Gamification in Accounting Education: A Tam Perspective and Evidence from Non-Accounting Students

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ABSTRACT

Gamification in accounting education has emerged as a promising strategy to enhance engagement and learning effectiveness in higher education. Despite its growing adoption, limited research has explored how gamification is perceived by non-accounting students. Grounded in the Technology Acceptance Model (TAM), the research examines the effects of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on students' intention to adopt gamification as a learning method. Data were collected through a structured questionnaire distributed among non-accounting undergraduates enrolled in an introductory accounting course. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the results reveal that both PU and PEOU have significant positive effects on students' intention to use gamified tools. The model explained 72.5% of the variance in intention to use gamification, indicating strong predictive power. The effect size analysis revealed that PEOU had a large effect on gamification intention, while PU had a medium effect, highlighting that ease of use plays a slightly more critical role than usefulness in students' willingness to adopt gamified tools. This study contributes to the growing literature on gamification and accounting education by offering empirical evidence that supports the integration of game-based learning tools among non-accounting students.

Keywords: Technology Acceptance Model (TAM), Gamification, Accounting education, PLS-SEM, Non-accounting students

INTRODUCTION

Accounting is often regarded by non-accounting students as an intimidating and difficult subject, frequently leading to disinterest and disengagement. Saudagaran [1] noted that non-accounting majors commonly perceive accounting as complex and unapproachable, contributing to a lack of motivation toward the subject. Similarly, Lloyd and Abbey [2] classified accounting as a 'high-risk' course, citing consistently high failure rates that further discourage student participation. These negative perceptions are so deeply rooted that non-accounting students are generally unlikely to enroll in accounting courses unless they are mandated as part of their program requirements [3]. In addition to these perceptions, technical barriers also hinder student engagement. Ali et al. [4] reported that many students struggle with the online learning of accounting due to their discomfort with using digital platforms, particularly when combined with the abstract nature of numbers, calculations and accounting formulas. One of the most frequently cited challenges is the abstract nature of accounting principles and its conceptual complexity [5][6]. These challenges have created a clear need for innovative pedagogical approaches that not only make accounting accessible and less intimidating but also increase engagement and motivation among non-accounting students.

One emerging solution is gamification, the use of game design elements in non-game context to enhance user engagement. A study by Shah [7] highlighted that game-based learning serves as a motivational factor to maintain student interest in introductory accounting courses. Likewise, Kao et al. [8] found that accounting-specific gamification improved engagement and learning outcomes through mobile apps, reinforcing the

importance of both usefulness and usability in technology adoption. By turning learning into a challenge or a competition, students become more invested in the process, leading to higher levels of interaction with the course material and their peers. Almuntsr et al. [9] found from the systematic literature review that gamification in accounting education generally boosts engagement, motivation, and skill development, but also faces notable drawbacks. Few challenges include limited resources, difficulty selecting suitable games, time demands, and the need for educator expertise. Additionally, gamification risks shifting students' focus to fun elements rather than learning objectives. Yet, Almeida et al. [10] cautioned against reliance on superficial game elements which can initially engage students but may lose effectiveness without thoughtful integration into pedagogy. As such, while the general consensus points to the benefits of gamification in accounting education, a critical examination of the existing literature reveals a significant research gap concerning its application and effectiveness among non-accounting majors. The majority of studies in this domain primarily focus on accounting students, often within specific accounting courses, and do not adequately address the unique learning needs, motivations, and challenges faced by students from other disciplines who are required to take accounting courses. The primary limitation identified in the broader systematic literature review by Almuntsr et al. [9] is the small sample size in many studies, which makes it difficult to generalize findings. Without dedicated research, it is challenging to ascertain whether the benefits observed in accounting majors translate effectively to non-accounting majors, who may have different prior knowledge, career aspirations, and levels of intrinsic motivation for learning accounting concepts.

Accordingly, this study examines a web-based gamified digital tool designed to support accounting learning for non-accounting students. This research paper applies the Technology Acceptance Model (TAM) to provide a robust framework for understanding user acceptance of new technologies, and while it has been applied to educational technologies and gamified systems, there remains a critical gap in understanding the specific perceptions and acceptance of gamified accounting education among a population that is often overlooked i.e. non-accounting students. These students, who may have limited prior exposure or interest in accounting, represent a unique demographic whose acceptance of gamified learning tools could significantly impact their foundational understanding and attitudes towards the discipline, yet their specific experiences and the factors influencing their technology acceptance in this context are not well-documented. Therefore, this research aims to investigate the factors influencing non-accounting students' acceptance of gamified accounting education, utilizing the TAM framework to provide empirical evidence and insights into how such interventions can be effectively designed and implemented to improve learning outcomes and address the broader challenges in accounting education. In doing so, it contributes to the growing body of research on digital learning tools, offering practical implications for curriculum designers, educators, and educational technologists who seek to make accounting more engaging, inclusive, and effective for a diverse student population.

LITERATURE REVIEW

Gamification has been widely adopted in education to enhance motivation and engagement, particularly in traditionally theory-heavy courses such as accounting. Nowadays, the integration in educational framework of the gamification feature such as points, badges and leaderboards are essential [11]. This approach aims to transform traditional learning systems by engaging millennial generation which leans towards more interactive and dynamic systems, ultimately increasing student participation and academic performance [12]. Tandiono et al. [13] study found that non-accounting students generally favor gamification and that a specifically designed game helped them understand accounting terms, concepts, and financial statements, it also highlighted that a few students still found self-study and traditional lectures more critical to their learning experience. As such, Mohamed et al. [14] reiterated that there is a broader need to investigate the effectiveness of various educational technologies (e.g., gamification, interactive simulations, virtual reality, AI-powered tutoring systems) on the learning outcomes and engagement of non-accounting students. Drawing upon the Technology Acceptance Model (TAM) proposed by Davis [15], this study focuses on two key construct – Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) – as predictors of students' intention to use gamification in accounting courses.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is used to assess the user acceptability of information system technologies [15]. TAM is primarily composed of two elements that influence the user's inclination to utilise

technology: perceived ease of use (PEOU) and perceived usefulness (PU). According to TAM, both PEOU and PU directly influence an individual's attitude toward using the technology, which in turn affects their behavioral intention to use it. TAM is a frequently used paradigm for assessing user behaviour or attitude in any new technology platform. It is used to assess how users accept and use specific technology. Finally, behavioral intention is a direct predictor of actual system use. The model suggests that if a technology is perceived as easy to use and useful, users are more likely to develop a positive attitude towards it, form an intention to use it, and ultimately adopt it. Over the years, TAM has been extended and refined, leading to models like TAM2, TAM3, and the Unified Theory of Acceptance and Use of Technology (UTAUT) [16]. These extensions incorporate additional factors such as social influence, facilitating conditions, and experience, providing a more comprehensive understanding of technology acceptance in various contexts. However, in the context of this study, the objective is to investigate how a gamified web-based learning system influences acceptance among non-accounting students. Given the exploratory nature of the research and the specific focus on system usability and perceived value, the two key TAM constructs sufficiently capture the primary determinants of behavioural intention without introducing unnecessary model complexity [17]. Furthermore, prior research in technology-enhanced learning has demonstrated that PEOU and PU alone are strong predictors of technology adoption in an educational context [18]. Thus, adopting the original TAM provides a robust and parsimonious framework for understanding technology adoption in learning environments.

Perceived ease of use (PEOU) of educational gamification

Perceived ease of use refers to the extent to which the use of specific technology would not be complicated. According to Davis [15], the easier technology is to use, the more likely it will be adopted. For example, if the gamified application offers simple navigation, quick login features, and clear task instructions, students can focus on learning accounting concepts without being hindered by technical difficulties. Several studies (e.g. [11][19][20][21]) have shown that PEOU significantly predicts users' acceptance particularly when the platforms are intuitive and user-friendly in gamified environments [22]. With respect to gamification, PEOU refers to the extent to which a student perceives that the use gamified learning system would not require a lot of effort and would be easy to use. Thus, this leads to the following hypothesis:

Hypothesis 1 (H1): Perceived ease of use has a significant positive effect on students' intention to use gamification web-based/app in accounting courses.

Perceived Usefulness (PU) of educational gamification

Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance their learning or performance [15]. In the context of educational gamification, prior studies have found that usefulness plays a significant role in shaping user intentions [20][23][24][25]. Furthermore, gamification has been linked to improved academic performance and a better understanding of accounting concepts. For example, the use of simulations and video games in accounting education has been shown to positively affect students' achievement [26]. These game-like environments often mimic real-world accounting situations, allowing students to practice decision-making in a low-risk setting and learn from their mistakes. This experiential learning approach can lead to a more robust and lasting understanding of accounting principles compared to rote memorization. When the students perceived gamified tools as beneficial to their understanding or exam performance, they are more likely to adopt and continue using them. Hence, the following hypothesis is formulated:

Hypothesis 2 (H2): Perceived usefulness has a significant positive effect on students' intention to use gamification web-based/app in accounting courses.

METHOD

Respondents

In September 2024, 107 students from the Faculty of Administrative Science and Policy Studies (FSPPP), Universiti Teknologi MARA (UiTM) participated in a survey. The sampling process combined elements of

purposive sampling and cluster sampling, where selection was based on classes conducted by specific course instructors. The clusters came from two academic programs, Diploma in Public Administration (AM110) and Bachelor of Administrative Science (Hons) (AM235) in UiTM Seremban 3. The two programs were chosen because this program requires students to enroll in at least two accounting courses to graduate. Entire classes taught by the selected instructors were included, and participation required attending a one-hour session to explore the game representing 33% (77 out of 230) of diploma students' population and 38% (30 out of 78) of bachelor's degree population taking part. For the semester under review, the study population comprised students enrolled in ACC116 (Diploma level) and ACC466 (Degree level). This approach offered logistical efficiency by conducting the study during scheduled class times. However, because the classes were selected based on instructor availability rather than random allocation, the findings may be less generalisable to the entire program population, introducing a potential source of sampling bias [27]. This is because the sample may systematically over- or under-represent certain characteristics of the total program population, thus affecting the accuracy of the results. In line with best practices for reporting research, the findings may have limited generalizability due to the non-random selection of participants, and the results should be interpreted accordingly [28].

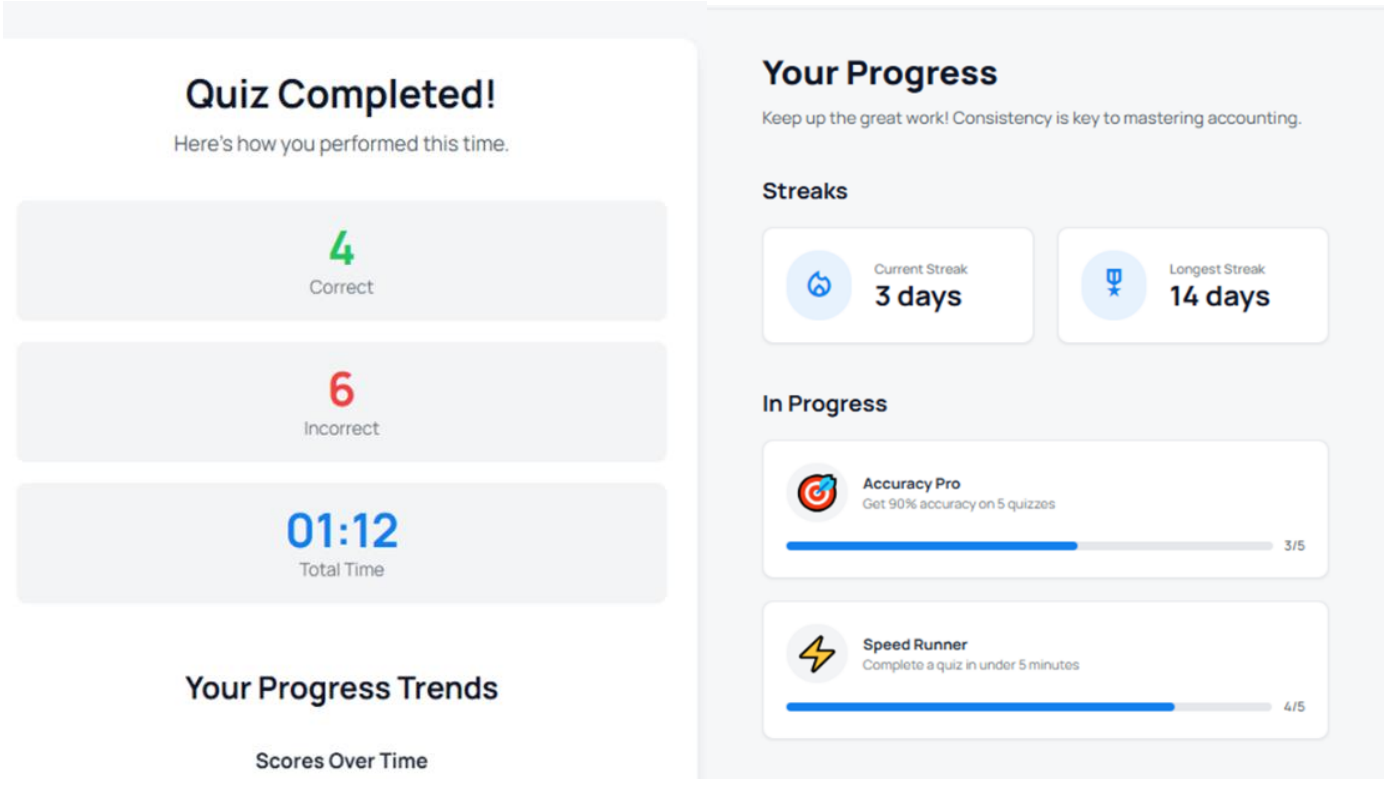
The Educational Game – Revision web-based system

The revision web-based system is designed for three minutes reviewing video with three minutes interactive questions. The web consisted of the number of logins, correct and wrong answers, badges and points obtained, in addition the total challenges completed by each student. The gamification elements of this web-based system are on competitive feature driven by the students' ranking/leaderboard, badges and points collected by students. The subsequent section provides a detailed description of the gamification elements designed to foster student engagement and enhance the enjoyment of learning accounting.

Gamification Elements - Points

Points serve as a quantitative indicator of task performance and are among the most widely used game elements. Students earn points as they explore more topics and successfully pass the accompanying quizzes. These points allow students to monitor their progress and overall score, while also serving as the basis for leaderboard ranking. Figure 1 shows two screenshots: the first on the left presents the summary of quizzes completed for a topic, and the second on the right displays the progress points earned from answers and the time consumed by students.

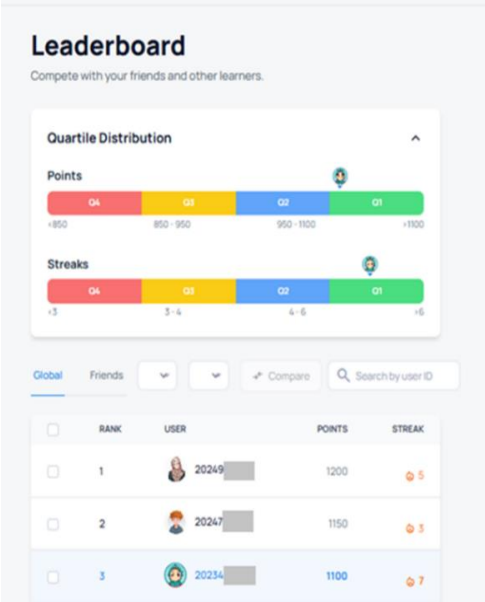
Figure 1. Screenshots of quiz completed, points earned by answers and time consumed



Gamification Elements - Leaderboards

A comparative ranking of students known as the leaderboard is a widely used game element. This web-based gamification learning ranks students according to the time spent on each quiz within a topic as well as their overall performance, which is determined by the total points earned. This feature encourages competition and motivation by allowing students to benchmark their progress against peers.

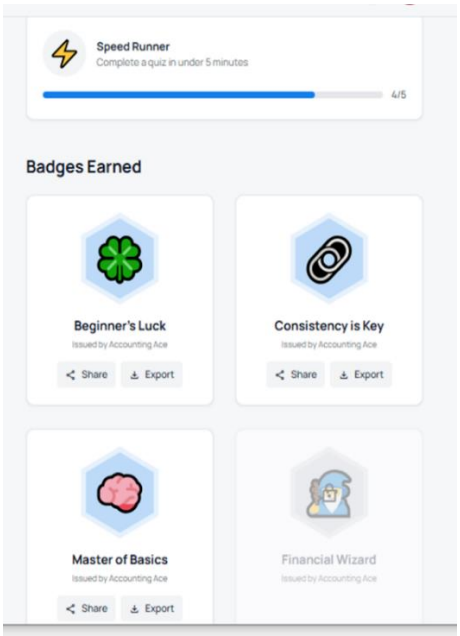
Figure 2. Screenshot of leaderboard showing student's ranking based on points and streak



Gamification Elements - Badges

Badges serve as a unique indicator of achievement and are commonly used to symbolize player's accomplishments. Students who earn badges not only collect them but also earn a certain number of points, which encourage students to complete specific topics to achieve higher rankings on the leaderboard. For example, students receive a badge called "Beginner's Luck" upon completing the first quiz topic. Additional badges may be awarded for being ranked first in a topic or for answering all questions correctly in the shortest time. These badges enhance student engagement, encourage students to try as much as possible each quiz, and increase replayability.

Figure 3. Screenshot displaying badges unlocked and not yet unlocked by students



As of now, the web is still in an ongoing process and fully completes one of the topic basic cost accountings which is Introduction to Cost and Management Accounting. Both courses, ACC116 and ACC466 comprise this topic in Chapter 1/Topic 1 which indicate the students are eligible to represent as the sampling group for this study. After completing the topic during the semester, students were given one hour to explore the educational games.

Procedure and survey design

The survey was distributed to respondents via Google Forms, with each item rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A 5-point Likert scale was chosen for this study due to its well-documented advantages. Its simplicity reduces the cognitive burden on respondents, which can improve data quality [29]. The scale is structured to capture a full range of attitudes, including a true neutral midpoint, which is critical for valid measurement [30]. Furthermore, the 5-point Likert scale has proven to be a reliable and valid tool for measuring attitudes and perceptions within educational research contexts, lending confidence to the psychometric soundness of the instrument [31]. Prior to participation, informed consent was obtained to ensure ethical compliance regarding the use of responses for research purposes. Descriptive statistics were conducted using IBM SPSS Statistics Version 28 to summarize the demographic and variable-related data. To test the hypothesized relationships, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed using SmartPLS 4.0. According to Chin [32], the minimum sample size for PLS-SEM should be at least 10 times the number of items for the most complex construct. As shown in Table 1, each construct in this study included four measurement items, thus requiring a minimum of 40 respondents. The final sample size of 107 respondents therefore exceeded the recommended threshold, satisfying the minimum sample size criteria for PLS analysis.

Table 1. Questionnaire

Construct	Item code	Questionnaires items	References
Perceived ease of use (PEOU)	PEOU1	It was easy for me to use the revision web-based system for learning accounting.	Adapted from Davis [15]
	PEOU2	I become skilful at using the revision web-based system without much effort.	
	PEOU3	Learning how to use the revision web-based system was easy for me.	
	PEOU4	The revision web-based system was clear and easy to navigate.	
Perceived Usefulness (PU)	PU1	Using the revision web-based system helped me answer questions more quickly.	
	PU2	The revision web-based system improved my understanding and performance in the accounting course.	
	PU3	The revision web-based system made it easier for me to revise accounting topic.	
	PU4	I found the revision web-based system useful for my learning in accounting course	
Gamification (G)	G1	I intend to use gamified web-based system in accounting courses because they are useful in helping me understand the subject better.	Adapted from Davis [15] & Venkatesh and Davis [16]
	G2	I am motivated to continue using gamified in accounting course because they are useful and make learning more enjoyable and competitive.	
	G3	I plan to use gamified in accounting course because they are easy to use and keep me engaged throughout the revision process.	
	G4	I predict, I would use gamified in accounting course because they are user-friendly and make revision less stressful.	

RESULTS

The demographic data of the respondents is shown in the table below:

Table 2. Demographic data of respondents

Demographic characteristics	Categories	Frequency	Percentage
Age	20 and below	77	71.96%
	21 and above	30	28.04%
Gender	Female	82	76.64%
	Male	25	23.36%
Skill in technology	Advance	22	20.56%
	Medium	82	76.64%
	Poor	3	2.80%
Internet	Mobile data	100	93.46%
	Wifi	7	6.54%
Coverage (signal strength)	Excellent	24	22.43%
	Good	66	61.68%
	Fair	15	14.02%
	Poor	2	1.87%
Device used	Laptop	12	11.21%
	Smartphone	95	88.79%

Most respondents are female students (76.64%) and aged below 20 years old (71.96%) represent by diploma students. Skills in technology indicate that 76.64% were medium proficient. 88.79% of students use smartphones with most respondents considering their internet was good coverage and the internet strength was stable.

To assess the reliability and validity of the constructs, Cronbach's Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE) were evaluated. As shown in Table 3, all the three constructs demonstrated acceptable internal consistency and convergent validity.

Table 3. Construct Reliability and Convergent Validity

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	R^2
Gamification	0.838	0.884	0.681	
Perceived Ease of Use	0.770	0.799	0.593	
Perceived Usefulness	0.875	0.879	0.727	0.725

Cronbach's alpha values ranged from 0.770 to 0.875 exceeding the recommended threshold of 0.70 [33] indicating acceptable internal consistency. Composite reliability scores for all constructs were values between 0.7 and 0.9 which satisfied the recommended value [34]. AVE is defined as the grand mean value of the squared loadings of the indicators associated with the constructs. An AVE value of 0.5 or higher indicates that, on average the construct explains more than half of the variance of its indicators. Therefore, the AVE value is suggested to be greater than 0.5 [35] which indicates the AVE values ranged from 0.593 to 0.727 demonstrating adequate convergent validity.

Table 4. Discriminant Validity (Fornell & Larcker criterion)

	Gamification	Perceived Ease of Use	Perceived Usefulness
Gamification	**0.825**		
Perceived Ease of Use	0.765	**0.770**	
Perceived Usefulness	0.717	0.521	**0.853**

Table 4 indicates the Fornell Larcker criterion to compare the latent variable correlations with the square root of the construct's AVE. The square roots of each construct's AVE should be greater than its highest correlations

with any other construct. The value from the table shows that the square root value of the diagonal AVE is greater than other correlation coefficient values in the matrix. These results confirm that each construct is empirical distinct, supporting discriminant validity as per Fornell and Larcker's [36] guideline.

Table 5. Discriminant Validity (Heterotrait-Monotrait Ratio of Correlations (HTMT) criterion)

	Gamification	Perceived Ease of Use	Perceived Usefulness
Gamification			
Perceived Ease of Use	0.893		
Perceived Usefulness	0.835	0.599	

Table 5 shows heterotrait-monotrait (HTMT) analysis to further validate discriminant validity. HTMT is an estimate of what the true correlation between two constructs would be if they were perfectly reliable. As such, the above table shows a value less than 0.9 indicating good discriminant validity [37]. These results confirm that the constructs are sufficiently distinct from one another, supporting the model's discriminant validity.

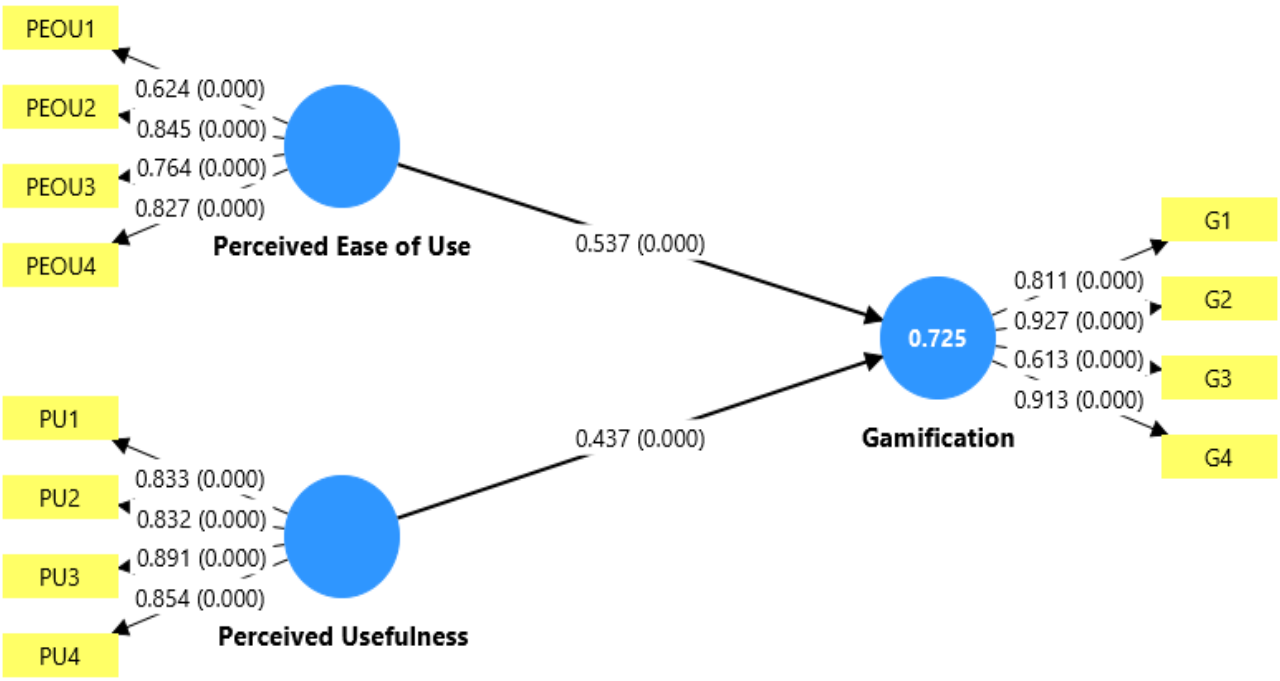
Table 6. Hypothesis

	Hypotheses	Path Coefficient (β)	T Statistics	P Values	97.5% Confidence Intervals	Results
H1	Perceived Ease of Use (PEOU) → Gamification (G)	0.537	8.753	0.000	0.656	Supported
H2	Perceived Usefulness (PU) → Gamification (G)	0.437	6.524	0.000	0.568	Supported

Structural model analysis was conducted to test the hypothesized relationship using PLS-SEM. Table 6 presents the hypothesized relationship between the perceived ease of use and usefulness of students' intention to use gamification learning in accounting courses. The results show that both hypotheses were statistically significant and supported. H1 indicated perceived ease of use had a positive and significant effect on gamification ($\beta = 0.537$, $t = 8.753$, $p < .001$), with a 97.5% confidence interval of 0.656. While H2 show perceived usefulness also showed a significant positive influence on gamification ($\beta = 0.437$, $t = 6.524$, $p < .001$), with a confidence interval of 0.568.

The PLS-SEM path analysis model is shown in Figure 4 below.

Figure 4. Model of PLS-SEM path analysis diagram



The measurement model evaluated by examining indicator loadings, average variance extracted (AVE), and composite reliability (CR). According to Hair et al. [33] an ideal indicator loading should exceed 0.70, although a minimum threshold of 0.5 is considered acceptable. In this study, all items included in Figure 1 had loadings above 0.6, which meets the widely accepted benchmark for indicator reliability [38]. To assess the model's explanatory power, the coefficient of determination (R^2) was analyzed. The R^2 value range from 0 and 1, with higher values indicating greater explanatory strength in validating the predictive accuracy of endogenous variables within the structural model. As outlines by Chin [39], R^2 values of 0.67, 0.33, and 0.19, indicating a strong, moderate, and weak explanatory power, respectively. Referring to Table 3 and Figure 1, the R^2 value obtained was 0.725 (72.5%), indicating that the model possesses strong explanatory power. In other words, perceived ease of use and perceived usefulness together explain 72.5% of the variation in students' intention to use gamification web-based/apps in accounting courses.

Effect sizes (f^2) were calculated to assess the individual contribution of each predictor to the R^2 value in Table 7 below:

Table 7. Result of R^2 and f^2

Construct	R^2	f^2	Decision
Gamification	0.725		
Perceived Ease of Use		0.763	Large effect
Perceived Usefulness		0.506	Moderate to large effect

Based on Cohen [40] guidelines, effect sizes are categorized as small ($f^2 \geq 0.02$), medium ($f^2 \geq 0.15$) and large ($f^2 \geq 0.35$). Perceived ease of use had a large effect size on gamification ($f^2 = 0.763$), suggesting a strong influence on students' intention to use gamified web/apps. While perceived usefulness had a moderate to large effect size ($f^2 = 0.506$), also contributing significantly to the explained variance.

DISCUSSION

This research paper aims to investigate the factors influencing non-accounting students' acceptance of gamified accounting education, utilizing the TAM framework comprised of two elements that influence the user's inclination to utilise technology: perceived ease of use (PEOU) and perceived usefulness (PU). Prior research in technology-enhanced learning has demonstrated that PEOU and PU alone are strong predictors of technology adoption in an educational context [18]. The results show that PEOU had a positive and significant effect on gamification ($\beta = 0.537$, $t = 8.753$, $p < .001$) and consistent with previous research which indicates that an intuitive and user-friendly design is essential for technology acceptance in educational contexts, as it helps students focus on learning rather than the technology itself [11][19][20][21]. Perceived usefulness also showed a significant positive influence on gamification ($\beta = 0.437$, $t = 6.524$, $p < .001$), align with prior studies which suggest that when students perceive gamification as useful, they are more likely to engage with it [20][23][24][25]. The result of this present study demonstrates that both PEOU and PU significantly influence non-accounting students' intention to use gamified web-based in accounting courses. The result is expected since the younger generations tend to spend their spare time playing computer games and technology-savvy generation.

In addition, this study found that PEOU had a large effect on gamification ($f^2 = 0.763$), compared to PU which had a medium effect ($f^2 = 0.506$), highlighting that ease of use plays a slightly more critical role than usefulness in students' willingness to adopt gamified tools. The larger effect size of PEOU compared to PU suggests that, in the context of non-major students enrolled in mandatory accounting courses, the simplicity and intuitiveness of the gamified system play a more decisive role in shaping acceptance. As highlighted in prior studies, these students often perceive accounting as a complex, high-risk and intimidating course [1][2][3][5][6]. From a cognitive load theory perspective, reducing extraneous cognitive load through user-friendly and easily navigable gamified platforms becomes more critical than emphasizing long-term usefulness [41]. This finding contrasts with prior TAM research, which typically identifies PU as the stronger determinant of intention in mandatory learning contexts [16]. As Almuntsr et al. [9] observed, gamification can shift students' focus toward enjoyment rather than learning goals, which may explain the stronger influence of PEOU in this study. Similarly, Almeida

et al. [10] cautioned that while game features may initially engage students, their effectiveness can decline if not well integrated into instructional design. This outcome is particularly relevant for non-accounting students, who often perceive accounting as complex and intimidating, making ease of use a critical factor for sustaining engagement.

The limitation of this study was the sampling method using potential source of sampling bias, and the sample is limited to non-accounting students from the Faculty of Administrative Science and Policy Studies (FSPPP) Universiti Teknologi MARA Seremban Campus, which limited to non-accounting majors at a single institution, which may hinder generalizability. Future research could examine whether the influence of PEOU is larger than PU is moderated by students' prior gaming experience or their perceived difficulty of the accounting course. By exploring the moderating effects of individual differences (e.g., prior gaming experience, cognitive load, learning styles) on TAM constructs in gamified accounting education could provide a more granular understanding of technology acceptance. The insights gleaned from this review offer valuable contributions to the literature on technology acceptance and pedagogical innovation in accounting education. The successful integration of gamification requires a nuanced understanding of user perceptions, going beyond functionality to include the impact on the course's learning outcomes. For accounting educators, this means designing gamified experiences that are not only effective in conveying complex concepts but also foster a sense of achievement in academic performance. For curriculum developers and policymakers, the findings underscore the need for strategic investment in well-designed gamified platforms and comprehensive training programs.

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