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UNDERSTANDING GAME-BASED LEARNING ADOPTION INTENTION AMONG ACCOUNTING STUDENTS: AN INTEGRATION OF THE THEORY OF PLANNED BEHAVIOR AND SELF-DETERMINATION THEORY

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Abstract:

Students often find the detailed accounting standards, particularly those concerning Inventories (MFRS102), to be very challenging, which calls for innovative teaching approaches. The study investigates students' motivation and attitude as significant factors affecting students' intention to adopt Game-Based Learning (GBL) for learning the accounting standard on Inventories. This study is theoretically grounded in the Theory of Planned Behaviour (TPB). The TPB posits that an individual's attitude toward a behaviour is a key factor in determining their intention to engage in that behaviour. Integrating Self-Determination Theory (SDT) alongside TPB, this study also investigates the role of student motivation in influencing adoption intention. This study employed a purposive convenience sampling technique, whereby the online survey was distributed to 189

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undergraduate accounting students at a public university in Malaysia. The data were analysed statistically using Smart Partial Least Squares (PLS) software. Findings reveal that students' motivation exerts a positive and significant influence on the intention to adopt GBL in the classroom. Meanwhile, students' attitude does not have a significant impact. These results suggest that Game-Based Learning may be a useful complement to traditional face-to-face instruction and may support students' understanding of complex accounting standards such as Inventories, while also enriching learning methods in higher education.

Keyword:

Accounting, Attitude, Motivation, Game-Based Learning

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Introduction

Gamification refers to the incorporation of game mechanics and design elements into non-game contexts to make learning more engaging and enjoyable (Apostol, Zaharescu & Alexe, 2013). Game-Based Learning (GBL) involves the use of actual games as a structured and formal teaching method within face-to-face or online learning environments to convey information and reinforce learning outcomes. It is regarded as an innovative educational tool capable of building students' confidence, cultivating a more positive attitude toward accounting, and fostering a deeper and more lasting understanding of accounting principles (Phillips & Graeff, 2014). Prensky (2006) also emphasises that GBL has unique elements that facilitate learning: it offers motivation and structure through clearly defined rules and objectives, engages learners through interactivity, stimulates creativity by incorporating elements of competition, challenges learners through problem-solving tasks, generates enjoyment throughout the learning process, and strengthens self-esteem by rewarding achievement and success.

In the recent years, gamification has revolutionised teaching practices for all disciplines, providing students with more stimulating and interactive classroom experience that create more motivation than traditional teaching methods (Westera, 2019). This shift is particularly relevant to accounting education where the often rule-based nature of accounting standards requires students to quickly acquire specialised vocabulary and conceptual underpinnings before they can engage with practical situations. Cognitively, this process can be demanding and when taught only through traditional lecture-based methods can lead to disengagement or a superficial understanding.

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Traditional face-to-face instruction is effective for delivering structured content but often does not maintain student interest for long periods of time especially when the subject matter is technical, detail-oriented, and perceived to be dry or difficult. This has resulted in a growing need for alternative pedagogical strategies that can complement traditional teaching, while improving student engagement, retention, and conceptual clarity. One such technique is Game-Based Learning (GBL), which presents an interactive and experiential alternative to passive learning. Unlike a commercial game, which is primarily designed for entertainment, GBL is designed for educational outcomes.

In the context of education, GBL is essential to increase student involvement, as well as to improve the quality and results of learning (López Gavira & Omoteso, 2013). It actively involves learners in seeking and constructing knowledge and exposes learners to a range of emotional experiences including pride, frustration, joy, sadness, disappointment, and curiosity (Lee & Hammer, 2011). These are all known as the key elements of deep and meaningful learning. This process allows students to develop cognitive competencies, but also emotional and social skills, which are of considerable value for their future performance as professionals in their respective fields (Liu et al., 2015). With these documented benefits, a rationale for investigating GBL as a viable and complementary teaching strategy particularly for topics students find difficult to understand such as detailed accounting standards within accounting education is clear. While earlier research has demonstrated that game-based learning and gamification can boost motivation and engagement in accounting education, empirical evidence on the extent to which GBL facilitates students' understanding of, technically complex standards, such as Inventories, is scarce. This research attempts to fill this gap by investigating GBL to complement face-to-face instruction in teaching Inventories in higher education.

Beyond the classroom, GBL has concrete value for young entrepreneurs struggling with the challenges of business ownership in today's digital economy. According to recent studies (Kuczera & Komorowski, 2025, Brown & Knobloch, 2022, and Lai & Siau, 2003), simulation games created for entrepreneurship education can greatly enhance business management knowledge and planning abilities. Supply chain simulations, for example, let users investigate inventory management (Szander, Strommer & Bajor, 2014) and logistics dynamics in a competitive, market-like setting. Tools like these help young entrepreneurs learn the basics of inventory like stock management, estimation and distribution of resources through experience in a risk-free environment instead of just reading about it, thus preparing them with real world skills that are becoming more necessary in today's digital economy. Therefore, understanding the factors that drive students' attitudes and motivation with GBL is crucial for educators and curriculum designers who want to modernise and enrich the accounting learning experience, and extend its relevance to aspiring entrepreneurs who want to manage inventories effectively in the digital era.

GBL has been well supported by the literature concerning its pedagogical value in improving engagement, motivation and conceptual understanding. However, the psychological and behavioural mechanisms underlying students' willingness to adopt GBL as a learning approach have received less attention. To understand why learners, develop a positive attitude toward GBL, and what motivates them to engage with it, a theoretical lens that can explain the cognitive and motivational pathways leading to behavioural intention is needed. In this study, we adopt the Theory of Planned Behaviour (TPB) and Self-Determination Theory (SDT) to

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investigate the combined effect of students' attitudes and motivation toward their intention to adopt Game-Based Learning for learning accounting standards.

Literature Review

Theoretical Framework

This study is grounded in the Theory of Planned Behaviour (TPB) (Ajzen, 1991), which suggests that an individual's attitude toward a behaviour is a significant determinant of their intention to perform that behaviour. The students' attitude toward GBL is hypothesised to influence their intention to adopt GBL as a learning approach in accounting education in this study context. TPB is a strong and validated theory in explaining behavioural intention, especially in the setting of technology and educational adoption, so it is very appropriate to investigate students' adopting GBL intention in the classroom.

This study not only considers attitude but also the role of student motivation in influencing intention to adopt by incorporating Self-Determination Theory (SDT) (Deci & Ryan, 1985). SDT distinguishes between intrinsic motivation (motivation to participate in an activity for the inherent interest or enjoyment of the activity) and extrinsic motivation (motivation to participate in an activity for a separable outcome) and both are theorised to enhance engagement and behavioural intention. By integrating SDT with TPB, this study is able to capture not only the cognitive-evaluative pathway whereby attitude influences intention, but also the motivational-affective pathway whereby students' inherent drive and engagement contribute to their intention to adopt GBL. Collectively, these two theories provide a strong theoretical foundation to comprehend the interaction between students' attitudes, motivation and their intention to adopt Game-Based Learning in accounting education.

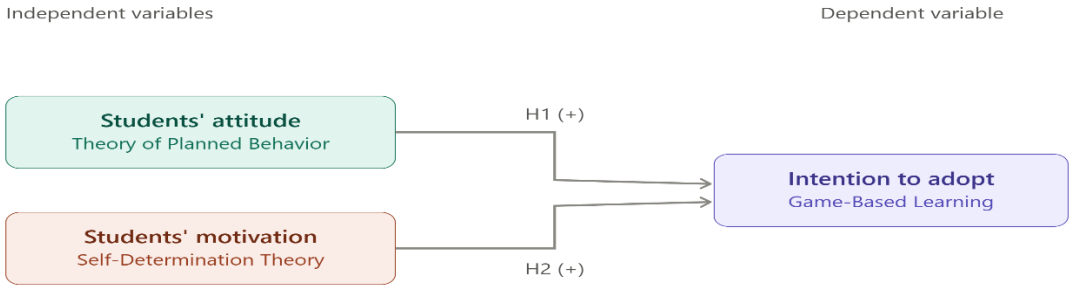


Figure 1: Conceptual Framework

This section presents the conceptual framework that forms the basis of this study, offering a clear guide for how the research objectives will be accomplished. This framework positions students' attitude and students' motivation as the two independent variables, each drawing on the theoretical mechanism discussed earlier (TPB for attitude, SDT for motivation), both hypothesized to positively predict intention to adopt GBL, our dependent variable. This structured approach allows the study to offer valuable insights into designing learning materials through gamification, especially in view of the increasing prevalence of games within the Malaysian market and the evolving preferences of younger generations (Ibrahim et al., 2011).

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Students' Attitude and Intention to Adopt GBL

According to the Theory of Planned Behaviour (Ajzen, 1991), attitude toward a behaviour is one of the strongest predictors of behavioural intention; individuals who hold favourable evaluations of a given behaviour are more likely to form the intention to engage in it. This relationship has direct empirical support within accounting education specifically. A large-scale study involving 816 accounting undergraduates who used a gamified learning tool called Accountingame found that attitude was a key predictor of continued use intention and word-of-mouth intention toward games-based learning as a method of supporting the accounting learning process. Similarly, in a related study applying multiple behavioural theories including Self-Determination Theory, Flow Theory, and Planned Behaviour which tested to the same accounting student population, motivation and attitude dimensions obtained using GBL resources were found to significantly influence students' perceived learning of accounting content. These findings reinforce the theoretical expectation that students who develop favourable attitudes toward GBL are more inclined to form a stronger intention to adopt it.

Moreover, Yu et al. (2024) examined students' learning attitudes and their current dispositions toward the integration of information technology into the curriculum. Achieving positive educational outcomes requires students to adopt constructive attitudes, remain focused on ongoing learning activities, and avoid behaviours that disrupt their peers' learning. The introduction of technology into teaching can help support these goals, enriching the learning environment when students approach their studies with the appropriate mindset. Furthermore, attitude plays a pivotal role in technology adoption across various domains, shaping users' intention to use applications, as demonstrated in studies on gamification tools and mobile technology (Kuo & Yen, 2009; Zhu, Lin, & Hsu, 2012; Rezaei, Shahijan, Amin, & Ismail, 2016).

Meanwhile, Rahman et al. (2024) surveyed 688 smartphone-based online game players and discovered that customer attitude has a significant effect on their intention to use such games, revealing a strong relationship between attitude toward smartphone-based online gaming and the intention to engage in it. Attitude was conceptualized in six dimensions namely perceived emotional value, perceived quality value, social influence, technology gratification, perceived usability and psychological well-being. Results suggest that each of the above dimensions plays an important role in the user's attitude toward smartphone-based gaming. Based on this theoretical and empirical background we hypothesize that:
H1: Students' attitude has a positive and significant influence on their intention to adopt Game-Based Learning.

Students' Motivation and Intention to Adopt GBL

Self-Determination Theory (Deci & Ryan, 1985) posits that motivation whether intrinsic (driven by inherent interest or enjoyment) or extrinsic (driven by external outcomes such as grades or rewards) is a key driver of engagement and behavioural intention. Investigating users' motivation to engage with mobile technology can offer valuable insights into their ongoing engagement behaviors. Motivation can be categorized into three main types: functional, which focuses on efficiency, ease of use, and time-saving aspects; hedonic, which involves fun, enjoyment, and pleasure; and social, which reflects the desire to connect with and share experiences with others (Kim et al., 2013). Understanding these different motivational factors can help in designing more effective and engaging mobile experiences.

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Prensky (2003) argued that motivation is an indispensable condition for successful learning, and that games are inherently well-suited to providing this condition. In a related vein, Cheung et al. (2021) examined how various motivational factors influence player loyalty in mobile games, identifying three primary dimensions: intrinsic motivation (enjoyment and challenge), extrinsic motivation (rewards and achievements), and social motivation (interaction with other players). Their findings suggest that intrinsic motivation plays the most significant role in fostering loyalty, followed by social motivation. These insights suggest that a deeper understanding of motivational factors can help game developers design features that enhance player retention and engagement.

This is consistent with findings from accounting-specific gamification research; a recent study on finance and accounting simulation tools such as Cash Flow, Catan, and SimDeF observed that game-based learning in accounting education positively influences both motivation and attitudes among students. Likewise, empirical evidence from the Accountingame study found that motivation was among the constructs meaningfully shaped by GBL exposure, alongside attitude, in influencing students' engagement with accounting learning tools (Rodrigues et al., 2021). Motivated students are more likely to actively seek out and embrace learning methods they perceive as engaging and rewarding, such as GBL, particularly given that GBL is designed to enhance enjoyment, challenge, and a sense of achievement (Prensky, 2006). Based on this theoretical reasoning and supporting empirical evidence, it is hypothesized that

H2: Students' motivation has a positive and significant influence on their intention to adopt Game-Based Learning.

Research Methodology

The research gathered data via online questionnaire which responded by 189 students from undergraduate students taking the accounting subject from Universiti Teknologi MARA, Perak Branch. This study employed a purposive convenience sampling technique to select respondents. Purposive sampling is a nonprobability sampling method in which participants are deliberately selected based on specific characteristics or criteria relevant to the research objective, rather than being randomly drawn from the population (Etikan, Musa & Alkassim, 2016). In this study, the target population was purposively defined as undergraduate accounting students, since these students possess the relevant exposure to accounting coursework and standards necessary to meaningfully evaluate their attitudes and motivation toward Game-Based Learning (GBL) adoption.

Within this purposively defined population, respondents were subsequently selected based on accessibility, reflecting an element of convenience sampling. Convenience sampling involves selecting respondents based on their accessibility and willingness to participate and is commonly used when probability sampling is impractical or when the researcher faces constraints in time, cost, or resources. As the survey was distributed to accounting students at a single public university in Malaysia, respondents were drawn from a readily accessible cohort rather than a randomly sampled population across multiple institutions.

The combined use of purposive and convenience sampling is appropriate for this study given that the choice between nonprobability sampling techniques depends on the nature and objectives of the research, and this study does not aim to generalise findings to the entire

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population of accounting students in Malaysia, but rather to explore attitudes and motivational factors influencing GBL adoption intention within a defined and accessible student population.

For the data collection process, it was collected through an online survey. There are two sections in the questionnaire; Section A focused on the demographic of the respondents while Section B asked students about three constructs; students' attitude, students' motivation and game-based learning adoption intention. All these constructs were adapted and modified from Ibrahim, Yusoff, Mohamed-Omar & Jaafar, (2011) and Masroom (2006). The four-point Likert scale was operationalized to estimate all the measures (1 = strongly disagree, 4 = strongly agree). This four-point Likert Scale was adopted as it is ideally a good scale for market researchers, in which to get the specific responses. Quantitative approaches were performed to analyze the data by using Smart Partial Least Squares (PLS) software.

Results and Discussion

Demographic Of Respondents

As presented in Table 1, the demographic profile of the 189 respondents reveals a sample that, while diverse, is predominantly female, comprising 72% (136 respondents) compared to 28% male (53 respondents). The age distribution is heavily concentrated within the 20–29 years age group, representing 94.2% of respondents (178 individuals), which is consistent with the study's target population of undergraduate students at a local university. With respect to academic performance, as measured by Cumulative Grade Point Average (CGPA), most respondents (64.6%) reported a CGPA of 3.50 and above, followed by 28% within the 3.00–3.49 range, 6.3% within the 2.50–2.99 range, and 1.1% within the 2.00–2.49 range. Notably, none of the respondents recorded a CGPA below 2.00, indicating an overall high level of academic performance across the sample. This predominance of high-achieving students suggests that the sample's perceptions of GBL adoption are largely shaped by academically capable learners, which may reflect informed and reflective attitudes toward innovative learning approaches such as GBL, though it also implies that findings may be less representative of lower-performing students who could potentially benefit differently from gamified learning interventions.

Table 1: Demographic Characteristics of Respondents

Characteristics	Items	Frequency	%
Gender	Male	53	28%
	Female	136	72%
Age	Under 20 years old	10	5.3%
	20-29 years old	178	94.2%
	30-39 years old	1	0.5%
Academic Performance (CGPA)	3.50 and above	122	64.6%
	3.00-3.49	53	28%
	2.50-2.99	12	6.3%
	2.00-2.49	2	1.1%

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Less than 2.00	0	0%

Assessment of the Measurement Model

The data from the questionnaire was analyzed using Smart PLS (Partial Least Square), a two-step approach which involves evaluating both the measurement and structural models. The measurement model examines the relationship between items and constructs, while the structural model explores the relationship between exogenous and endogenous constructs in the research model. Figure 2 shows the measurement model, which must meet the criteria for internal consistency reliability, convergent validity and discriminant validity. Internal consistency reliability is to ensure the consistency of results across items, while convergent validity is tested to ensure that multiple items measuring the same concept agree with each other. To assess the internal consistency reliability and convergent validity of the measurement model, the loadings, composite reliability (CR), and average variance explained (AVE) were evaluated. As shown in Table 2, all constructs demonstrated satisfactory reliability and convergent validity. Composite reliability (CR) values ranged from 0.809 to 0.845, exceeding the recommended threshold of 0.70 (Hair et al., 2019). Average variance extracted (AVE) values ranged from 0.569 to 0.649, surpassing the minimum threshold of 0.50, thereby confirming convergent validity. Although the Cronbach's alpha for Student Motivation (0.653) was marginally below the conventional 0.70 threshold, this is not uncommon in PLS-SEM studies with a limited number of indicators, and the construct's CR and AVE values confirm adequate reliability overall.

Table 2: The Measurement Model Assessment

Constructs	**Measurement items**	**Loadings**	**Cronbach's α**	**CR**	**AVE**
Game Adoption Intention	INT1	0.7	0.749	0.841	0.569
	INT2	0.768			
	INT3	0.759			
	INT4	0.788			
Student Attitude	SA1	0.656	0.753	0.845	0.649
	SA2	0.815			
	SA3	0.923			
Student Motivation	SM1	0.806	0.653	0.809	0.587
	SM2	0.794			
	SM3	0.693			

As shown in Table 3, discriminant validity was assessed using the Fornell-Larcker criterion, which requires the square root of each construct's average variance extracted (AVE) to exceed its correlations with other constructs (Fornell & Larcker, 1981). The results confirm that the square root of AVE for Game Adoption Intention (0.754), Students' Attitude (0.806), and Students' Motivation (0.766) all exceeded their respective inter-construct correlations, thereby establishing discriminant validity for the measurement model.

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Table 3: Discriminant Validity of Measurement Model Using Fornell and Larcker

Constructs	Game Adoption Intention	Students' Attitude	Students' Motivation
Game Adoption Intention	0.754		
Students' Attitude	0.335	0.806	
Students' Motivation	0.6	0.358	0.766

Assessment of the Structural Model

A structural model analysis was conducted to test the two hypotheses. In the assessment of the structural model, the direction of the beta value, the significance level of the t-values and p-value were examined, as suggested by Hair et al. (2017). The structural model results (see Table 4 and Figure 2) reveal that Students' Attitude and Students' Motivation jointly explain 37.6% ($R^2 = 0.376$) of the variance in Game Adoption Intention, indicating a moderate level of explanatory power (Chin, 1998). Contrary to expectations, Students' Attitude was found to have no statistically significant influence on Game Adoption Intention ($\beta = 0.138$, $t = 1.248$, $p = 0.212$), leading to the rejection of H1. In contrast, Students' Motivation demonstrated a positive and statistically significant influence on Game Adoption Intention ($\beta = 0.550$, $t = 5.615$, $p < 0.001$), thereby supporting H2. These findings suggest that motivation, rather than attitude, is the primary driver of students' intention to adopt Game-Based Learning within this study's context.

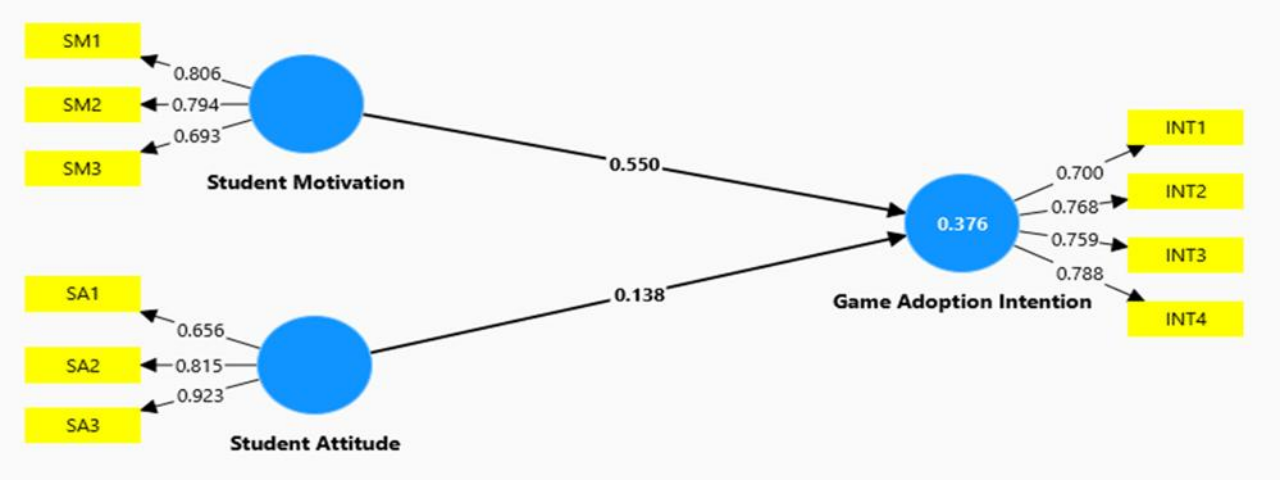


Figure 2: Structural Model

Table 4: Structural Model Assessment and Hypothesis Testing

Hypothesis	Relationship	Beta	Std Deviation	t value	p value	Decision
H1	Student Attitude -> Game Adoption Intention	0.138	0.111	1.248	0.212	Rejected
H2	Student Motivation -> Game Adoption Intention	0.55	0.098	5.615	0.000	Supported

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Table 5 presents the values of the coefficient of determination (R^2) and effect size (f^2) of the exogenous variables on the endogenous variable. The R^2 value represents the amount of variance in the endogenous construct explained by all the exogenous constructs in the research model. As can be seen from the table, the R^2 was 0.376, which denoted that the exogenous variables (students' attitude and students' motivation) explained 37.6% of the variance in the endogenous variable (game adoption intention).

As regards the size effect, f^2, this represents the value of R^2 that is changed when a specific construct is omitted from the model. Following Cohen (1988), the impact of the effect size was judged to be small if the value of f^2, was 0.02, medium if it was 0.15 and large if it was 0.35. The results in Table 5 indicate that the supported exogenous variables (student attitude), f^2, = 0.027 and (student motivation), f^2, = 0.423 had a small and large effect size, respectively on the endogenous variable (game adoption intention).

Table 5: Result of R^2 and f^2

Construct	R^2	f^2	Decision
Game Adoption Intention	0.376		
Student Attitude		0.027	Small
Student Motivation		0.423	Large

Conclusion

This study set out to investigate the influence of students' attitude and students' motivation on their intention to adopt Game-Based Learning (GBL) in accounting education, drawing on the Theory of Planned Behavior and Self-Determination Theory as its underlying theoretical framework. Using data collected from 189 undergraduate accounting students at a public university in Malaysia and analysed through Partial Least Squares Structural Equation Modelling (PLS-SEM), the study empirically tested two hypothesised relationships within a structural model that explained 37.6% of the variance in Game Adoption Intention.

The results provide a nuanced picture of the drivers for students' intention to adopt GBL. H1 was not supported, meaning that a positive attitude toward gaming as a learning method is not enough to lead to adoption intention, contrary to the hypothesised relationship based on the Theory of Planned Behaviour where students' attitude did not have any statistically significant influence on their intention to adopt GBL. In contrast, students' motivation was found to be a strong and statistically significant predictor of adoption intention (H2 supported), indicating the importance of intrinsic and extrinsic motivations such as enjoyment, challenge and sense of achievement in determining students' willingness in adopting GBL as a learning approach. Overall, these findings indicate that motivation, not attitude, is the more important lever that educators and curriculum designers can use to facilitate adoption of GBL in accounting classrooms.

These findings have important theoretical and practical implications. Theoretically, this study adds to the growing body of literature on educational technology adoption by demonstrating that attitude, though a well-established predictor of intention in general TPB-based models, may not have the same explanatory power in accounting education contexts where GBL is still a relatively novel pedagogical approach. This points out that future adoption models within this

domain may benefit from prioritising motivational constructs, or by investigating if attitude functions indirectly through motivation rather than as a direct, standalone predictor.

The results provide practical guidance for accounting educators and curriculum designers in that positive attitudes toward gamified-based learning (GBL) do not need to be the sole focus, but rather more attention should be given to the design of gamified learning materials that can actively stimulate student motivation. For example, reward structures, achievement milestones, meaningful challenges and opportunities for mastery. Since students have difficulty digesting complex and rule-based accounting standards, GBL has strong potential as a complementary teaching strategy that enriches the traditional face-to-face lecture format, with motivation as the central design principle. The results of the study have implications beyond the classroom and can reach a broader audience: as mentioned above, GBL and simulation-based tools have practical implications for young entrepreneurs to understand inventory management and related business principles in a digitalising economy, thus GBL can be a flexible educational tool applicable outside formal university courses.

The study has certain limitations despite these contributions. The sample was drawn from one public university in Malaysia using purposive convenience sampling technique which limits the generalisability of the findings to accounting students in other institutions or countries. Also, the sample was significantly skewed toward high-achieving students (64.6% had a CGPA of 3.50 and above) suggesting that the findings may be more reflective of the perspective of the academically strong students than of the accounting student population. The model explains a moderate proportion of the variance in the intention to adopt GBL (37.6%), there is still a large amount of unexplained variance that suggests other relevant factors such as perceived usefulness, social influence, facilitating conditions, or prior gaming experience were not included in this study and may even better explain students' intention to adopt GBL.

To improve generalisability, future studies could replicate this study in different educational institutions and with larger student populations or expand the model by adding other predictors or testing motivation as a mediating variable between attitude and adoption intention. Longitudinal or experimental designs could also allow for stronger causal inferences regarding the impact of sustained GBL exposure on students' attitudes, motivation and actual adoption behaviour over time. To summarise, this study confirms the potential of Game-Based Learning as a truly innovative and complementary approach to accounting education, provided that it is designed and implemented based on a fundamental understanding of the factors that genuinely motivate students to learn.

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Author Contribution Statement: All authors contributed significantly to the development of this manuscript. Irda Syahira Khair Anwar was responsible for the conceptualization, methodology, and overall supervision of the study. Rahayu Abdul Rahman, Norul Akma Mansor and Norliana Omar handled data collection, analysis, and interpretation of results. Marina Ibrahim and Naimah Zaini contributed to the literature review, drafting, and critical revision of the manuscript. All authors read and approved the final version of the manuscript prior to submission.

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