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Article

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An empirical study on the impact of learning theory on gamification-based training programs

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Abstract

Purpose – This study aims to investigate gamification-based training program through the lens of self-determination theory and in the context of corporate training programs. It integrates the self-determination theory, game elements and learning outcomes in gamified training programs to derive insights.

Design/methodology/approach – Data is sourced from software development companies operating in the city of Bangalore in India. It applies the partial least square structural equation modeling to investigate the relationship between the self-determination learning theory and game elements and the impact it has on learning outcomes.

Findings – As a precursor to the development of a game-like learning ecosystem, the authors study the perception of trainers and human resource managers toward game-based training programs in the organization. The authors find that game-based learning makes training more engaging, immersive and contextual for the learners.

Research limitations/implications – The study is based on a specific sector, i.e. software development companies, and so the results may lack in generalizability. Future research, therefore, may consider other industrial sectors such as manufacturing, banking and telecom to understand the relationship between the constructs.

Practical implications – This study provides insights for the trainers, human resource managers and academicians on the effectiveness of gamification-based training programs. It also provides information on how the learning theory can be leveraged to understand gamification-based training programs.

Social implications – This work fulfills an identified need of the training industry to understand new methods of training with an aim to improve the learning outcomes among the learners.



Originality/value – This study provides a deep understanding on the effectiveness of training tools such as gamified training programs in enhancing and improving the learning outcomes among the learners.

Keywords Gamification, Gamified, Learning, Psychology, Education

Paper type Research paper

1. Introduction

Gamification-based learning is gaining popularity among the academia and the corporates (Klock, Gasparini, Pimenta, & Hamari, 2020). In academics, gamification is applied to enhance students' interest and engagement in learning (Koivisto & Hamari, 2019).

Game elements are adopted to provide real-life situations of work through gamification-based training program (York & deHaan, 2018). Gamification-based training programs are aligned to strategic objectives with the purpose of achieving organizational goals (Schöbel et al., 2020). Research reveals that gamified training programs provide a unique ecosystem of learning that creates interest among the learners and increases their engagement with the content (Landers & Armstrong, 2017; Coull et al., 2017; Pereira, Oliveira, Vieira, Lima, & Paes, 2018). Klock et al. (2020) conducted a meta-analysis on gamification and found that it greatly helped to support learning outcomes in students in higher education institution.

Studies on gamification in academics and corporates have included constructs such as motivation, engagement, academic performance, socialization and collaboration. While designing games, developers add several training elements, such as leaderboards, badges, challenges, group competition, levels, storytelling, points, feedback, avatars, social points, feedback, rewards, likes and achievements to motivate the learners to take control over their learning journey. These elements provide information about the training contents and improve the engagement in the training program. However, studies on the effectiveness of game elements and learning outcomes remain limited from the research perspective (Gokhale & Kulkarni, 2022; Tu, Hsieh, & Feng, 2019; Aldemir, Celik, & Kaplan, 2018).

Extant research has applied various learning theories to understand gamification. Some of these theories include the self-determination theory, flow theory and goal-setting theory. However, the studies on gamification and learning theories are more confined to the academic eco-system leaving room for more research in the corporate setting (Huang, Hew, & Lo, 2019; Jurgelaitis, Čeponienė, Čeponis, & Drungilas, 2019; Rachels & Rockinson-Szapkiw, 2018; Groening & Binnewies, 2019).

Further, more research is needed on learning theories, gamification elements and selecting the right constructs of the training outcomes from the perspective of a corporate eco-system.

To fill this gap in literature, the current research uses the self-determination theory of learning to understand factors, such as employee engagement and their readiness to adopt gamification in corporate training. The study also provides insights into the effectiveness of the gamification elements in corporate training.

2. Literature review

The literature review is conducted from two perspectives, first, learning theories and gamification and, second, on the elements of gamification and training outcomes.

2.1 Learning theories and gamification

Learning theories have been developed based on various disciplines such as education, psychology, sociology and neuroscience (Zimmerling, Höllig, Sandner, & Welp, 2019). In

the past, learning theories were more focused on education; however, in recent times, their use has been extended to include other domains such as human resources management (Gupta & Gomathi, 2017).

In case of gamification and its impact on learning outcomes in students, research has extensively applied the self-direction theory, flow theory and goal setting theory (Huang et al., 2019; Magylaitė, Čeponienė, Jurgelaitis, & Danikauskas, 2020; Rachels & Rockinson-Szapkiw, 2018; Groening & Binnewies, 2019; Nishihara, Parwak, Edogun, Park, & Lee, 2020). Gamification has also been studied through the lens of the cognitive evaluation theory, behavior reinforcement theory, social comparison theory, rational choice theory, self-efficacy theory, constructivist learning theory and technology-enhanced training effectiveness model (Lopez & Tucker, 2019; Landers & Armstrong, 2017; Rachels & Rockinson-Szapkiw, 2018).

Among these, the most commonly used theories include the self-determination theory, flow theory and goal-setting theory (Gupta & Gomathi, 2017). The self-determination theory is focused on factors that help to enhance an individual's sense of autonomy, competence and their ability to relate to the training programs (Nishihara et al., 2020). This theory mentions that higher the satisfaction of learners higher is their motivation to self-learning (Buil, Catalán, & Martínez, 2020). The second most commonly used theory is the flow theory proposed by Csikszentmihalyi (2017). The theory states that learners are motivated by learning environments that are challenging and this creates a flow toward further learning (Rachels & Rockinson-Szapkiw, 2018). The third theory, the goal-setting theory, helps to identify the factors that motivate learners to achieve the learning goals (Groening & Binnewies, 2019).

From the above discussion, it becomes clear that the self-determination theory identifies the factors that should be included in any gamification program to motivate the learners to engage with the course and take control over their learning journeys (Dale, 2014). The flow theory of learning identifies the factors that can keep the learning flow going in the learners (Bai, Foon, & Huang, 2020). The goal setting theory favors the setting up of learning goals and then designing gamification content in a way that motivates the learners to fulfill them (Fortes Tondello et al., 2018).

Previous studies (Zimmerling et al., 2019; Larson, 2020) indicate that the flow theory of learning and the goal setting theory of learning have been more predominantly used in the research pertaining to learning and development programs (Nebel, Schneider, Schledjewski, & Rey, 2017).

2.2 Game elements and learning outcomes

Studies have reported improvements in the academic performance of the participants involved in gamification-based learning (Sanchez, Young, & JounEAU-Sion, 2017). Studies also report to an increase in engagement in the learners, while also promoting collaboration and behavioral change (Huang et al., 2019; Landers & Armstrong, 2017; Wu, 2018; Bouchrika, Harrati, Wanick, & Wills, 2019; Buckley & Doyle, 2017). However, the benefits of gamification can only be realized when the games include the right elements of self-motivated learning (Ding, 2019; Bouchrika et al., 2019; Buckley & Doyle, 2017; Baxter, Holderness, & Wood, 2017; Morschheuser, Hamari, & Koivisto, 2016).

Several game elements are applied in any gamification program, and these are listed in Table 1. The studies (Denden, Tlili, Essalmi, & Jemni, 2017; Hallifax et al., 2019; Klock et al., 2020) indicate that points, leaderboards, challenges, ranking and scores are the most popular gaming elements applied in the gamification-based training programs.

Elements	Details	References
Points	Points means score points which provide feedback to the individual in the gamified training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
Leaderboards	Leaderboards are the engagement-based activities that reflect the higher score achieved by the trainees in the gamification training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
Challenges	Challenges are the motivation actions to accomplish a task in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Ranking	Ranking is the display of points and position of the training participants and teams in the gamification program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Badges	Badges are the symbols assigned to the participants to accomplish a task in the gamified training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Progress bars	Progress bars are the tools to provide feedback to the participants in the gamified training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
Narrative	Narrative is the method of information provided to the participants for taking the right actions in the gamified training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Medals	Medals are the visual representation of achievement in a gamification training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Storyline	Story includes information related to the backstory and the ongoing plot of the game in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Levels	Levels provide information to the participants on the gamified version of content progression in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Certificates	Certificates are the symbols of mastery achieved over a particular skill in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Virtual goods	Virtual goods are the products and services that are applied in the gamified training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Achievements	Achievement indicates the participant's merit in the gamified training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
Avatars	Avatars are the icons which represent the application of product and services in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019

Table 1.
Elements in gamification

Several studies have been conducted to understand the role of gamification in supporting learning in the academic settings (Ding, 2019; Bouchrika et al., 2019; Buckley & Doyle, 2017; Baxter et al., 2017; Morschheuser et al., 2016). However, there is much scope for research in the context of corporate training.

The above discussion points to three directions for further research. First, how to leverage the self-determination theory to identify elements to use in designing game-based programs for a corporate setting. Second, understand the compatibility of gamification

elements while designing a corporate training program. Third, evaluate the effectiveness of gamification elements on the learning outcomes of a training program.

3. Theoretical framework

To reiterate from the previous section of literature review, self-determination theory of learning is related to an individual's self-determination and self-motivation toward achieving set goals. It is important to understand the influence of the learning theory and its impact on the game elements and learning outcomes from the perspective of gamification-based training program. Based on this discussion, we develop a theoretical framework for the study. This section describes the self-determination theory, the game elements and the learning outcomes achieved through gamification-based training programs.

3.1 *Self-determination theory*

The theory of self-determination was proposed in the special issues of contemporary educational psychology (Ryan & Deci, 2000). Over the period of time, the self-determination theory has found great use in the context of education and training (Tansley, Hafermalz, & Dery, 2016).

This theory is based on three needs of the learner, namely, autonomy, competence and relatedness. Autonomy is the sense of initiative and ownership toward an action. Competence is the ability to master new concepts, and finally, relatedness refers to the ability to connect to the subject and experience a sense of belonging with the work (Ferguson, Van den Broek, & Van Oostendorp, 2020).

From the perspective of gamification, all the three components of the self-determination theory must be integral elements of the course design process. Accordingly, this study includes these components to understand how they can support learning outcomes in gamification-based training programs.

3.2 *Game elements*

Gamification has been extensively applied in the educational ecosystem (Dicheva, Irwin, & Dichev, 2017) to improve students' engagement and motivation. The engagement and motivation can be achieved by incorporating the right game elements for the training program (Landers & Armstrong, 2017).

Some examples of concrete elements are those that are typically seen in games, such as badges and leaderboards, while the more abstract examples are time constraints and styles of games (Landers & Armstrong, 2017).

An alternative perspective divides game elements into three categories: dynamics, mechanics and components (Landers & Armstrong, 2017). The dynamic element consists of the high-level aspects of the game that have to be considered and managed, such as emotions, narrative and progression. The mechanics element consists of processes that engage players by taking the actions forward, such as challenges, competition and cooperation (Landers & Armstrong, 2017). The third category includes components that are either a specific form of mechanics or dynamics, such as achievements, avatars, badges and levels points (Landers & Armstrong, 2017).

The current study considers various game elements and the impact they have on the learning outcomes in corporate learning and development initiatives.

3.3 Learning outcomes

Learning evaluation is the systematic collection of information related to the training program. Constructive understanding of the specified outcomes is evaluated based on the learning outcomes (Kraiger, Ford, & Salas, 1993).

Learning outcomes are multidimensional, which means that learning may be evident from changes in cognitive, affective or skill capacities. A number of training evaluation models have been proposed, such as Kirkpatrick (1976, 1987), which includes four levels of evaluation: trainee reactions, learning, behavior and organizational results. Within this model, learning outcomes are measured by examining the extent to which trainees have acquired relevant principles, facts or skills (Alliger & Janak, 1989).

Generally, the training field has envisioned learning outcomes solely as changes in verbal knowledge or behavioral capacities (Bloom, 1956; Gagne, 1984). To advance the science and practice of learning outcomes, it is necessary to move toward a conceptually developed scheme of learning outcomes (Kraiger et al., 1993). Drawing from Blooms et al. (1956) and Gagne's (1984), the study includes three learning outcomes constructs, awareness of the participants, employee involvement and employee engagement in the training program. To elaborate on the constructs of the study, awareness includes aspects of knowledge related to the training program and its relationship to the learning outcomes (Schmidt & Ford, 2003); employee involvement, as the name suggest, refers to employee involvement in the training programs (Wolf & Zwick, 2008); and the construct of engagement includes the level of engagement of the employee in the training program (Chandani, Mehta, Mall, & Khokhar, 2016).

The present research adopts the self-determination theory to identify the factors that can improve learning outcomes in a game-based corporate training program. Accordingly, it considers the three vital factors proposed by the theory to improve learning outcomes, namely, autonomy, competence and relatedness. It proposes that the game-based training should be designed in a way to ensure learners have some autonomy on the course content, are able to build on their competence and can relate to the course and how they can meet their professional aspirations.

Our complete model shows the linkages between these three constructs of the self-determination theory and the gamification elements; refer to Figure 1.

4. Research methodology

To evaluate the impact of the learning theory on gamification-based training program in a corporate ecosystem, the study adopts a robust research strategy to capture the required information. This section also details the research design, research methods, measures, data analysis and measurement model and the response bias in the study. The summary of the research methodology is presented in Figure 2.

4.1 Research design

The present study is based on the responses from the trainers applying gamified training program, and therefore, the empirical research method is applied as the research strategy. The study aims to fulfill three objectives, first, to understand the role of self-determination learning theory in helping to design an effective gamification-based training program; second, to understand the compatibility of the gamification elements in a corporate training program; third, to understand the influence of the game elements on the learning outcomes of the corporate participants in the study. Based on the research strategy and objectives, we apply the formative research process to understand the impact of gamification on the learning outcomes of any corporate training program.

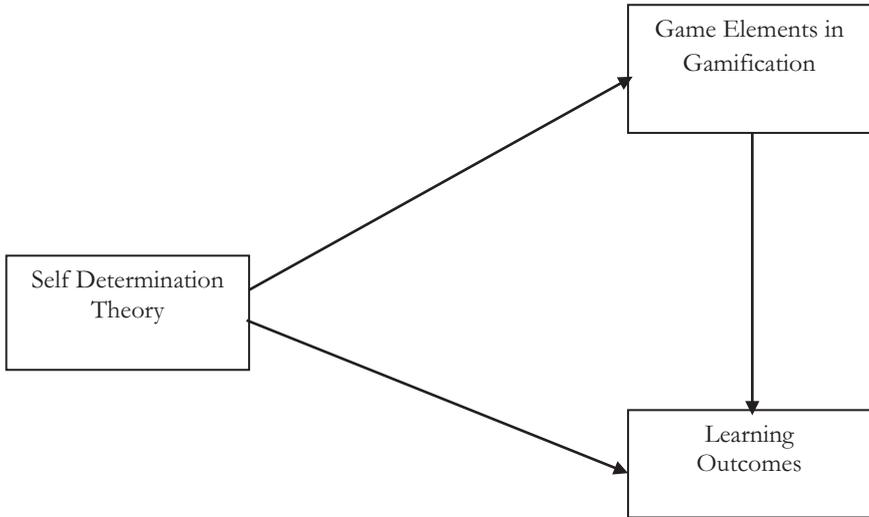


Figure 1.
Theoretical model of the study

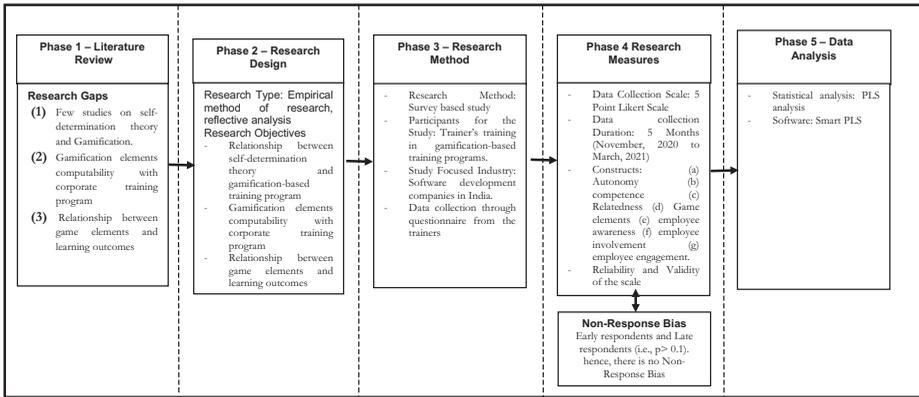


Figure 2.
Summary of research model for the study

4.2 Research method

Data is collected through survey-based methodology. The participants include trainers engaged in the gamification-based training program in software development companies in Bangalore. Data is collected from a database of software companies registered with NASSCOM India, Bangalore. About 5,000 companies operate in Bangalore, a city which is also known as the Silicon Valley of India. A total of 200 human resource managers and trainers from these software development companies were surveyed using a structured questionnaire to test the theorized relationships. We received responses from 114 respondents, out of whom 104 were males and 10 females. Demographic information of the respondents is provided in Table 2. The study applies the random sampling method to collect information from the respondents.

Table 2.
Profile of the participants

Variable	Frequency	(%)
<i>Gender</i>		
Male	104	91.23
Female	10	8.77
<i>Designation</i>		
Human resources manager	103	90.35
Training manager	11	9.65
<i>Age</i>		
25–35	17	14.91
35–45	55	48.25
45–55	42	36.84
<i>Experience</i>		
2–5 years	18	15.79
5–10 years	39	34.21
10–15 years	45	39.47
15 years and above	12	10.53

4.3 Measures

The data is collected through five-point Likert scale ranging from 1 as the lowest to 5 being the highest (1 = strongly disagree) and (5 = strongly agree). Participants were given a questionnaire to fill out. The aim of the questionnaire was to measure their perception about gamification in training and how it influenced the learning outcomes. The following constructs were developed for the study based on the self-determination theory and the various elements of gamification: autonomy, competence, relatedness, game elements, employee awareness, employee involvement and employee engagement. The study operationalizes the constructs as reflective constructs. The details of the constructs, along with the source of each measure, are provided in [Appendix](#).

4.4 Data analysis

The study applies smart partial least square (PLS) software to conduct the path analysis. The traditional PLS are measured as a combination of indicator weights without including the measurement errors ([Henseler et al., 2014](#)). Measurement errors often serve as additional indicators that correspond to actual indicators; together, real indicators and measurement errors might create bias. [Kock \(2017\)](#) opines that without looking at the errors of estimating, the use of compounds instead of factors leads to other known sources of bias. Path coefficients tend to be weak in relation to their corresponding true values. Thus, recent developments in the construction approach over traditional PLS strategies have helped to close the gap between factor-based and composite-based structural equation modeling strategies ([Kock, 2017](#); [Sarstedt, Hair, Ringle, Thiele, & Gudergan, 2016](#); [Anderson & Gerbing, 1988](#)).

4.5 Measurement model

Cronbach alpha is applied ([Cronbach, 1951](#)) to check the reliability of the constructs. Results, shown in [Table 3](#), indicate that the values are more than 0.6. The composition of the technique is tested by average variance extracted (AVE), and the results are more than 0.50 ([Flynn, Huo, & Zhao, 2010](#)). Results for the discriminant validity and cross-loading for discriminant validity are presented in [Tables 4](#) and 5. The total loading of each element (λ_i) is greater than 0.5, and the coefficients of the combined reliability scale are higher than 0.7 ([Flynn et al., 2010](#)).

4.6 Nonresponse bias

We test nonresponsive comparisons by comparing the first responders with the late responders. Early respondents are identified as those who responded in the first week of the study, and late respondents are those who responded in the last week of data collection (Armstrong & Overton, 1977; Chen & Paultraj, 2004). We perform a *t*-test for both the first responders and late respondents for all variables and do not find any significant differences between early respondents and late respondents (i.e. $p > 0.1$).

5. Results

The evaluation of the models focuses on estimating the validity of the constructs. The model includes composite reliability, item-wise reliability, AVE and estimating discriminant validity.

The model provides reliability and validity of the variables and so they are included in the model (Henseler, Ringle, & Sarstedt, 2012). The reliability results in Table 3 are over 0.7, testifying to the internal consistency among the constructs. AVE needs to be > 0.5 to reflect the validity of the variables.

Table 4 shows satisfactory convergent validity of the variables (Hair, Black, Babin, & Anderson, 2014). Figure 3 indicates loadings of more than 0.70, which is in the acceptable range (Dommeyer, Gross, & Ackerman, 2016). This indicates satisfaction for the reliability analysis of the study.

Discriminant validity needs to be above the minimum value of 0.5 (Dommeyer et al., 2016). Discriminant validity of the constructs shows higher values of more than 0.5 in AVE, refer to Tables 3 and 4.

Further, cross-factor loadings are shown in Table 5 and Figure 3. After analyzing the validity and reliability of the measurement model, the proposed structural model is analyzed (Figure 4) (Hair et al., 2014).

To analyze the significance of the structural relationship, we evaluate the path coefficients and their corresponding significance levels. To evaluate them, it is necessary to verify the significance of learning outcomes through the *t*-values and the strength of the relationships. This information is presented in Table 6.

The results from path coefficients show that the self-determination learning theory and learning outcomes are negative predictors of game elements. However, self-determination learning theory has a positive association with learning outcomes. The second assessment

Table 3.
Composite reliability
for all reflective
constructs

Reflective constructs	Composite reliability	AVE
Self-determination	0.856	0.664
Game element	0.861	0.572
Learning outcome	0.812	0.654

Note: AVE = average variance extracted

Table 4.
Results from
discriminant validity

Variables	Game element	Learning outcome	Self-determination
Game element	0.756	–	–
Learning outcome	0.658	0.808	–
Self-determination	0.776	0.799	0.815

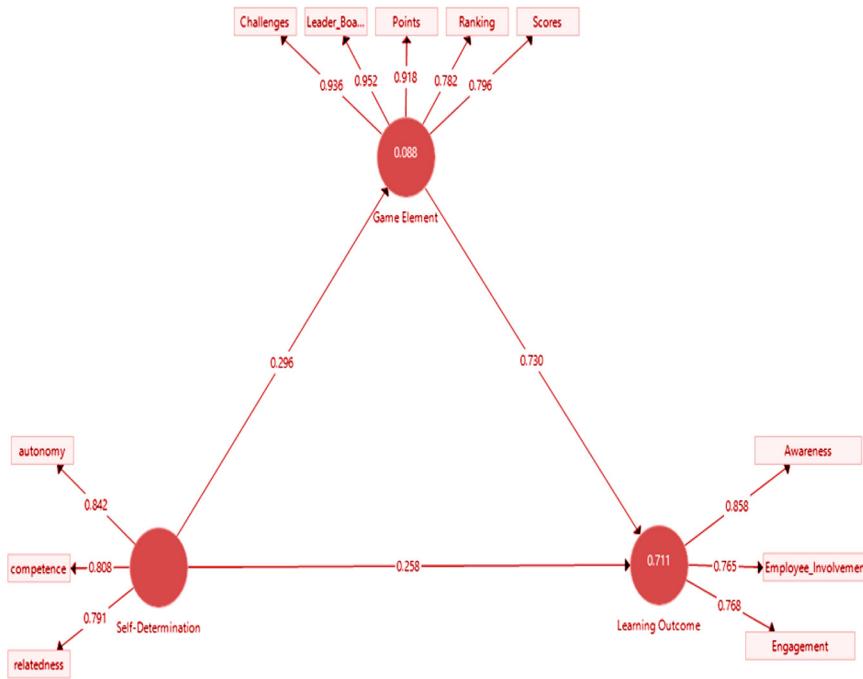


Figure 3. Conceptual model with PLS algorithm calculation

Constructs	Self-determination	Game elements	Learning outcome
Autonomy	0.842	–	–
Competence	0.808	–	–
Relatedness	0.791	–	–
Challenges	–	0.936	–
Leaderboard	–	0.952	–
Points	–	0.918	–
Ranking	–	0.782	–
Scores	–	0.796	–
Awareness	–	–	0.858
Employee involvement	–	–	0.765
Engagement	–	–	0.768

Table 5. Cross-loading for discriminant validity

in the PLS model is the value of R^2 . This value is assessed through 0.65. All above loading values are considered as substantial relationship; 0.33 as moderate relationship; and 0.19 as weak relationship (Chin, 1998). Table 7 provides the R^2 values obtained for the study. These values show that self-determination theory to game elements has a weak relationship (0.255); self-determination to learning outcomes has a substantial relationship (0.706), and game elements to learning outcomes have a moderate relationship (0.317).

The results with regards to f^2 values are interpreted as 0.02 as a small effect, 0.15 as a moderate effect and 0.35 as large effects on the latent variable; refer to Table 8. Self-determination on game elements shows 0.001, which is a small effect; self-determination on

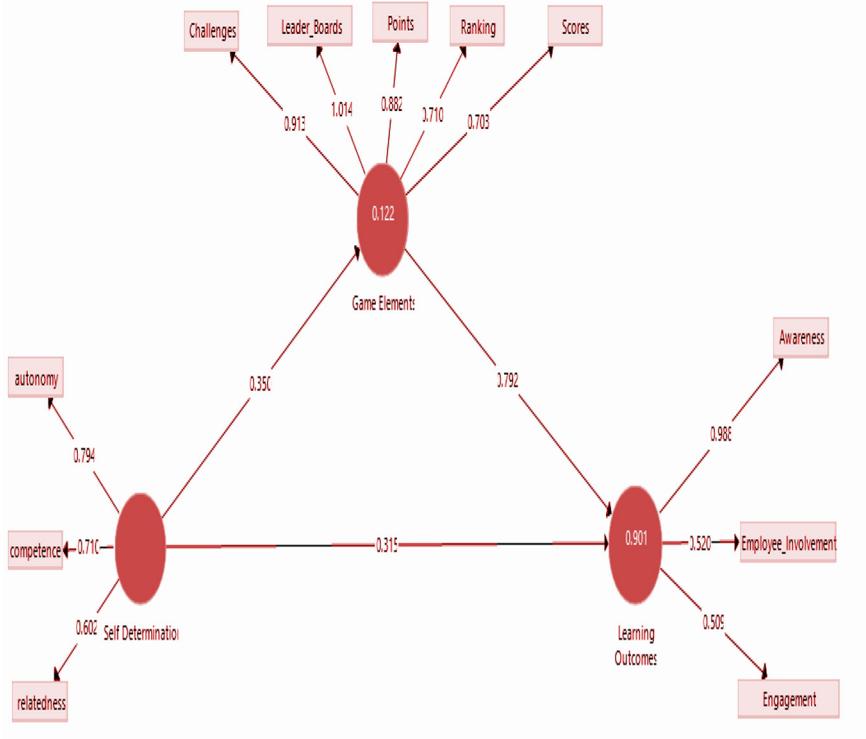


Figure 4. Structural model with PLS algorithm calculation

Table 6. Structural model assessment results

	Loadings	SD	T-stat	p-value	2.5%	97.5%
Self-determination – Game elements	-0.219	0.222	0.027	0.008	-0.684	-0.387
Self-Determination – Learning outcomes	0.455	0.457	0.054	0.001	0.122	0.015
Game elements – Learning outcomes	-0.276	0.283	0.012	0.011	-0.234	0.457

Notes: SD = standard deviation; T-Stat = t-statistic

Table 7. Results from R^2 and R^2 adjusted

	Original sample (O)	Sample mean (M)	SD	T-stat	p-values
Self-determination – Game elements	0.255	0.254	0.045	5.633	0.11
Self-Determination – Learning outcomes	0.706	0.306	0.043	7.061	0.00
Game elements – Learning outcomes	0.317	0.719	0.029	24.47	0.07

Notes: SD = standard deviation; T-Stat = t-statistic

learning outcomes is 0.042, which is a large effect, and game element on learning outcomes is 0.171, which is the moderate effect.

The results from the cross-validation redundancy value, which is greater than 0, have a predictive relevance. From the results shown in Table 9, it is observed that self-determination is

0.383, which is greater than 0, while learning outcomes is 0.071, which is also greater than 0. The game element value is 0.000.

The standardized root means square residuals (SRMR) are in the range of 0.10 and 0.08, which is considered good fit. The results, refer to [Table 10](#), show that SRMR is less than 0.08.

6. Discussion

The theoretical framework for gamification comprises three areas, namely, learning theories and gamification, elements of gamification and application of the constructs in designing game-based learning. In this study, existing academic literature on the application of gamification-based training in the corporate eco-system is examined to provide an answer to the influence of self-determination theory on gamified elements and learning outcomes, i.e. awareness, involvement and engagement, among the participants in corporate training programs

6.1 Role of self-determination theory in influencing gamified elements

A review of literature brings to light that the self-determination theory has been leveraged to identify game elements to include in gamified learning to improve learning outcomes in students in academic settings ([Aldemir et al., 2018](#); [Baydas & Cicek, 2019](#); [Ding & Yu, 2018](#); [Huang et al., 2019](#)).

Our study too evaluates the application of self-determination theory on game elements, albeit in the corporate setting, and finds a negative relationship between the two. However, studies conducted in the past have indicated that game elements have been effective in engaging the learners. However, from the perspective of the learning theory and game elements, our results are not encouraging. The reason for this difference can be attributed to

	Loadings	SD	T-stat	p-value	2.5%	97.5%
Self-determination – Game elements	0.001	0.216	1.215	0.022	0.331	2.611
Self-Determination – Learning outcomes	0.042	0.011	0.301	0.00	0.001	0.040
Game elements – Learning outcomes	0.171	0.422	0.305	0.089	0.423	3.522

Notes: SD = standard deviation; T-Stat = t-statistic

Table 8.
f² results

Variables	SSO	SSE	Q ² (=1-SSE/SSO)
Self-determination	1086	669.9	0.383
Game elements	1086	1086	0.000
Learning outcome	1448	1345.73	0.071

Notes: SSO = sum of squares of observation; SSE = sum of square errors

Table 9.
Cross-validated redundancy

	Saturated model	Estimated model
SRMR	0.054	0.044

Note: SRMR = standardized root means square residuals

Table 10.
Model fit

the fact that corporate trainers have to first evaluate and include in their training design game contents which are acceptable to the training objectives. They have to therefore incorporate the game elements that can enhance and improve the learning outcomes. Hence, our results indicate a negative relationship with regards to the game elements of gamification training program and learning outcomes.

6.2 Influence of self-determination theory on learning outcomes

Studies on the self-determination theory have focused on themes, such as engagement, socialization, achievements, performance, collaboration, enjoyment and behavioral change (Huang et al., 2019; Landers & Armstrong, 2017; Wu, 2018; Bouchrika et al., 2019; Buckley & Doyle, 2017). Our findings point to a positive relationship between the self-determination theory and gamification design vis a vis improving employee awareness and involvement and engagement with the course content. Hence, we conclude that the self-determination theory has a positive influence on the training outcomes in the gamified training programs in the corporate ecosystem.

6.3 Game elements and its influence on training outcomes

Gamified training applies game elements to communicate the training contents. Existing studies show that features such as points, leaderboards, challenges, ranking and scores are the most popular gaming elements (Denden et al., 2017; Hallifax, Serna, Marty, Lavoué, & Lavoué, 2019; Saleem, Noori, & Ozdamli, 2022; Klock et al., 2020). The present study indicates that game elements need to be selected from the context of organizational culture to support effective communication and learning outcomes.

7. Implications

At the theoretical level, our results suggest that prior findings on gamified learning are very valuable for designing gamified training for employees and higher education students (Sotos-Martínez, Ferriz-Valero, García-Martínez, & Tortosa-Martínez, 2022). However, our findings are different in that they suggest that it is important to incorporate the right game elements to have a positive impact on the training outcomes. These results contribute to recent theoretical debates about the role of gamified training in corporates training (Saleem et al., 2022; Haruna et al., 2021). Our findings imply that bonding forms of game elements, represented by learning outcomes, are valuable for making the training programs effective in the organization.

From a practical perspective, these results are instructive for trainers and organizations and as well as for the training policymakers. Training programs need to identify the right game elements to achieve learning outcomes. Trainers and human resource managers should evaluate and understand the game elements that are suitable for the training programs and organizational culture. Managers must regularly interact with the employees and reaffirm that selected game elements fit with their profiles and also the training design of the program.

8. Limitations and areas of future research

This study, being a cross-sectional study with a single source of data, is subject to concerns about causality and common method variance. Our sample size was small and confined to software development companies. Future research can consider other industrial sectors for greater insights.

Future research can also examine the differential impact of training programs on other industrial sectors and identify the right game elements for effective training programs. It can also investigate the selection of the right learning theory and the right game elements for effective learning outcomes.

9. Conclusion

Gamified learning has received increased attention and interest among the trainers and organizations. However, research has been more confined to the application of learning theories on understanding the learning outcomes through gamified training programs. Hence, there remains a gap with regards to understanding the relationship between learning theories, game elements and learning outcomes. Our findings indicate that the selection of game elements is important to achieve learning outcomes. We find that there is need for organizations to identify both training goals and the game elements that can make gamified training engaging and relevant.

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1	<i>Autonomy:</i> Need to feel self-governing and independent	Deci and Ryan, 1985
2	<i>Competence:</i> Need to be effective in dealing with the environment	Deci and Ryan, 1985
3	<i>Relatedness:</i> Need to have close, affectionate relationships	Deci and Ryan, 1985
4	Challenges are the motivation actions to accomplish a task in the training program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
5	Leaderboards are the engagement-based activities that reflect the higher score achieved by the trainees in the gamification training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
6	Points means score points which provide feedback to the individual in the gamified training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
7	Ranking is the display of points and position of the training participants and teams in the gamification program	Huang et al., 2019; Jurgelaitis et al., 2019; Rachels and Rockinson-Szapkiw, 2018; Groening and Binnewies, 2019
8	Scores means which provide feedback to the individual in the gamified training program	Lopez and Tucker, 2019; Landers and Armstrong, 2017; Rachels and Rockinson-Szapkiw, 2018
9	<i>Awareness:</i> Self-awareness, personal development and life skills	Kraiger, K., Ford, J. K., and Salas, E., 1993; Chandani, A., Mehta, M., Mall, A., and Khokhar, V., 2016
10	<i>Employee involvement</i> Work structures and processes that allow employees to systematically give their input into decisions that affect their own work	Kraiger, K., Ford, J. K., and Salas, E., 1993; Chandani, A., Mehta, M., Mall, A., and Khokhar, V., 2016
11	<i>Engagement</i> Align employees with your company values. increase productivity. enhance well-being. improve workplace conditions	Kraiger, K., Ford, J. K., and Salas, E., 1993; Chandani, A., Mehta, M., Mall, A., and Khokhar, V., 2016

Table A1.
Constructs for the study

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