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Continuance Intentions to Use Gamification for Training in Higher Education: Integrating the Technology Acceptance Model (TAM), Social Motivation, and Task Technology Fit (TTF)

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ABSTRACT Despite the public enthusiasm for gamification training for employees, gamification is not yet been fully incorporated for instructor training in universities. Previous studies have examine factors that improves employee participation, motivation and engagement that leads to the employee intentions to use gamification for training. Therefore, in this study, task technology fit (TTF), social motivations (SM) and knowledge gain from using gamifiction were investigated. The TAM is enhanced with other factors; such as the task technology fit (TTF) and social motivation. The TTF is used to examine gamification utility, while social motivation is used to examine social influence (SI) and social recognition (SR). Data were collected in two phases, in the first phase 375 data were used for the TAM, secondly, 31 data were used for the pre and posttest. A structural equation model were presented to test the TAM while the t-test were used to study the knowledge gain from using the gamification system. However, the foundation for understanding instructors' behavior in this study's context are: (1) perceived usefulness and attitudes are crucial to the continuance intentions to use gamified Moodle for training; (2) perceived usefulness mediates the relationships among social recognition, TTF, perceived ease of use, and social influence on continuance intentions; (3) when predicting continuance intentions, TTF, social recognition, social influence, and perceived ease of use are vital; (4) TTF positively affects perceived ease of use; and, unexpectedly, (5) the TTF and social influence have no significant effects on perceived usefulness. Detailed results and educational implications are discussed.

INDEX TERMS Gamification, gamified Moodle training platform, gamification in higher institution, technology acceptance model, motivation, task technology fit, and social motivation.

I. INTRODUCTION

In the last decade, the use of technology, such as gamification, in education has caused an educational revolution. These methods are substantially different from previous methods of increasing motivation and participation for instructor training in higher education [19]. Gamification represents a cutting-edge stage in the evolution of training by increasing training motivation and participation of instructors in institutions of higher learning. Gamification is considered as a recent novel technology-enhanced training platform. Online technological platforms, such as Moodle facilitate scalable peer to peer training and learning dominant channel for instructor and student interactions [44], [45], [15]. This social learning and training is a key factor of gamification platform [33]. The advantages of gamification are numerous. The flexibility, easy access, introduction of critical thinking skills, and attainment of desirable outcomes are considered as the mechanism that drives motivation, participation, engagement and collaboration. These are the most important factors that are exploited in gamification to enhance learning and training [37]. Companies in America, China and other developed countries have introduced gamification for employee training. Elite companies in those counties, such as Microsoft,

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Cisco, Google, Ford and Samsung, have developed gamified employee training platforms [7].

Despite the public enthusiasm for gamification, the incorporation of gamification for training for employees in higher institute of learning such as instructors have not been achieved despite the inconsistent instructor training attendance or participation. On the average, only 20% of instructors attend training due to lack of motivational factors [11]. Considering this issue, the introduction of a motivation and engagement platform that uses game elements that triggers participants' desired intrinsic behaviors towards training could solve the problem [12], [36]. However, the completion of gamified training activities may not measure knowledge. Similarly, in this study, the TAM is used to measure instructors' acceptance and continued use of gamification for training, while pretest and posttest questionnaires were issued to assess the experience and measure the knowledge gain from using the Moodle gamification platform. Considering the swift growth and adoption of gamification for training, a study of the factors that affect instructors' continued use of gamification may reveal its viability and sustainability. Few studies have conducted research on the factors that influence continuance intentions to use gamification for training by instructors.

In this study, the TAM is enhanced with other factors, such as the TTF, SI and SR to investigate instructors' acceptance and behavioral continuance intentions at Cyprus International University. Moreover, this study includes the TTF which is seen as a theory that measure the likelihood of a technology to match a task of a user, this consist of system reliability, timeliness and compatibility [49] to examine the effects of instructors' perceived ease of use and the perceived usefulness of gamification for training. Furthermore, tests were carried out to assess the knowledge gain.

In this study, we discuss and provide an empirical study and research on the following: firstly, instructors' perception of gamification based on their attitudes, habits, adoption and knowledge [17] secondly, the extent to which gamification fits instructors' needs with an emphasis on the utility of gamification for training. Thirdly, the perception of instructors' acceptance of the use of gamification for training. Fourthly, the assessment of how the aforementioned factors influence gamification continuance intentions. Thus, a framework integrating the TAM, task (TTF), social influence and social recognition. Section 2 presents a literature review that offers an overview of gamification, the TAM, the TTF and SR factors. Section 3 presents this study's research model and discusses the research design. The methodology is discussed in section four. Section 5 presents the most relevant findings of this study. Finally, section six draws the conclusion and presents the limitations and our future study plans.

The findings of this study further enrich the body of knowledge on gamification. The awareness of these factors enable the stakeholders in institutions of higher learning to facilitate the mitigation and mediate the effects of professional development. Moreover, the TAM was employed to study the factors that influence employee intentions to use gamification for training [20], [6], [14]. There is limited or no literature on the influence of the task technology fit, social influence and social recognition on instructors' perceptions of the use of Moodle for instructor training [44], [45] [17]. Although some studies examined the TTF in several perspectives, few studies were conducted on gamification [40], [22], [10]. Similarly, it is unclear if gamification is a good fit for instructor training and how it affects continuance intentions to use. This study serve as a guide for the design, planning, and implementation of gamification for instructor training in the context of the Moodle gamified training platform.

II. LITERATURE REVIEW

To gain an ample understanding of this study's problem, a literature review of the theoretical background is carried out. We review the relevant literature on the development of gamification to justify the usage of the TAM, TTF and SR factors in a specific domain. The following section presents the reviews of the studies that recently employed the TAM, TTF and social indicator factors and how they function.

A. GAMIFICATION

Serious gaming, gamification, game based learning and training are usually not separate, but there are few gaps between them with respect to their usage and approaches. Thus, gamification is the use of game elements, game mechanics and game principles in nongame contexts, such as in education [31], [6], [10]. Game elements include points, leaderboards, progress bars, badges, and levels [37], [33]. The game mechanics are simply the machine that drives the game elements [12], [36].

1) CHARACTERISTICS OF GAMIFICATION

Recent studies shows that gamification is becoming a widely discussed topic in education. The activation of direct intrinsic behavior is one of the most vital features of gamification. There are at least five vital qualities that gamification offers, which include increasing participant collaboration, engagement, participation and motivation; increasing task commitment and enjoyment; acquiring problem solving skills; acquiring critical thinking skills; acquiring personal learning skills; etc. [18] , [6]. Gamification qualities were investigated by [31] using a gamified management information system to gamify customers' face-to-face organizational support system and employee training was.

There are numerous gamification platforms in use for employee training, but there are few gamification platforms that are used for employee training in institutions of higher learning [27]. Studies have predict failures in the use of gamification platforms. The failure occurs as a result of adopting gamified platform that is not flexible or customizable or the gamification platform is not purposely created for education in higher institution. This lack of gamification platform for use in education made it challenging to achieve the desired utility fit in this context [27], [49], [30], [31], [45].

TABLE 1. Gamification application in moodle.

Game element	How the element explains gamification	Game dynamics
Leader board	Using the level up plugin, users can view their progress using a ladder board, which is the same as the leader board that is used in a normal gamification environment.	Completion
Badge	This feature is same in Moodle where badges are issued after completing activities or using points.	Achievement
Progress	This feature is the same in Moodle and it is activated by completing activities as well	Ranking
Points	Points are generated and issued using the level up plugin block, which records users' activities using the CRUD (create read update and delete) algorithm that is found in the level up plugin settings.	Rewards
Level	The level up plugin provides a feature that is able to issue notification pop ups. This can be set using accumulated points or by completing activities	status
Chat	Chat and forums are available in Moodle that allow users to gain collaboration experience points	Social
Unlocking content	This feature unveils the next activity while leaving the following activities locked unless the previous activity's requirements are met. This motivates user to quickly finish the present level.	Trigger
Completion tracking	This feature allows the administrator to track the activities of users to assess if the user attains the goals of using the gamified system	Measurement or monitoring

Therefore, this study provides findings on the use of a familiar platform that is frequently used in most institutions of higher learning for educational purposes. Moodle, which is the Modular Object Oriented Dynamic Learning Environment, has a perfect pedagogical purpose to gamify training modules for instructors [30], [15] by mapping game elements to the training activities'. Currently, the BadgeOS, Kahoot, Duolingo, FlipQuiz and Goalbook platforms are commonly used.

2) GAMIFIED ACTIVITY RESEARCH IN MOODLE

Game elements in Moodle can be instituted by unveiling customizable gamification features and applying game dynamics and game elements [32], [2], [5], [12], [36] [44], [45]. The game elements found in Moodle are shown in table 1.

Thus, the Moodle game element design is built on the set conditions that are found in the Moodle course feature. The leading gamification plugins for Moodle are installed to provide the game elements. Those plugins are h5p, level-up (provide badges, levels, ranks, progress and points) and the progress bar.

III. EXTENDED TECHNOLOGY ACCEPTANCE MODEL (XTAM)

Integrating external factors or constraints to TAM is termed as Extended TAM. The xTAM elucidate the likelihood of acceptance of educational technology [6], [43]. First, this study introduces social influence and social recognition, which are referred to as social motivation, and then, the task technology fit model is used to extend the technology acceptance model [40]. The external factors were added in order to examine system consistency, system reliability, timeliness and compatibility of gamification in Moodle.

A. SOCIAL MOTIVATION IN MOODLE GAMIFIED TRAINING PLATFORM

Because Moodle provides a free interactive online gamification platform, it will be easy for other institutions to use Moodle to follow their goals and interests in adopting gamification [32]. It is speculated that learning and training styles could affect user's preference for gamification. Therefore, researchers examined the influence of users' intentions to use gamification for learning and training by examining and exploring the psychological effects that are essential for learning, determining and applying social behavioral relevance to gamification [38]. In addition, researchers have studied the factors that affect users' perceptions and intentions to use gamification [34], [28]. A further study was carried out on how social cohesion and badges motivate group work on complex organization problems by employees using gamification [43]. Another study by [12] expressly mentions gamification antecedents as one of the primary factors of self-determination, and another study uses the TTF and social motivation in the TAM to examine users' behavioral acceptance and motivations to use gamification [40], [28]. Similarly, this study revealed findings on the understanding and adoption of gamification utility. The combination of the TTF with the TAM model is obligatory because they are the most frequently used models to study technology's acceptance, utilization, willingness and motivations to use [40], [49], [22].

B. TASK TECHNOLOGY FIT (TTF)

The TTF is a theoretic model that is used to examine how technology enhances performance. The TTF measures the impact of technology use and assesses the match between the task and the features of the technology. Subsequently, the TTF has been widely used by researchers to forecast the acceptance and usage of a new technology [3]. Although there are studies on TTF in different contexts, few studies was done on gamification for instructor training in higher education. To date, it is unclear if the TTF impact the adoption of gamification for training and how well gamification will influence instructors' acceptance [40], [20].

Therefore, a favorable outcome from the use of gamification is expected when there is a close fit between technology and the task while the TTF model is the focal point. The theory of the TTF model compensates the discrepancy in the TAM in this respect. Hence, the combination of the two models can better assess the variation in the utilization of technology than either the TTF or the TAM alone [28], [9], [1], [16].

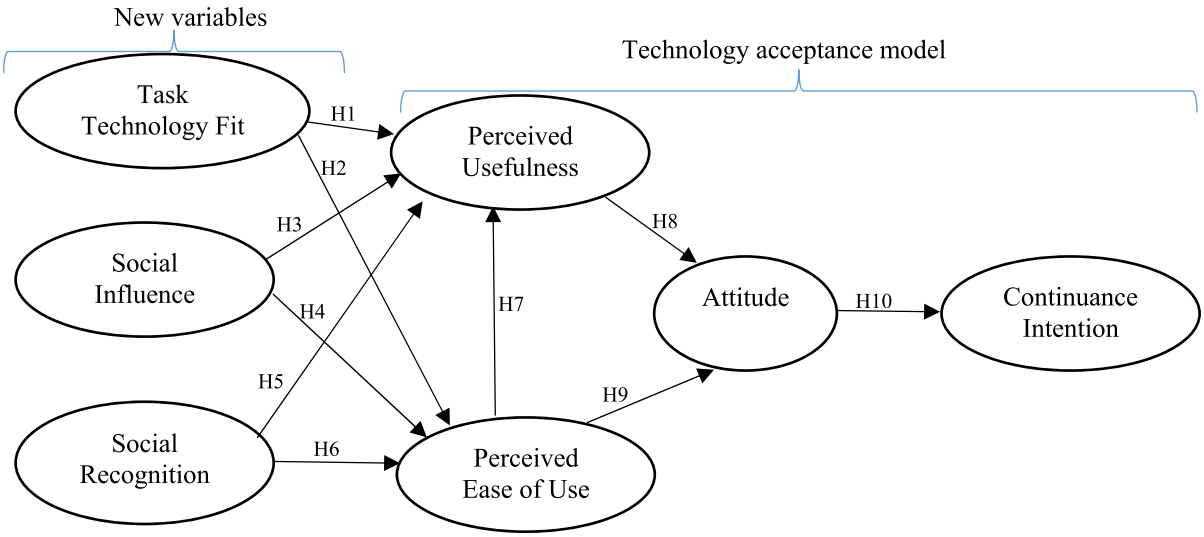

FIGURE 1. xTAM model.

C. TECHNOLOGY ACCEPTANCE MODEL (TAM)

The TAM is one of the most cited theories for predicting technology acceptance, and it has been adopted by numerous theoretical studies [25], [26], [23]. The model in this study is used to study instructors' acceptance of the use of gamification for training. In addition, a new construct is introduced to assess the training task fit in gamification. The new construct introduced to the TAM is called xTAM.

IV. RESEARCH HYPOTHESES

The hypothesis for this study was derived from the xTAM that was mentioned above in figure 1. The relationships between the factors are incorporated in the proposed model to study instructors' acceptance of the continued use of gamification for training.

A. TASK-TECHNOLOGY FIT

The TTF is employed to evaluate user performance. The factors that influence the use and the examination of the competencies of technology utility and task requirements are determined by the TTF model [40]. The efficacy of technology acceptance is based on user acceptance and how perfect the task fits. The TTF provides an empirical measure. The utility's fitness between the technology and task need to be accepted by the user. Studying the understanding of individual users' attitudes towards the use of the technology is paramount [40], [6]. It is highly possible that the technology matches the task when users accept the technology. With this understanding, we propose the following.

H1: The TTF has a positive effect on the perceived usefulness of Gamification for training.

H2: The TTF has a positive effect on the perceived ease of use of gamification for training.

B. SOCIAL INFLUENCE (SI)

The views of others influence the intentions to use a particular technology. This is a significant factor in determining the acceptance and use of technology. SI appears in several empirical study on the acceptance of information technology and has received strong support from user behavior [19], [40].

In this study, SI is seen as how friends, colleagues or family members influence user to participate in gamification. Similarly, when a user observes that other peers use gamification and perceive the benefits of its use, that individual will be motivated to use gamification for training in the present and in the future. Thus, this factor plays a great role in driving other peers' attitudes on the use of gamification for training [40]. From this perspective, we proposed the following.

H3: SI has a positive effect on the perceived use of gamification for training.

H4: SI has a positive effect on the attitudes towards the perceived ease of use of gamification for training.

C. SOCIAL RECOGNITION (SR)

Recognition is vital in understanding people's own abilities and skills by making it known to other peers through the reword or tropes that are seen in a game. The relationship between the users in a technological platform does not define social recognition, but it is understood that self-esteem, confidence and respect do. Similarly, establishing recognition plays a fundamental role in SR.

Although studies have investigated various SR patterns, but few studies in done so far on gamification [35]. From this perspective, we proposed the following.

H5: SR has a positive influence on the perceived usefulness of gamification for training.

H6: SR has a positive influence on the perceived ease of using gamification for training.

D. PERCEIVED EASE OF USE (PEOU)

The PEOU is the degree to which a person basically believes that gamification will be easy to use or effortless. That is

means, there is no acquisition of skills when using gamification for training. Previous studies indicate that the PEOU has direct positive effects on users' attitudes and the perceived usefulness of technology [29], [24]. However, the PEOU could affect the continuance intentions to accept gamification for training. From this perspective, we proposed the following.

H7: The PEOU has a positive effect on attitudes towards the continuing use of gamification for training.

H8: The PEOU has a positive effect on the perceived usefulness of gamification for training.

E. PERCEIVED USEFULNESS (PU)

The PU reflects users' subjective assessment of using a gamification platform to increase instructors' motivations and participation in training. This factor suggest that a gamification user could achieve training goals using gamification as a driving force for motivation [35].

PU has been a construct that is repeatedly used to reveal the direct determinants of users' continuance of use [24]. Based on this logic, we proposed the following:

H9: PU has a positive impact on attitudes to use gamification for training.

F. ATTITUDE AND CONTINUANCE INTENTIONS (ACI)

The link between ACI as seen in the TAM suggests that attitudes to use function as the assessment and predisposition of user behavior. The attitude to use of gamification for training is seen as the degree to which a participant perceived desirable or undesirable feelings related to the use of gamification for training.

Previous studies found out that attitude is one of the most powerful predictors of the intentions to use technology [29], [40]. Thus, we propose this research hypothesis.

H10: ACI towards the use of gamification for training has a positive influence on continuance intentions to use.

V. RESEARCH METHOD

This study employs a quantitative survey questionnaire to test the above formulated hypotheses. The data collection and questionnaire development are discussed in this section.

A. QUESTIONNAIRE DEVELOPMENT

The questionnaire were administrated in two phases. The first questionnaire were used to test the research model and hypotheses. The questionnaire contains the demographic information of the participating instructors. Twenty one questions were adapted from previous studies [40] [20], [23], [35], [29], [40], [21]. These questions were related to perceived usefulness, perceived ease of use, attitudes, continuance intentions to use, task technology fit, social influence, and social recognition. Five point Likert scale questions were used for this study with the responses ranging from Strongly Disagree to Agree. Secondly, fourteen pretest and posttest questions were adopted and designed using a five point Likert scale ranging from Strongly Disagree to Agree [23], [29], [48].

B. DATA COLLECTION

The data were collected in two phases, and all the participants were full time instructors lecturing in Cyprus International University. In first phase, 500 questionnaires were distributed to all instructors and 375 completed questionnaires were returned. This questionnaire were used to investigate the instructors' motivations and behavioral intentions of continuance of using gamification for training. In second phase, the Moodle gamification training platform (MGTP) was provided to instructors to study the knowledge gain and to determine their views of the MGTP. The instructors were from the department of English language teaching and English preparatory classes. The MGTP was available online for 3 months for instructors to participate in the training. At the beginning of the training, hard copy pretest questionnaires were issued. In addition, the login details, the steps on how to enroll in the Moodle gamification training platform and an explanation of how experience points are generated with the pointing rules were given to the participants.

Forty-five questionnaires were administered and collected for the pretest. At the end of the training, a posttest questionnaire was also given to the instructors via the MGTP. The questionnaire was generated using the Moodle questionnaire plugin and was established in the gamification platform as an activity. Forty-five user's accounts were created by the administrator, and 37 of the users were willingly joined. However only, 31 participants completed the training, therefore, 31 posttest questionnaires were returned. Among the rest of the participants four of them just login to the system, three of them completed 3 levels and the remaining participants stopped at level 1. One of the participants just joined the gamification platform without attempting the levels. Out of the 37 participants, 20 were females, and 17 were male.

Finally, 6 questionnaires were randomly removed from the pretest questionnaires in order for the number of questionnaires to be the same as with the posttest.

C. DATA ANALYSIS

To analyze the data, we employed two processes [4]. First, we examined the goodness of fit and the proposed hypothesis regarding the validity of the measurement model by evaluating the reliability, convergent and discriminant validity using ADANCO. Similarly, the structural model was analyzed by investigating the strength of the interactions of the constructs.

Second, the descriptive statistics were calculated using IBM SPSS. The mean from the posttest and pretest were compared using t-test to demonstrate the impact of the MGTP on learning or training effects. There is a substantial difference between the pretest and the posttest. The difference proves that there is evidence of learning.

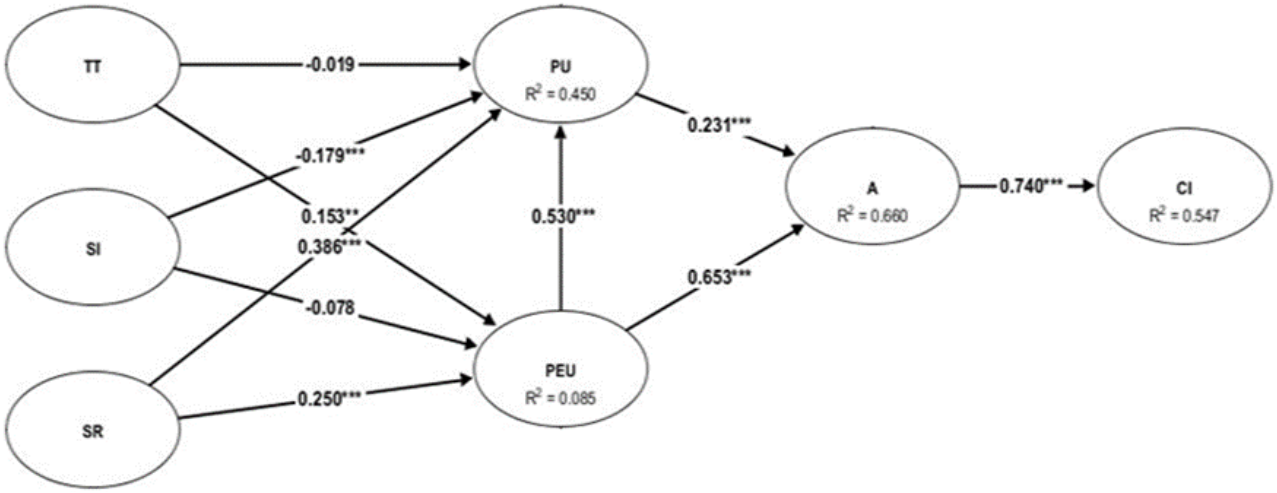

FIGURE 2. Structural model result.

TABLE 2. Construct reliability and convergent validity.

Construct	Construct code	Items loading (k)	AVE	Cronbach's α
Task-technology fit	TTF 1	.995	.9613	.9798
	TTF 2	.988		
	TTF 3	.959		
Social influence	SI 1	.881	.8303	.8006
	SI 2	.940		
Social recognition	SR 1	.779	.5821	.6481
	SR 2	.792		
	SR 3	.716		
Perceived usefulness	PU 1	.750	.6260	.7091
	PU 2	.776		
	PU 3	.844		
Perceived ease to use	PEU 1	.844	.6201	.7951
	PEU 2	.824		
	PEU 3	.622		
	PEU 4	.838		
Attitude	A 1	.793	.6840	.7682
	A 2	.888		
	A 3	.797		
Continuance intentions to use	CI 1	.917	.7759	.8545
	CI 2	.831		
	CI 3	.892		

1) CONSTRUCT VALIDITY

Cronbach's alpha test was applied to assess the data reliability. All the items of the construct in this study met the requirement of Cronbach's alpha (α), which is >0.7. The indicators of the estimated convergent validity were assessed, and all speculated constructs met the criteria. Additionally, two criteria were used to evaluate the constructs, and they are the following: (1) the average variance extracted (AVE) for the construct should be >0.5, and (2) the factor loading (k) of the construct should be >0.5 [13]. The construct reliability, 'α', 'AVE' and 'k' results from our analysis are listed in table 2. The results of α indicate that all constructs were greater than 0.7, which means that all the constructed hypothesized indicators are reliable.

TABLE 3. FORNELL-Larcker discriminant validity criterion.

Construct	TTF	SI	SR	PU	PEU	A	CI
TTF	**0.9613**						
SI	0.2786	**0.8303**					
SR	0.1479	0.3731	**0.5821**				
PU	0.0211	0.0167	0.1663	**0.6260**			
PEU	0.0431	0.0242	0.0682	0.3593	**0.6201**		
A	0.0500	0.0180	0.0802	0.3868	0.6257	**0.6840**	
CI	0.0576	0.0307	0.1050	0.3410	0.6462	0.5469	**0.7759**

2) DISCRIMINANT VALIDITY

This factor is the square of the values of all constructs. The validity is based on the squared difference between the variables and the correlation of the extracted AVE. There values are shown in table 3. However, to assess the discriminant validity, the variance between the AVE and their measures need to be greater than the variance in the construct from the model [13].

From table 3, the values that were extracted satisfy the requirements of discriminant validity. The squared roots are greater than the correlation of the constructs.

D. STRUCTURAL MODEL (SM) FOR THE HYPOTHESES

Generally, the SM is used to assess the relevance of how well the data from the analysis represent the model. SM attributes, such as the goodness of fit (GFI), were used in this study to evaluate and determine if the data are good using the accepted range of the recommended value. The result was 0.0867. This result falls within the recommendation of being less than 0.9. Hence, we find that the GFI satisfies the recommendation and represents that the data fit the model.

The structural equation model was used to test the 10 hypotheses as presented in section III. Figure 2 present the SM result as well as the path result between they

TABLE 4. Hypothesis test result.

Hypothesis	Path coefficient	P value	Support
H1: Task Technology fit (TTF) → Perceived Usefulness (PU)	-0.019	p < 0.3600	No
H2: Task Technology fit (TTF) → Perceived Ease of Use (PEOU)	0.153	p < 0.0039***	Yes
H3: Social Influence (SI) → Perceived Usefulness (PU)	-0.179	p < 0.0003**	Yes
H4: Social Influence (SI) → Perceived Ease of Use (PEOU)	-0.078	p < 0.1130	No
H5: Social Recognition (SR) → Perceived Usefulness (PU)	0.386	p < 0.0000***	Yes
H6: Social Recognition (SR) → Perceived Usefulness (PU)	0.250	p < 0.0000***	Yes
H7: Perceived Usefulness (PU) → Attitude (A)	0.231	p < 0.0000***	Yes
H8: Perceived Ease of Use (PEOU) → Perceived Usefulness (PU)	0.530	p < 0.0000***	Yes
H9: Perceived Ease of Use (PEOU) → Attitude (A)	0.653	p < 0.0000***	Yes
H10: Attitude (A) → Continuance Intentions (CI)	0.740	p < 0.0000***	Yes

hypothesis structures. This model allows for the assessment of the relationship among the constructs based on the theories. This assessment consists of the model's measurement, the reliability, validity assessments, and the R^2, which are used to test the structural model. The second step after model testing is to estimate the original coefficients (β) and the p-values of the structural model. This approach determine the model fit to any given conceptual framework. As listed in table 4, the main factors include the relationship between the Task Technology Fit and the Perceived Ease of Use ($\beta = 0.120$, $p < 0.01$), which has a positive and significant coefficient, and Perceived Usefulness ($\beta = -0.019$), which is insignificant.

Additionally, among the factors influencing the Task Technology Fit, Perceived Usefulness ($\beta = -0.179$, $p < 0.01$) has a significant positive effect. However, the Task Technology Fit and Perceived Ease of Use ($\beta = -0.078$) have no significant relationship. Additionally, among the factors influencing Social Recognition, Perceived Usefulness ($\beta = 0.386$, $p < 0.01$) has a significant positive effect. Among the factors influencing Social Recognition, Perceived Ease of Use ($\beta = 0.250$, $p < 0.01$) has a significant positive effect. Among the factors influencing the Perceived Usefulness, Attitude ($\beta = 0.231$, $p < 0.01$) has a significant positive effect. Among the factors influencing Perceived Ease of Use, Perceived Usefulness ($\beta = 0.530$, $p < 0.01$) has a significant positive effect. Also influencing Perceived Ease of Use, Attitude ($\beta = 0.653$, $p < 0.01$) has a significant positive effect. Continuance Intentions ($\beta = 0.740$, $p < 0.01$) has a significant positive effect on Perceived Attitude. Therefore, all hypotheses except H1 and H4 are not supported. These results indicate that the other variables are useful and significant when determining the core constructs of the TAM Model.

The R^2 explains the variance in the dependent variable that is explained by the independent variables and the strength of the estimated path coefficients in the model. Thus, the R^2 and the path coefficient in SM analysis are used to determine how well the data support the 10 hypotheses of this research model.

The relationships between the R^2 statistic and the path coefficients in our given research model are illustrated in figure 2. One of the most important variables in our research model is the perceived usefulness of gamification, which is determined using three main external constraints. These constraints are the social influence on the use of gamification, the social recognition of the use of gamification and, finally, the task technology fit of the gamification utility. An R^2 of 0.0450 was obtained due to the direct effect of perceived ease of use of gamification, which is the key TAM construct. As determined in this study, 8.5% of the variance in the perceived ease of use of gamification explains instructors' training. An R^2 of 0.660 was obtained based on attitudes towards the use of gamification for training by instructors. This value is determined based on the effects of the perceived ease of use of gamification and perceived usefulness on attitudes. Finally, an R^2 of 0.547 is obtained to show how attitudes towards gamification affect continuance intentions to use gamification for training. Attitude to use gamification for training explained 54.7% of the variance in continuance intentions to use gamification for training by instructors. Table 4 illustrates the tentative results of the hypotheses of this study. It is noted that more than 80% of the model paths have been supported by the results of this study. Out of the 10 hypotheses of this study, 2 hypotheses were not supported.

E. RESULTS AND DISCUSSION OF FINDINGS

This section discusses the relationships within the model based on the hypotheses of this study, as shown in table 4 above.

Hypotheses one and two explain the relationships between the TTF and TAM variables. Hypothesis one in this relationship was rejected while hypothesis two was accepted, as illustrated in table 4. Hypothesis one fails to be accepted because there is a need for instructors to gain more experience in the use of gamification for training to meet the requirements for the use of the TTF. Here, the more experience that a user gains, the better the user's PEOU of the gamified training platform. Therefore, the use of the gamified Moodle platform

by instructors for training is perceived to be useful only if it is perceived to be easy to use [39]. In contrast, a positive effect of TTF on PU could not generate an exponential increase in instructors' PU of the gamified platform, especially when instructors do not perceive the gamified platform to be easy to use, as posited by hypothesis two.

Hypotheses three and four explain the interactive relationships between SI and TAM variables. Hypothesis three suggests that SI influences PU and A. Hypothesis four, which concerns how SI should directly influence attitudes, failed to support the relationship between SI and PEOU. This result implies that external social factors have no direct influence on instructors' attitudes towards the use of the gamified platform for training. Within this unfortunate circumstance, there is an indirect link between SI and attitudes, as intermediated by PU from hypothesis three. There are two possible reasons for this indirect link. (1) The social interaction within a gamified system for training does not provide an interactive inference, which in turn affects the influence of SI in predicting instructors' behavioral attitudes towards using gamification for training. (2) The effect of SI on instructors' behavioral attitudes towards using gamification for training depend on users' PEOUs.

The relationship between social recognition and TAM represent the recognition of the gamification features in the model. Hypotheses five and six suggest that SR and TAM have direct positive effects on PU, PEOU and attitudes to use the gamified platform for training by instructors.

This positive relationship provides evidence on how recognition increases users' behavioral attitudes in gamification. In a gamification platform, game elements, such as badges, stimulate recognition. When a badge of honor is given to successful participants, the participants are easily recognized by the badges. Therefore, recognition is one of the strong factors that provide empirical evidence of how it influences instructors' behavioral attitudes towards using gamification for training.

Finally, hypotheses seven to ten address the main TAM construct, as shown in table 4. The PU of the gamified technology utility supports how useful gamification is with regards to increasing professional development. A possible explanation of this result is that using gamification for training provides the skills that are needed for instructors to increase their performance. PEOU is a strong indicator that affects users' behavioral attitudes towards technology use [42]. A possible explanation for this result could be that gamification platforms that are accessible through the familiar Moodle platform using a web browser or mobile application could strongly influence instructors' use of gamification for training. This result makes gamification easy to use. Instructors' behavioral attitudes towards gamification adoption depend completely on the perceived usefulness of gamification.

PU and PEOU increase instructors' attitudes towards continuing to use gamification for diverse training needs in higher learning institutions.

VI. IMPLICATIONS

This section tries to innumerate and explain the implications of this study's findings for education. We aimed to integrate social influence, social recognition (gamification features), the TAM and the TTF to determine instructors' causal continuing acceptance of using gamification for training purposes at Cyprus International University, notwithstanding assessing the knowledge of instructors. In reference to our 10 hypotheses, we provide the following research insights on xTAM (TTF, SI, SR and gamification features).

Educational implications of TTF: The combination of the two models (TAM and TTF) provides a more detailed explanation of the variance or utilization of gamification for training than the use of the TTF or TAM alone. There is consistency with the conclusions from previous study results, which indicate that the TTF has direct effects on forecasting users' perceived usefulness/ease of use [40], [16], [42]. Therefore, in this current study, the TTF contributes by mediating the effects of perceived usefulness and perceived ease of use. This contribution could be a result of the ongoing study and implementation of gamification. Similarly, this study's results on the TTF simply state that when the degree of the gamification task utility is greater, instructors' perceive gamification to be more useful and easier to use. This observation implies that the more the gamification technology utility fits the training task's contents, the greater is the increase in behavioral attitudes to continue use.

Education implications of Social Influence's (SI): SI provides a better understanding of the influence of the acceptance of gamification as a sociological motiving factor. SI has an important role in influencing gamification. These social motivational factors have a significant influence on the perceived usefulness of gamification. Therefore, instructors perceive gamification to be useful for training when they know that others whom they regard with high esteem believe that gamification is useful. In addition, when others regard that gamification is beneficial for increasing professional development, socialization is seen to have an indirect influence on users' attitudes to use gamification with perceived usefulness as a mediating factor. This supports the conclusion from previous research that task relevance has a direct effect on perceived usefulness [40], [16], [42]. Work or task relevance seems to be as important as TTF.

Educational implications of gamification features: Leader boards, badges, and avatars create recognition in the gamification environment. However, with the application of social recognition to the xTAM to measure the perceived usefulness of gamification, the associations of the gamification features as independent variables imply that social recognition is a mediating factor in determining gamification's ease of use. In addition, our results show that perceived usefulness has a greater effect on perceived ease of use. This result implies that gamification is highly related to users' perceptions of its use rather than the perception of the ease of use. These current findings are unique in gamification research. These results

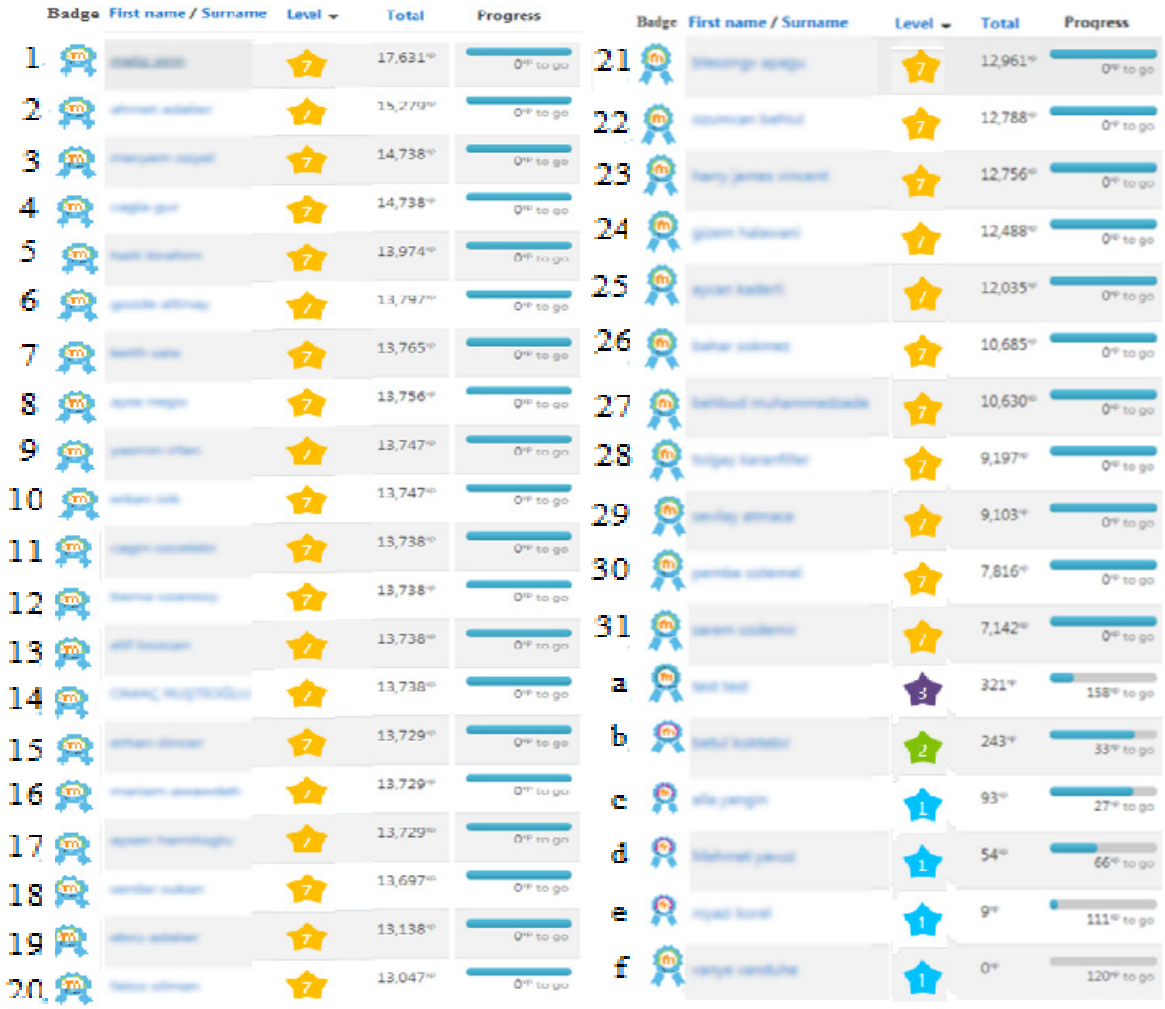

FIGURE 3. Game elements in MGTP.

could be used to form strategies for implementing effective applications that will improve instructors' professional development [14], [20].

Educational implications of the TAM: These results indicate that the more instructors perceive gamification is easy to use, the more useful gamification is. Therefore, the usability of the gamification utility creates or increases instructors' behavioral attitudes towards its usability. In addition, the easier it is to use the gamified training platform, the greater the user's intentions to use gamification for training [43]. Therefore, perceived use of gamification is important to mediate the effect of perceived use of gamification to attitude. This observation implies that the more the gamification is used, the more easily instructors see the use of gamified training platform. From this study, is noted that the usefulness and the attitudes of gamification use are constantly associated with the continuance intentions to use. This observation indicates that the users' perception of the use of gamification positively influences continuance intentions [35]. These results are consistent with some other studies indicating how perceived ease of use affects continuance intentions, as indicated above [35].

Hence, the results conform to the general findings of the TAM, showing that the TAM is relevant for the analysis of gamification.

VII. ANALYSIS OF THE KNOWLEDGE GAINS FROM THE MGTP

This section is divided in two sections. First section address the analysis of the data obtained from the gamification platform using game elements. Secondly, we address the T-test results from the knowledge gain from using the gamification platform.

A. GAME ELEMENT ANALYSIS IN THE MOODLE GAMIFICATION TRAINING PLATFORM

Game elements, such as badges, leader boards, levels' total points and progress, were used as tools to gamify the platform. The game elements were implemented in Moodle using plugin tools. This tools are, Level up, H5p Interactive Video

TABLE 5. Paired samples statistics.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Posttest	2.9194	31	.63721	.11445
	pretest	48.4493	31	10.08518	1.81135

TABLE 6. Paired samples test.

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Post-test pretest	-45.529	10.0227	1.8000	-49.2063	-41.8535	-25.3	36	.000

and Vm chat. These tools were installed in Moodle to gamify the platforms.

Figure 3 present the game element summary obtained from the GTLP. Indicating from a – f out of 37 participants did not complete all 7 levels. This result implies that 84% of the participants were motivated to complete all the activities. This result indicate that most of the participants believe in the relevance of the gamification platform to their professional development. As seen in the log data, most instructors completed all the activities in one log. This means that the activities in the platform interest them, it also seems to be useful to them. Since the platform seems useful, this tends to improve task fitness, and social influence affects the completion of a task, notwithstanding recognition and continuance of use. Similarly, some of the participants that retook the training earned more points, which supports the continued attitudes towards the usage of the platform. Some of the participants logged in to view the progress of other participants, which also gave them more points. The badges that were issued to recognize the successful completion of the level, motivates other participants to complete their tasks. In contrast, participants that earn less than 10,000 experience points tend not to stay long enough to complete the stated tasks. The participants have not seen how relevant the platform is to their training needs. Therefore, the task technology fit will motivate these participants to use gamification for training.

At the end, participants were given the chance to share their opinions. The opinions provide great insights that enrich this study by proving that gamification increases instructors' knowledge, notwithstanding the motivations to continue to use gamification for training.

B. T-TEST RESULTS FROM TESTING THE KNOWLEDGE GAINS USING THE GAMIFICATION PLATFORM

The paired sampled T test is one of the most popular tools for comparing the means of two distinct sets of data. Therefore, this test assesses the correlation between the task technology fit, social influence and social recognition and the evidence of learning due to the use of the MGTP for instructor training in the xTAM.

Table 5 shows the sample t test results obtained from the pretest and posttest questionnaires. The result revealed differences between the two tests. The mean result of the posttest is 48.4493 while that of the pretest is 2.9194. This finding implies that instructors gain more experience when using the gamification training platform, and they are more motivated than using normal face-to-face traditional training. In addition, the standard deviation of the posttest is 0.63721 while that of the pretest is 10.08518.

Following the paired sample test, as shown in table 6, the t (31) value is −25.292, and the level of significance (p) value is 0.000 (which is less than 0.05). This result indicates a strong support stating that there is a 95% difference between the upper and the lower confidence levels of the analysis. [45], [46], and [47] provide measurements of the required range of significance and the p value. Additionally, the significance level of 0.488 is higher between the pretest and the posttest. This finding suggests that instructors completely accept gamification, and knowledge can be gained using gamification. Some of the questions that were used for the pre and post test are; Gamification is a better way of training; I enjoyed gamified training approach; I think gamification is a more effective and efficient way of training; I feel more motivated in a gamification platform.

VIII. CONCLUSIONS, LIMITATIONS, AND FUTURE STUDIES

The objective of the study was to study the TTF, social influence and social recognition on instructors' acceptance of gamification for training, notwithstanding the knowledge gain. This study was conducted only at Cyprus International University to the best of our knowledge, in the research model, we employed TAM model that included the task technology fit, social influence and social recognition. We further investigated the knowledge gain by examining participants' experiences using the gamification platform.

This study shows that the TAM with the TTF, SI and SR predicts and explains the acceptance and knowledge gains of using gamification for instructor training. This finding further supports that the use of the gamification platform for training increases instructors' participation and behavioral intentions to continue using gamification for training.

As seen from the t-test results, the difference between the pretest and posttest in the context of this study implies that the pretest data first support training using gamification. Second, there are indications that some instructors do not know that gamification exists. Third, the pretest reveals how gamification can be used for personal training and how it can motivate users to participate in training. The posttest data analysis proves that instructors were happy using the gamification platform for training, notwithstanding the knowledge that was obtained from using the gamified training platform.

The accuracy and sustainability of using gamification for instructors' training depends on how connected and useful the

gamification technology is with respect to the training goals. This observation, however, attracts peers' social influence and social recognition. Similarly, the practical implications of this study insist that the more the gamified system (technology utility) fits the training goals/needs (tasks), the more instructors will continue using gamification for training. Similarly, instructors that participated in the gamified training platform affirm that they gained knowledge from the gamification platform.

Finally, as fascinating as the results/findings are, the study has some limitations that need to be noted. First, there are other factors in addition to those considered here. A future study should be carried out at different universities or in different sectors, which will improve the generalizability of these results.

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