Data collection and participants

To carry out the research, a collaboration agreement with a Germany-based international company was signed. The company is present in more than 50 countries with a total workforce of about 14,000 and operates in the engineering and high-tech sector in the Industry 4.0 environment. The study participants were employees of this company, which are required to undergo gamified e-training courses in information security and data protection.

After getting the approval of the company's works council, data was collected in February and March 2021 using an online survey through Microsoft Forms. As company employees from different locations were surveyed, the questionnaire was first produced in English and, thereafter, with the support of a professional translation agency, translated into four other languages (i.e., German, Spanish, Portuguese and Chinese). An invitation to complete the questionnaire was sent to 8930 company employees from 11 different countries. A total of 1237 responded to the survey. After discarding invalid responses, the final sample consisted of 1178 employees.

Table 1 shows the sample characteristics.

4.2. Materials

The gamified e-training includes four game elements: clear goals, challenges, feedback and narrative context. First, the e-training clearly conveys the goals of the courses to the employees to ensure they understand the requirements necessary to successfully

Table 1
Sample characteristics.

Category		Percentage (%)
Gender	Men	76.3 %
	Women	16.8 %
	Prefer not to say	6.9 %
Age	<18 years old	0.3 %
	18–25 years old	4.8 %
	26–35 years old	23.1 %
	36–45 years old	24.4 %
	46–55 years old	24.7 %
	>55 years old	16.4 %
	Prefer not to say	6.3 %
Last time	<1 month	19.3 %
	1–3 months	34.5 %
	3–6 months	21.7 %
	6 months to 1 year	17.7 %
	>1 year	6.8 %
Location	APAC	14.4 %
	EMEA	66.3 %
	AMER	19.3 %
Working experience	<1 year	7.7 %
	1–5 years	29.9 %
	5–10 years	26.1 %
	>10 years	36.3 %

Note: EMEA: Europe, Middle-East, Africa; AMER: North, Central and South America; APAC: Asia-Pacific.

complete the training. Second, the e-training sets practical challenges, such as puzzles and drag-and-drop exercises, and achievements to attain, that is, the employees are challenged to successfully complete each course phase. Third, different forms of feedback are provided during the process, such as points, progress reports and immediate comments. Finally, in terms of the narrative, the courses show real and animated videos about how to react to potential cybersecurity threats. The stories in the videos immerse employees in a narrative context, and emphasise how important their actions are in ensuring information security in the company.

4.3. Measurement instrument

To ensure the content validity of the measures, that is, the degree to which the set of items that make up the scale represent the totality of aspects that characterize the variable to be measured (Nunnally & Bernstein, 1994), well-established scales were employed to measure the study variables (see Appendix A). The items were measured using 7-point Likert scales. The game elements were measured as follows: clear goals and feedback were assessed following Fu et al. (2009), challenges were measured following Silic and Lowry (2020) and narrative context used items adopted from Green and Brock (2000). To measure enjoyment, items were adapted from Venkatesh (2000). Perceived ease of use was assessed following Davis (1989) and Aparicio et al. (2019), and the items for perceived usefulness were adapted from Davis (1989). Attitude was measured following Hwang and Choi (2020). Finally, gender, age, time elapsed since completion of previous e-training and work experience in the company were included as control variables.

4.4. Common method bias

Procedural and statistical methods were used to assess whether the study suffered from common-method bias (Podsakoff et al., 2003). Participation in the study was voluntary and the responses were anonymous. Additionally, to prevent respondents from identifying cause-effect relationships among the constructs, the dependent and independent variables were presented on different pages of the survey. Regarding the statistical procedures, Harman's single factor test was used to detect whether common method bias existed. Results showed that no single factor accounted for the majority of the variance. In addition, the well-established method based on full collinearity tests proposed by Kock and Lynn (2012) and tested in Kock (2015) was used. Variance inflation factors (VIFs) were generated for all latent variables in the model. Then, VIFs were examined. As posited by Kock (2015, p. 7), "if all VIFs resulting from a full collinearity test are equal to or lower than 3.3, the model can be considered free of common method bias". In the proposed model, the higher VIF value was of 2.434, lower than the 3.3 threshold. Therefore, common method bias does not appear to be a significant problem in this research.

5. Results

Partial least squares (PLS) structural equation modelling, with SmartPLS 3.0 software, was used to test the hypotheses (Ringle et al., 2015). The following sections describe the measurement and the structural model results.

Table 2
Measurement model results.

Construct	Indicator	Factor loading	AVE	Cronbach's alpha	CR	Q ²
Clear goals	GOL1	0.963	0.926	0.920	0.962	N.A.
	GOL2	0.962				
Challenges	CH1	0.945	0.894	0.881	0.944	N.A.
	CH2	0.946				
Feedback	FED1	0.931	0.892	0.939	0.961	N.A.
	FED2	0.958				
	FED3	0.943				
Narrative	NAR1	0.928	0.876	0.929	0.955	N.A.
	NAR2	0.955				
	NAR3	0.925				
Enjoyment	ENJ1	0.953	0.907	0.949	0.967	0.394
	ENJ2	0.957				
	ENJ3	0.946				
Perceived ease of use	PEOU1	0.954	0.909	0.950	0.968	0.226
	PEOU2	0.949				
	PEOU3	0.957				
Perceived usefulness	PU1	0.947	0.898	0.943	0.963	0.469
	PU2	0.955				
	PU3	0.941				
Employees' attitude	ATT1	0.960	0.929	0.962	0.975	0.344
	ATT2	0.965				
	ATT3	0.967				

5.1. Measurement model

The reliability and validity of the constructs was first assessed (see Table 2). All standardised factor loadings were above 0.70 and statistically significant at 1%, which confirms that individual item reliability was adequate (Carmines & Zeller, 1979). The convergent validity of the constructs was also confirmed, since the average variance extracted (AVE) values were above the threshold of 0.5. In addition, all the constructs were internally consistent, as their Cronbach’s alpha and composite reliability (CR) values were all above the threshold of 0.7. Discriminant validity was analysed using three tests (Hair et al., 2017): cross-loadings, the Fornell-Larcker criterion, and the HTMT ratios. First, we proved that all indicators’ outer loadings on the associated construct were greater than any of their cross-loadings on other constructs. Next, we verified that the square roots of the AVEs of each construct were greater than the inter-construct correlations (Fornell & Larcker, 1981) (see Table 3). Finally, we also confirmed that all HTMT values were below the threshold of 0.90, and the normal bootstrap confidence interval of the HTMT did not contain the value 1 (see Table 4).

5.2. Structural model

A bootstrapping procedure with 5000 subsamples was used to assess the statistical significance of the standardised paths. The model explains 43.9% of the variance of enjoyment, 25.3% of perceived ease of use, 52.7% of perceived usefulness and 38.2% of attitude. The model has predictive relevance, as the Q² values for the dependent variables were all positive (Table 2). The standardised root mean square residual (SRMR) showed a value lower than the threshold of 0.08, which suggests that the model has good fit.

The results are presented in Fig. 2. As to the game elements, challenges ($\beta = 0.231$; $t = 8.586$) and narrative ($\beta = 0.501$; $t = 14.721$) promoted enjoyment during the gamified e-training experience, supporting H1b and H1d. However, neither clear goals ($\beta = 0.046$; $t = 1.153$) nor feedback ($\beta = 0.011$; $t = 0.303$) increased enjoyment, rejecting H1a and H1c. Enjoyment users experienced while interacting with the e-training system was positively related to perceived ease of use ($\beta = 0.503$; $t = 21.997$) and perceived usefulness ($\beta = 0.461$; $t = 16.837$), supporting H2a and H2b. Perceived ease of use also influenced perceived usefulness ($\beta = 0.375$; $t = 12.166$), supporting H3. Finally, both perceived ease of use ($\beta = 0.090$; $t = 2.257$) and perceived usefulness ($\beta = 0.547$; $t = 15.849$) were positively associated with employees’ attitudes towards the gamified e-training, supporting H4a and H4b. The only control variable with a significant impact on employees’ attitude was gender ($\beta = -0.096$; $t = 3.690$); men showed more positive attitudes towards the gamified e-training than did women.

6. Discussion

This study analyses the effects of game elements used in a gamified e-training system on employees’ enjoyment and technology acceptance variables. The findings provided evidence that two of the elements –challenges and narrative– have the potential to increase employees’ enjoyment during workplace training. By contrast, clear goals were not found to affect employees’ enjoyment. This is contrary to the findings of previous literature which argued that goal setting gamification features and clear goals increase flow experience and, consequently, hedonic value (Guo et al., 2016). A possible reason for this outcome might be that clear goals are a necessary, but not sufficient, condition to increase employees’ enjoyment and playfulness. Similarly, feedback did not increase employees’ enjoyment. Although unexpected, these results are in line with other works which found that feedback and self-tracking gamification features, such as progress indicators, have no impact on individuals’ enjoyment (Mulcahy et al., 2020), flow experience or hedonic values (Guo et al., 2016). In the context of a gamified student response system, Buil et al. (2019) also found that students’ perceptions of autotelic experience (i.e., enjoyment) are not influenced by goal clarity and feedback while using clickers.

The enjoyment that the employees derived from the gamified e-training led them to perceive the system as easy to use and useful. This result contributes to the debate about the causal direction between enjoyment and perceived ease of use (Sun & Zhang, 2006), by proving that enjoyment with the e-training system fostered employees’ perceptions of the ease of use and usefulness of the system. In line with the TAM, this research also demonstrated that when employees perceive that e-training systems are easy to use, this fosters their sense that they are useful, and that employees’ perceptions of the ease of use and usefulness of e-training systems foster positive attitudes towards the systems.

Table 3
Fornell-Larcker test.

	1	2	3	4	5	6	7	8
1. Clear goals	0.962							
2. Challenges	0.246	0.945						
3. Feedback	0.731	0.219	0.944					
4. Narrative	0.613	0.394	0.578	0.936				
5. Enjoyment	0.418	0.442	0.385	0.626	0.952			
6. Perceived ease of use	0.663	0.211	0.641	0.637	0.503	0.953		
7. Perceived usefulness	0.518	0.448	0.490	0.648	0.650	0.607	0.947	
8. Employees’ attitude	0.409	0.333	0.369	0.587	0.626	0.424	0.607	0.964

Note: Diagonal elements are the root squared AVE values. Elements below the diagonal are the constructs’ correlations; N.A.: not applicable.

Table 4
Heterotrait-monotrait (HTMT) ratios.

	Clear goals	Challenges	Feedback	Narrative	Enjoyment	Perceived ease of use	Perceived usefulness
Challenges	0.273 [0.211; 0.331]						
Feedback	0.785 [0.736; 0.828]	0.239 [0.177; 0.297]					
Narrative	0.666 [0.614; 0.715]	0.433 [0.372; 0.492]	0.619 [0.563; 0.672]				
Enjoyment	0.446 [0.390; 0.498]	0.484 [0.426; 0.540]	0.404 [0.351; 0.456]	0.664 [0.620; 0.705]			
Perceived ease of use	0.708 [0.650; 0.758]	0.227 [0.168; 0.284]	0.677 [0.615; 0.730]	0.678 [0.630; 0.726]	0.525 [0.475; 0.572]		
Perceived usefulness	0.555 [0.494; 0.612]	0.492 [0.431; 0.545]	0.517 [0.456; 0.574]	0.690 [0.640; 0.734]	0.686 [0.644; 0.723]	0.637 [0.584; 0.688]	
Employees' attitude	0.435 [0.372; 0.496]	0.362 [0.302; 0.418]	0.385 [0.326; 0.448]	0.620 [0.566; 0.668]	0.655 [0.612; 0.693]	0.440 [0.380; 0.500]	0.636 [0.584; 0.682]

Note: The values in brackets represent the 95% bias-corrected and accelerated confidence interval of the HTMT values.

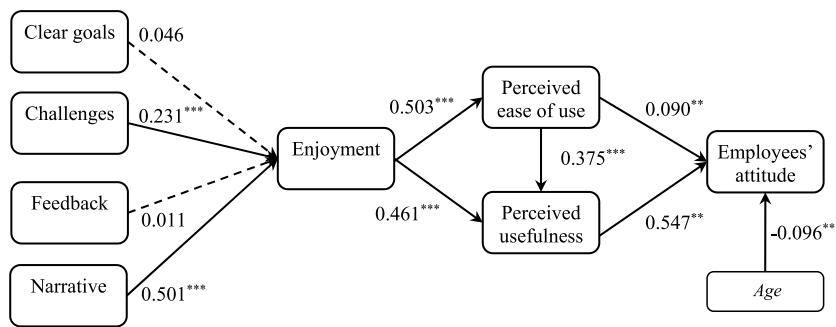


Fig. 2. Structural model result.
Note: ***p < 0.01; **p < 0.05.

6.1. Implications

This study makes several contributions. First, gamification outcomes are highly dependent on the operating context and on their users. Therefore, although gamification has been widely analysed in the educational context (Koivisto & Hamari, 2019), it is unclear if the results can be directly transferred to employee training and education in the workplace. Clearly, there is a need for more research into whether gamification can “ludify” strictly work-related domains (Wolf, 2019). Thus, the present study attempts to bridge, in the context of employee training, this gamification-based research–practice gap (Armstrong & Landers, 2018). By doing so, this study responds to calls in the literature for investigations to be undertaken into the use of gamification in intra-organisational contexts (Wunderlich et al., 2020) and in employee training (Landers & Armstrong, 2017; Perryer et al., 2016; Wang et al., 2022).

Second, this study overcomes some of the methodological shortcomings in the work-related gamification literature, such as the use of small samples and the use of student samples, by analysing the perceptions of 1178 employees of a multinational organisation, using previously validated measures. By doing this, the present study also responds to the calls for more research on TAM investigating a wider variety of types of users (Granić & Marangunić, 2019).

Third, the effectiveness of gamification may differ between voluntary and non-voluntary contexts (Hamari & Koivisto, 2015), and when the gamified system is more utilitarian than hedonic in nature, that is, in a work context. The present study contributes to the literature by analysing a gamified system in a workplace-based (utilitarian) mandatory use context.

Finally, previous studies examining gamification (e.g., Koivisto & Hamari, 2019; Rapp et al., 2019), have emphasised the need for more research into the effects of specific game elements. Similarly, a recent literature review on gamified training called for more research into a wide range of game elements to better understand why, and how, they function, and under which circumstances they work best (Mahat et al., 2022). The present study responds to this call and, in so doing, provides new insights into the effects of game elements included in gamified corporate training systems.

This study has a number of practical implications for organisations, human resources departments and designers and providers of e-training systems. Specifically, to ensure that employees develop positive attitudes towards e-training, the training should be designed to persuade the recipients to perceive it as easy to use, and useful for increasing their knowledge. Specifically, e-training systems should be designed such that they can be operated intuitively, and not present the employees with so many functionalities that they become technologically burdensome and, indeed, be seen to impose higher workload. Creating positive perceptions about ease of use is

of great importance, because these will help employees handle training tools with a sense of autonomy. The study also demonstrated that employees' enjoyment is critical, as it influences their perceptions of ease of use and usefulness. This research has shown that, of the game elements analysed, the two which most effectively foster enjoyment are challenges and narratives. In consequence, this study provides detailed and actionable recommendations on the design of effective gamified e-training systems for organisations. With the aim of increasing employees' enjoyment during the training experience, e-training systems should present interactive elements, such as challenges and narrative contexts. In particular, game elements should be included as follows. E-training systems may incorporate problem-solving tasks and challenges with a level of difficulty that match employees' abilities and convey feelings of accomplishment. Challenges and quests may take the form of demanding tasks and practical exercises, such as puzzles and drag-and-drop activities, which keep learners active and responsive during the training experience. In addition, to maximise learner comprehension, animated and real videos that show the content of the course in a meaningful way and through a storyline and narratives context should be used, rather than using descriptive/expository texts. As such, the use of video should be aimed at immersing employees in the training.

6.2. Limitations and future research

This investigation has limitations that offer opportunities for future research. First, this study uses cross-sectional data, which limits the possibility to draw conclusions about the long-term effects of gamified e-trainings. Future research might use longitudinal data to determine the long-term effects of gamified e-trainings and provide insights into possible causation. In this sense, it would be possible to analyse whether the initial positive effect of gamification due to the novelty of the course is maintained over time or decreases.

Second, the data was collected using a self-administered questionnaire. Although employees' perceptions provide important insights, it is also necessary to analyse the effectiveness of workplace-based gamified e-training systems through objective measures of employees' performance and learning outcomes. Therefore, future research should collect data directly from the e-training system, such as test scores, or data related to employees' actual behaviours. Thus, it would be possible to objectively assess whether gamification enhances learning outcomes and employees' skills and abilities, as well as their behaviours after completing the course.

Third, although the study has high ecological validity, since it examines an actual gamified e-training system, operated by a real organisation, the use of data from a single organisation reduces the generalisability of the results. Therefore, future research should expand the sample to consider employees from multiple companies across different countries and industries.

Finally, this research examines the effect of four specific game elements embedded in an e-training system. Future research should examine the effects of other game elements from different categories, such as social-oriented elements, so that organisations could easily customize their e-training systems according to employees' preferences. In addition, since organisations can use different approaches and solutions to train their employees, future research should carry out a comparative analysis between gamified e-trainings and other forms of training.

Funding

This study was supported by the Spanish Ministry of Economy, Industry and Competitiveness and the European Regional Development Fund (project ECO2017-82103-P); the Government of Aragon (GENERES Group S54_23R) co-financed by FEDER 2014–2020 'Building Europe from Aragon'; and the Spanish Ministry of Universities (pre-doctoral grant FPU19/01471 and 'Ayudas a la movilidad para estancias breves y traslados temporales de beneficiarios FPU' Ref: EST22/00295).

CRedit authorship contribution statement

Paula Bitrián: Conceptualization, Investigation, Methodology, Data curation, Formal analysis, Visualization, Writing – original draft. **Isabel Buil:** Supervision, Writing – review & editing. **Sara Catalán:** Conceptualization, Investigation, Methodology, Writing – review & editing. **Sarah Hatfield:** Supervision, Writing – review & editing.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix A. Constructs, items, and sources

Construct and source	Items
<i>Clear goals</i> Fu et al. (2009)	GO1. Overall learning goals are presented in the beginning of the e-training GO2. Overall learning goals are clear to me

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Construct and source	Items
Challenges Silic and Lowry (2020)	CH1. Completing the different practical exercises (such as puzzles) is challenging CH2. The different practical exercises of the e-trainings are demanding
Feedback Fu et al. (2009)	FE1. While I am completing the e-training, I receive feedback on the progress made (such as chapters completed) FE2. While I am completing the e-training, I receive immediate information on my success (or failure) FE3. While I am completing the e-training, I receive information on my score
Narrative Green and Brock (2000)	NAR1. While I was watching the videos, I could easily picture the events in them taking place NAR2. I could visualize myself in the events described in the videos NAR3. I was mentally involved in the videos while watching them
Enjoyment Venkatesh (2000)	ENJ1. I have fun completing the e-training ENJ2. I find the e-training enjoyable ENJ3. I find the e-training pleasant
Perceived ease of use Davis (1989); Aparicio et al. (2019)	PEOU1. The e-training is easy to use PEOU2. The e-training is well structured PEOU3. The e-training is easy to interact with
Perceived usefulness Davis (1989)	US1. The e-training improves my information security and data protection behavior US2. The e-training enables me to better react to potential cybersecurity threats US3. The e-training is useful
Employees' attitude Hwang and Choi (2020)	ATT1. Overall, my attitude toward the e-training is bad/good ATT2. Overall, my attitude toward the e-training is unfavorable/favorable ATT3. Overall, my attitude toward the e-training is negative/positive

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