Acceptance of digital game

by Tan Ming Kuang

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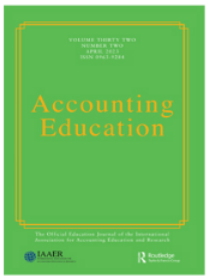

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Acceptance of digital game-based learning by accounting and business lecturers: empirical evidence from Indonesia based on the extended Technology Acceptance Model

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ABSTRACT

Although digital game-based learning (DGBL) has the potential to enhance learning motivation and complex cognitive skills of students, its adoption and effectiveness are heavily dependent on lecturers' acceptance. Comprehending lecturers' perceptions and beliefs underlying their decision-making processes is therefore significant. This study examines factors determining the intention of accounting and business lecturers in Indonesia to use digital games in their courses using an extended Technology Acceptance Model (TAM). Based on data collected from 258 lecturers, the research model is analyzed using PLS-SEM approach. The results show that the proposed model can explain 52.4% of the variance in accounting and business lecturers' behavioral intention to use digital games in class. Particularly, both perceived ease of use and usefulness are the factors significantly determining lecturers' intention. However, DGBL frequency negatively moderates the positive effect of perceived ease of use on lecturers' intention.

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Game-based learning; extended TAM model; lecturer attitude; PLS-SEM; Indonesia

Introduction

This study raises a question of what factors affect lecturers' intention to adopt Digital game-based learning (DGBL)[1] in accounting and business courses. The question is based on the issue of DGBL's low acceptance in the classroom, despite the fact that it is regarded as an effective approach for promoting students' learning motivation, social skills, and complex cognitive skills (Faisal et al., 2022). Lecturers are the focus of study because they play a critical role in promoting the use of new learning technology in their courses. To answer this question, this study uses a technology acceptance model (TAM) extended by De Grove et al. (2012) as a theoretical foundation to predict the DGBL's acceptance of accounting and business lecturers. This study also incorporates DGBL frequency into the extended TAM to explain the strength of the relationship between perceived ease of use (PEOU) and behavioral intention.

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This question is relevant and timely because comprehending lecturers' perceptions and beliefs about DGBL could help accounting educators find the appropriate strategies to promote its use in the classroom. There are two advantages of using DGBL over traditional teaching methods. First, the DGBL can provide engaging, interactive, and motivating learning experiences which are essential for an effective learning (Garris et al., 2002; Jabbar & Felicia, 2015; Tennyson & Jorczak, 2008). For example, Loon and Bell (2018) found that positive emotions stimulated by a computer simulation game enhance students' cognitive skills. Second, the DGBL has proven to be an effective method for students to acquire complex cognitive skills, such as decision making (Pasin & Giroux, 2011; Severengiz et al., 2020; Tawil et al., 2015), critical thinking (Lovelace et al., 2016; Urquidi-Martín et al., 2019; Yang, 2015), problem solving (Eder et al., 2019; Torres & Augusto, 2017; Yang, 2015), and higher-order thinking skills in Bloom's Taxonomy (Adams et al., 2012; Barab et al., 2012; Hwang et al., 2013; Soflano et al., 2015). These skills are important because research on students' conceptual understanding and learning approaches revealed that accounting students generally achieved lower-order learning outcomes (Kuang et al., 2021). Therefore, promoting an instructional method that can help students acquire higher-order thinking skills should be a concern for accounting educators.

This study employs a quantitative method to examine factors affecting lecturers' intention to adopt DGBL in accounting and business courses. This study collects data from 264 lecturers of accounting (56%), management (41%), and entrepreneurship (3%) from all over Indonesia through an online survey. The questionnaire survey consisted of three parts, a brief description about the use of digital games for business education, examining demographic information, and the constructs of the extended TAM. The research model is analyzed with PLS-SEM approach using the Smart-PLS version 3.2 program.

Although digital games have been recognized as being an effective approach for promoting students' learning motivation and complex cognitive skills, their use in formal education is still very limited (Almeida & Simoes, 2019; Kenny & McDaniel, 2011). Studies indicated that the primary reasons teachers are hesitant to use technology in their teaching practice are difficulties matching games to the curriculum (Calabor et al., 2019; El-Masri et al., 2015; Stieler-Hunt & Jones, 2015; Watson et al., 2013), insufficient access to appropriate software and hardware (Hovious & Van Eck, 2015; Watson et al., 2013), a negative attitude towards games (Archer, 2016; Dickey, 2015; Friedberg, 2015; Greitemeyer & Mügge, 2014), insufficient time in the school day (El-Masri et al., 2015; Hovious & Van Eck, 2015), little support from their teaching colleagues (Stieler-Hunt & Jones, 2017), and few incentives from their institutions to motivate and enhance skills and use educational games (Calabor et al., 2019).

However, it has been argued that teachers are the true agents of change in learning (Fullan, 2015, p. 1; Teo, 2008; Usluel et al., 2008), and that the acceptance of digital games as educational tools is heavily dependent on their perceptions. As a result, several studies have been conducted to investigate factors influencing teacher acceptance and attitudes toward DGBL. However, the majority of studies continue to focus on the adoption of digital games in K-12 education (primary, junior high, and senior high schools) (Sánchez-Mena & Martí-Parreño, 2017), with only a few exceptions focusing on higher education (undergraduate and postgraduate) (e.g. Sánchez-Mena et al.,

2019). The limitations of the literature on teachers' intentions to use DGBL in accounting and business education are becoming increasingly apparent (Calabor et al., 2019; Carenys & Moya, 2016). Hence, this study aims to fill the literature gap by empirically investigating the factors that influence accounting and business lecturers' intentions to use digital games in the classroom.

This study uses TAM as a theoretical foundation to predict the DGBL's acceptance of accounting and business lecturers. TAM has been extensively applied to different technological innovations in educational settings, with two primary factors influencing an individual's intention to use technology-based education: perceived ease of use (PEOU) and perceived usefulness (PU). However, the role of PEOU remains unclear in DGBL literature. Some studies show that PEOU is directly related to teachers' behavioral intention of DGBL (Dele-Ajayi et al., 2019; Panagiotarou et al., 2020), while others do not (De Grove et al., 2012; Rüth et al., 2022). Therefore, this study incorporates the role of the DGBL frequency variable into the extended TAM (De Grove et al., 2012) in order to explain the effect of lecturers' PEOU on lecturers' behavioral intention to accept DGBL. DGBL frequency refers to how often a lecturer uses digital games in their accounting and business courses. This study predicts that DGBL frequency will reduce the impact of PEOU on behavioral intention because when lecturers have more knowledge gained from prior experience with educational games, they have more knowledge sources when learning the new ones and may perceive that ease of use is irrelevant.

Contribution

This study makes significant contributions to theory and practice. First, this study adds to the body of knowledge about the motivations for using digital games (Ryan et al., 2006; Yee, 2006), teacher behavior and training in the use of digital games (Jones et al., 2007; Kenny & McDaniel, 2011), and teachers' intentions to use digital games (Bourgonjon et al., 2013; De Grove et al., 2012; Kebritchi, 2010; Ketelhut & Schifter, 2011) in higher education, particularly accounting and business education in Indonesia. The literature indicates a lack of empirical evidence investigating teachers' acceptance of DGBL at the higher education level (Sánchez-Mena & Martí-Parreño, 2017), and this lack is even more pronounced in the accounting education literature (Calabor et al., 2019). Second, this study expands on the modified TAM (De Grove et al., 2012) by incorporating the moderating role of DGBL frequency in explaining the relationship between PEOU and lecturer acceptance of DGBL in accounting and business education context. Third, this study addresses curriculum and instruction issues in the field of accounting education, which has rarely been empirically studied in the context of Asian countries (Apostolou et al., 2019, 2020, 2021). Fourth, this study contributes to empirical research by using structural model analysis, whereas most studies in the accounting curriculum use tabulation and differences-in-means analysis (Apostolou et al., 2019, 2020, 2021). Specifically, the model is analyzed using data gathered from 258 accounting and business lecturers in Indonesia with PLS-SEM approach. Finally, this study informs educational game developers about the importance of collaborating with lecturers to understand their needs and assist them in developing games that align with curriculum goals. It also encourages regulators to heavily publicize the effectiveness of game-based learning for accountants.

The remaining sections of this paper are organized as follows. The section that follows describes the conceptual framework and elaborates on the hypotheses. Following that, the method is presented, which includes an overview of the instruments and sample characteristics. The following section presents the model results, followed by a discussion and implications, as well as limitations and future research recommendations. The final section of the study is the conclusion.

Conceptual framework and hypothesis development

Technology acceptance model

To explain an individual's intention to adopt technology, this study utilizes the Technology Acceptance Model (TAM) developed by Davis (1989), which is based on the Theory of Reasoned Action (TRA). TRA is a psychological theory of human social behavior that assumes that beliefs, attitudes, and subjective norms underpin behavior intentions, which serve as a proxy for actual behavior (Fishbein & Ajzen, 1975). The TAM model proposes two perceptions that explain behavioral intentions: ease of use (PEOU) and usefulness (PU). PEOU refers to how easily someone believes they can use a system or technology without exerting any effort, while PU refers to how useful the technology is in supporting performance improvements. TAM has been proven to be a valid and robust acceptance model across a wide range of technologies and research contexts (Chuttur, 2009).

Critics of the early TAM model pointed out that it took too few factors into account, which limited its ability to explain behavioral intentions. Venkatesh and Davis (2000) addressed this criticism by including five antecedents to perceived usefulness and two mediators between subjective norms and perceived usefulness and intended use. Similarly, Sumak et al. (2011) found at least fourteen antecedents of PEOU and PU in their meta-analysis of the use of TAM in e-learning acceptance studies. These efforts to identify additional factors led to the creation of a single theory of acceptance and use of technology (UTAUT), which combines the principles of TAM, TRA, theory of planned behavior, innovation diffusion theory, social cognitive theory, and a personal computer utilization model (Venkatesh et al., 2003). While TAM was criticized for being overly restrictive, UTAUT was criticized for its lack of simplicity, coordination, and integration (Bagozzi, 2007).

This study uses the original TAM model with variable expansion as used by De Grove et al. (2012) because it has been tested for decades and is widely accepted for use in the area of technology and education (Sumak et al., 2011), such as e-learning (Baki et al., 2018), mobile learning (Al-Emran et al., 2018), and DGBL (Dele-Ajayi et al., 2017). In DGBL literature, TAM has been used to predict the intention behavior of students (e.g. Matute-Vallejo & Melero-Polo, 2019; Panagiotarou et al., 2020) and teachers (Asiri, 2019; Bourgonjon et al., 2013; De Grove et al., 2012; Rüth et al., 2022; Sánchez-Mena et al., 2019; Waarvik, 2019). The expanded TAM was chosen because it was able to explain the intention to adopt digital games in formal education. Testing in different contexts is important to increase the generalizability of TAM in predicting teachers' intention to adopt digital games for teaching. This study adds the DGBL frequency variable to the expanded TAM model to explain the intention to adopt digital games for teaching in business education in higher education.

Determinants of acceptance of digital games

This study operationalizes the acceptance of digital business games for teaching as a lecturer's behavioral intention to use digital games. There are two reasons for this. First, compared to actual use, behavioral intention has been used as the dependent variable in almost all DGBL studies using the TAM model (Asiri, 2019; Bourgonjon et al., 2013; De Grove et al., 2012; Rüth et al., 2022; Sánchez-Mena et al., 2019; Waarvik, 2019). Literature indicates that the extended TAM constructs were able to explain approximately 68% of the variance in the behavioral intention of pre-service (Rüth et al., 2022) and in-service teachers (De Grove et al., 2012), a relatively good performance compared to TAM in predicting teacher usage (24.6%) (Waarvik, 2019). Second, this present study revealed that DGBL is relatively new for most lecturers in Indonesia. Our data suggests that 36% of lecturers use digital games infrequently, while 53% of lecturers never use digital games in classroom activities. Only 11% of lecturers apply digital games for teaching accounting and business. From a practical perspective, the selection of behavioral intention as dependent variable is consequently a reasonable choice (Bourgonjon et al., 2013; Hu et al., 2003).

The explanation of the factors that influence behavioral intentions is divided into two sections for the development of the hypothesis. To begin, the original TAM model includes factors such as PEOU and PU. Second, there are the factors that are added to the original TAM model, which are experience, curriculum relevance, learning opportunities, and DGBL frequency.

Factors in the original TAM model: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)

The previous section mentioned that PU and PEOU are the two main factors explaining behavioral intention to use technology in the original TAM model (Davis, 1989). TAM assumes that usefulness and ease of use have a direct effect on behavioral intentions to accept a technology, and ease of use has a positive effect on usefulness. In this study, PU means how far the lecturer believes that using digital games will improve their teaching performance. Digital games are more likely to be used in the classroom by lecturers who believe they help students learn than by those who do not (De Grove et al., 2012). Recent research on the acceptance of educational technology generally supports the notion that usefulness influences teachers' willingness to adopt a new teaching tool (e.g. Jung, 2015; Mazman Akar, 2019; Menabò et al., 2021; Panagiotarou et al., 2020; Qashou, 2021). This is consistent with previous research on digital game acceptance that suggests the importance of usefulness as an adoption determinant (Asiri, 2019; Bourgonjon et al., 2013; De Grove et al., 2012; Rüth et al., 2022; Sánchez-Mena et al., 2019).

PEOU denotes the extent to which lecturers believe they can effectively use digital games. Lecturers who believe they have expertise tend to have positive perceptions (e.g. usefulness) and then use digital games in their classrooms as learning tools. While De Grove et al. (2012) and Rüth et al. (2022) do not find that PEOU affects teachers' intention to adopt DGBL, Dele-Ajayi et al. (2019) and Panagiotarou et al. (2020) find the significance of PEOU as an adoption determinant. Furthermore, PEOU has a positive effect on PU because the simplicity of a system can improve

outcomes, and a technology is perceived as more useful if it is easier to use (Davis, 1985). Previous studies focusing on game acceptance show evidence of the significance of PEOU as a PU determinant (Bourgonjon et al., 2010; Hsu & Lu, 2004; Sánchez-Mena et al., 2019). Hence, the proposed hypotheses are as follows:

H1: PU will have a positive effect on behavioral intentions to use digital games.

H2: PEOU will have a positive effect on behavioral intentions to use digital games.

H3: PEOU will have a positive effect on PU.

Additional factors to the original TAM model: experience, learning opportunities, curriculum-relatedness, and DGBL frequency

Other external variables, according to Davis (1989), should be added to the TAM for technology-specific measurements because they may affect the usefulness and ease of use of the technology. To test the acceptance of digital game technology for education, De Grove et al. (2012) added learning opportunities, experience, and curriculum-relatedness to the original TAM model. This study adds DGBL frequency as an extra variable into the De Grove et al. (2012)'s TAM model.

Learning opportunities

Learning opportunities and perceived usefulness (PU) are both measures of the benefits of adopting technology, but they differ in their focus. PU, according to Davis (1989), refers to 'the degree to which a person believes that using a particular system would enhance his or her job performance' (p. 320), while learning opportunities, as defined by Bourgonjon et al. (2010, p. 1147), refers to 'the degree to which a person believes that using video games in the classroom can offer him or her opportunities for learning.' PU is results-oriented, whereas learning opportunities are process-oriented. This is because the Technology Acceptance Model (TAM), which originally developed and studied PU, was focused on business and commercial contexts with different objectives compared to education (Hu et al., 2003; Teo, 2008). In contrast, the process of learning is crucial in the educational context because it influences the quality of learning outcomes. Hence, Bourgonjon et al. (2010) added the variable of learning opportunities to the traditional TAM model.

Bourgonjon et al. (2010) operationalize learning opportunities by highlighting the benefits of using digital games, which align with current learning theories such as constructivist, experiential, and contextual learning, as identified in previous studies (e.g. Egenfeldt-Nielsen, 2006; Kebritchi & Hirumi, 2008; Wu et al., 2012). For instance, digital games allow students to think critically and gain firsthand experience with the knowledge they are learning (see Table 2). Research indicates that middle school teachers who perceive digital games to enhance students' learning experiences consider them useful for achieving learning goals and intend to use them for teaching (Bourgonjon et al., 2013; De Grove et al., 2012).

Regarding perceived ease of use (PEOU), in line with the arguments of H3, teachers who believe they have expertise are more likely to perceive digital games as useful, not only for their outcomes but also for the process. Although previous research has established a relationship between learning opportunities and behavioral intentions, PEOU, and PU,

such research is still in its early stages and has been conducted mostly in the context of secondary education (De Grove et al., 2012). This study aims to evaluate this relationship in higher education, particularly in business education, and proposes the following hypotheses:

H4: Learning opportunities will have a positive effect on behavioral intentions.

H5: Learning opportunities will have a positive effect on PU.

H6: PEOU will have a positive effect on learning opportunities.

Experience

Experience refers to the level of a lecturer's familiarity with digital games for teaching their courses. However, individuals with extensive experience using technology may have altered views due to that experience. This study assumes that digital games can serve as a beneficial tool for business learning among students. Consequently, highly experienced lecturers are more likely to have positive beliefs regarding the benefits, PEOU, and learning opportunities provided by digital games, and they are also more inclined to incorporate these games into their classroom instruction compared to those with less experience. Previous research in information systems shows that experience is associated with behavioral intentions, PEOU, and PU (Davis & Venkatesh, 1996).

Despite this, research on digital game-based learning has produced inconclusive results (Bourgonjon et al., 2010, 2013; De Grove et al., 2012; Rüth et al., 2022). In particular, Rüth et al. (2022) investigated the relationship between personal characteristics of pre-service teachers and their intention to use digital learning as a reflective tool and learning aid. The researchers discovered that some personal characteristics, such as knowledge and game-related experiences, were weak predictors of teacher acceptance, which corroborated previous studies on in-service teachers (Bourgonjon et al., 2013). Conversely, Bourgonjon et al. (2010) used a structural equation model to examine students' acceptance of digital games in the classroom. Their findings indicated that students' perceptions of usefulness, ease of use, learning opportunities, and personal experience with games impacted their preference for using digital games in class. These findings are consistent with those of De Grove et al. (2012), who found that prior gaming experience among teachers had a positive impact on behavioral intentions and PU. Furthermore, both De Grove et al. (2012) and Bourgonjon et al. (2013) found that experience has a positive effect on learning opportunities and PEOU.

The ambiguous results from previous studies may be due to the limited research on the acceptance of digital game-based teaching in formal education (De Grove et al., 2012). Therefore, the researcher proposes the following hypotheses to clarify the effect of experience:

H7: The experience of using digital games in courses will have a positive effect on behavioral intentions.

H8: The experience of using digital games in courses will have a positive effect on PU.

H9: The experience of using digital games in courses will have a positive effect on learning opportunities.

H10: The experience of using digital games in courses will have a positive effect on PEOU.

Curriculum-relatedness

The role of digital games in education is heavily influenced by their relatedness to the curriculum, as noted by several studies (Baek, 2008; Dele-Ajayi et al., 2017; Egenfeldt-Nielsen, 2005; Ketelhut & Schifter, 2011; Rice, 2007; Sandford et al., 2006; Van Eck, 2006; Wastiau & Kearney, 2009). To ensure a high level of curriculum-relatedness, digital games must align with the content and teaching materials, allowing curriculum objectives to be achieved within the desired timeframe. Lecturers who recognize the relevance of digital games to the content being taught are more likely to find them easy to use and beneficial to both the process and learning outcomes, leading to an intention to use digital games in the classroom (De Grove et al., 2012). Previous research has demonstrated that curriculum-relatedness is a critical determinant of teachers' acceptance of digital games (Adukaite et al., 2017; De Grove et al., 2012; Rüth et al., 2022). For instance, De Grove et al. (2012) surveyed secondary school teachers' attitudes towards using digital game-based learning (DGBL) in the classroom and found that curriculum-relatedness influences teachers' intention to use DGBL, as well as their PEOU, learning opportunities, and PU.

Currently, numerous digital games have been developed based on business education material and are accessible either for free or for a fee (e.g. https://simformer.com/https://mitsloan.mit.edu/LearningEdge/simulations/Pages/Overview.aspx). Lecturers who possess extensive experience with digital games are more likely to perceive the relationship between digital games and the material being taught, compared to those with less experience. As a result, experienced teachers are more likely to adopt DGBL in their courses (De Grove et al., 2012). This finding is consistent with previous research indicating that prior experience can have a direct and indirect impact on the adoption of DGBL (De Grove et al., 2012; Panagiotarou et al., 2020; Sánchez-Mena & Martí-Parreño, 2017). De Grove et al. (2012) demonstrated that secondary school teachers with more experience perceive digital games as more appropriate for fitting into the curriculum than those with less experience. They also found that experience has a positive effect on curriculum-relatedness, which in turn influences behavioral intention.

To investigate the relationship between curriculum-relatedness and behavioral intentions, PU, learning opportunities, PEOU, and experience in the context of higher education, particularly business education, the following hypotheses are proposed:

H11: Curriculum-relatedness will have a positive effect on behavioral intentions.

H12: Curriculum-relatedness will have a positive effect on PU.

H13: Curriculum-relatedness will have a positive effect on learning opportunities.

H14: Curriculum-relatedness will have a positive effect on PEOU.

H15: Experience will have a positive effect on curriculum-relatedness.

The moderating role of DGBL frequency

As noted in the introduction, previous studies have not clarified the relationship between perceived ease of use (PEOU) and the behavioral intention to adopt digital game-based learning (DGBL). One possible explanation for this inconsistency is the diversity of

lecturers' skills and knowledge backgrounds (Igbaria et al., 1997; Subramanian, 1994; Sun & Zhang, 2006). Prior knowledge increases the accessibility of information to memory, which forms behavioral intention (Eagly & Chaiken, 1993; Fazio & Zanna, 1978; Fishbein & Ajzen, 1975; Regan & Fazio, 1977). Thus, it is likely that the effect of PEOU on behavioral intention differs between expert and novice users. Experienced lecturers who frequently use educational games have more skills and knowledge sources, and may not focus as much on ease of use when deciding to adopt DGBL (Granić & Marangunić, 2019).

Research generally supports the idea that prior knowledge moderates the relationship between PEOU and behavioral intention. A systematic review by Sun and Zhang (2006) of the effect of moderating factors on technology acceptance shows that experience has a significant negative effect on the relationship between PEOU and behavioral intention. For example, Venkatesh and Bala (2008) found that the positive effect of PEOU on behavioral intention diminishes with experience. Similarly, Choi et al. (2010) found that less skilled users have a higher level of PEOU effect on behavioral intentions compared to more skilled users. However, exceptions were found in Wulandari and Ali's (2019) research, where experience strengthened the effect of PEOU on teachers' intentions to integrate the eXtensible Business Reporting Language Topics into the accounting curriculum.

Based on these findings, this study proposes that if lecturers are more frequent (i.e. skillful) in using digital games for teaching, they are more likely to have a decreased PEOU towards DGBL acceptance. The effect of PEOU on behavioral intention will diminish as experience increases. Therefore, the following hypothesis is posited:

> H16: DGBL frequency will weaken the impact of lecturers' PEOU on lecturers' behavioral intention.

Research model

Based on the theoretical background and the 16 proposed hypotheses, a research model is represented in Figure 1.

Method

Research design

This study collected data through an online survey that included demographic questions and item scales to measure the various variables in the research model. Anonymity was assured. Accounting and business lecturers completed an electronic questionnaire using a link distributed through social media platforms such as WhatsApp, Line, and Telegram.

The questionnaire was divided into three sections. The first provided a brief description of the use of digital games for business education as well as links to websites where users could access digital business games. The second used closed-ended questions to identify demographic characteristics and experience of the participants using digital game based-learning, and the third used nineteen items formulated with a Likert-type scale of five intervals, with choices ranging from strongly disagree (1) to strongly agree (5) to measure the construct in the research model. The items for PEOU, PU, experience,

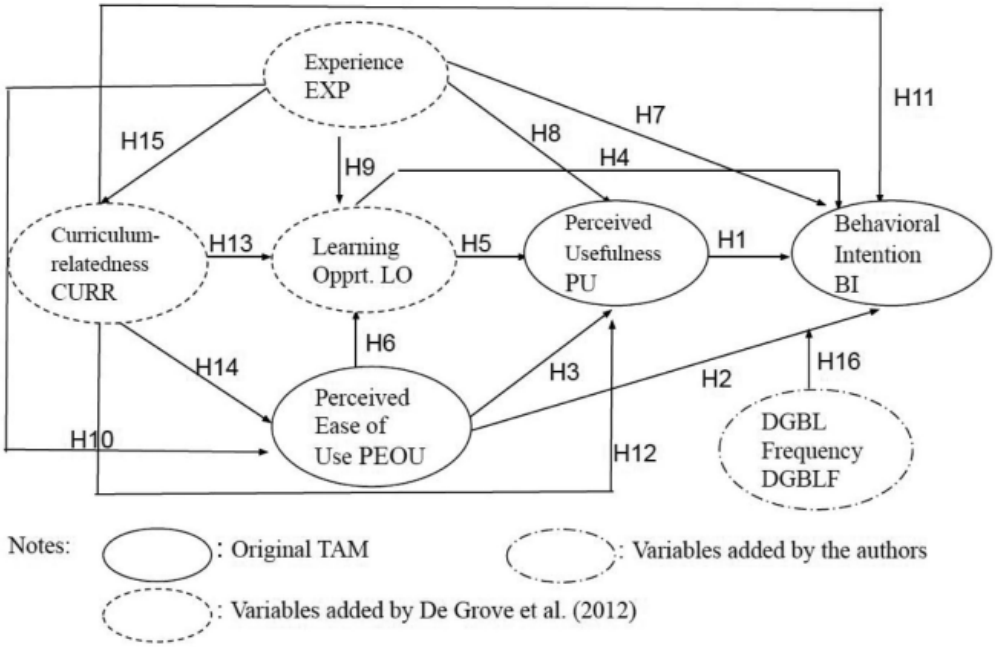

Figure 1. Research model.

behavioral intention, learning opportunities, and curriculum-relatedness were adapted based on previous TAM research (Bourgonjon et al., 2010; De Grove et al., 2012; Venkatesh & Davis, 2000).

Descriptive statistics were used to examine the responses on the last two sections of the questionnaire. The responses on the Likert-type scale items were analyzed using PLS-SEM, which allowed researchers to measure model parameters as well as structural path coefficients at the same time. The measurement model's reliability was assessed using standardized loading, and the measurement model's validity was assessed using the composite reliability index (CR), average variance extracted (AVE), AVE square root, and HTMT ratio.

Participants

This study included 264 accounting (56%), management (41%), and entrepreneurship (3%) lecturers from all over Indonesia. Six of the 264 respondents, however, were excluded from further analysis because they were unfamiliar with the concept of a digital learning game. Among the 258 people who remained in the sample, 63% were female and 37% were male. Table 1 presents information about the participants' gender, age, teaching experience, type of university, and experience using digital game-based learning.

The majority of respondents were between the ages of 41 and 50 and had more than 15 years of teaching experience. Twenty four per cent of respondents were lecturers at public universities, while 76% were lecturers at private universities. In terms of incorporating digital-based game learning into curriculum, 11% of respondents used digital games

Table 1. Participant characteristics.

Characteristics	Category	Quantity	Percentage
Gender	Male	95	37
	Female	163	63
Age	21–30 years	20	8
	31–40 years	84	32
	41–50 years	106	41
	51–60 years	41	16
	>60 years	7	3
Teaching experience	<5 years	32	12
	5–10 years	53	21
	11–15 years	52	20
	>15 years	121	47
Type of university	Public	61	24
	Private	197	76
Level of education	Bachelor	1	1
	Master	187	72
	PhD	70	27
Academic rank	Lecturer	19	7
	Assistant Professor-Lower	92	36
	Assistant Professor-Upper	113	44
	Associate Professor	30	11
	Professor	4	2
Program	Accounting	145	56
	Management	106	41
	Entrepreneurship	7	3
Digital game-based learning frequency	Frequently	28	11
	Infrequently	93	36
	Never	137	53

frequently in their courses, 36% used digital games infrequently, and 53% never used digital games, indicating that the use of digital games for teaching in Indonesia was limited. Specifically, the number of accounting, management, and entrepreneurship lecturers who had never used a digital game were 77, 56 (53%), and 4 (57%) respectively.

Results

Descriptive statistics

Table 2 presents the mean, standard deviation, minimum, and maximum scores of each item. The scores obtained indicate the preference of lecturers to use DGBL in their courses, with scores above 4 out of a maximum of 5 on most items and with median scores between 2 and 4 in all indicators. All of the items related to the construct of experience and PEOU received scores less than 3.5, indicating that it is a possible area for improvement through education and training programs.

Measurement model

The measurement model shows evidence of reliability and validity. Table 3 reveals all the standardized loadings and Cronbach's alpha are above .70 ($p < .01$) and .90 respectively, which is the generally accepted minimum cut off score to ensure reliability. The score is higher than .90 for the composite reliability and .50 in the case of the AVE, which are considered to be the minimum threshold for convergent validity (Fornell & Larcker, 1981; Nunnally & Bernstein, 1994). Table 4 shows that discriminant validity exists

Table 2. Descriptive statistics of the items of the extended TAM model.

Question items[a]		References	Mean	STD	Median	Min	Max
Curriculum-relatedness[b]		De Grove et al. (2012)					
CURR1	Digital games fit the accounting curriculum.		3.891	0.833	4	1	5
CURR2	It is clear how digital games can be used to fit the accounting curriculum's		3.891	0.809	4	2	5
Experience		Bourgonjon et al. (2010), De Grove et al. (2012)					
EXP1	I have used digital games before in the classroom.		2.620	1.339	2	1	5
EXP2	I have experience with the use of digital games in the classroom.		2.705	1.320	3	1	5
Learning opportunities[b]		Bourgonjon et al. (2010), De Grove et al. (2012)					
LO1	Digital games offer opportunities to experiment with accounting knowledge.		4.302	0.599	4	3	5
LO2	Digital games offer opportunities to take control over the learning process.		4.047	0.781	4	1	5
LO3	Digital games offer opportunities to experience things you learn about.		4.380	0.637	4	3	5
LO4	Digital games offer opportunities to stimulate transfer between various subjects.		4.252	0.672	4	2	5
LO5	Digital games offer opportunities to think critically.		4.364	0.664	4	2	5
LO6	Digital games offer opportunities to motivate students to learn accounting.		4.260	0.714	4	2	5
Perceived ease of use (PEOU)		Bourgonjon et al. (2010), De Grove et al. (2012), Venkatesh (2000)					
PEOU1	I know how to use digital games in classroom setting.		3.349	1.032	3	1	5
PEOU2	I have the necessary skills to use digital games in a classroom setting.		3.457	1.019	4	1	5
Perceived Usefulness (PU)		Bourgonjon et al. (2010), De Grove et al. (2012)					
PU1	Digital games enhance the quality of my job.		4.101	0.740	4	2	5
PU2	Digital games in my job increases my productivity.		3.988	0.795	4	2	5
PU3	Digital games enhance my effectiveness in my job.		4.050	0.783	4	2	5
PU4	I find digital games to be useful in my job.		4.124	0.747	4	2	5
PU5	Using digital games makes teaching easy.		4.147	0.705	4	2	5
Behavioral intention		De Grove et al. (2012)					
BI1	I'm planning to use digital games in the classroom.		4.027	0.789	4	1	5
BI2	In the future, I intend to use digital games in the classroom.		4.174	0.740	4	2	5
Digital Game-Based Learning Frequency		Researchers					
DGBLF	Your experience uses digital game-based learning.		1.580	0.680	1	1	3

[a]All but DGBLF survey questions used a 5-point scale ranging, where 1 = strongly disagree, 3 = neither agree nor disagree, 5 = strongly agree. The measurement of DGBLF used a 3-point scale, where 1 = never, 2 = infrequently, 3 = frequently.
[b]The word ACCOUNTING was replaced by the relevant name of the department in which each lecturer works.

Table 3. Reliability and convergent validity.

Factor	Item	Loading	*t*-value	CA	CR	AVE
Behavioral intention	BI1	.956	67.56*	.906	.955	.914
	BI2	.957	75.30*			
Curriculum-relatedness	CURR1	.960	61.43*	.923	.963	.928
	CURR2	.967	63.22*			
Perceived ease of use	PEOU1	.951	41.16*	.893	.949	.903
	PEOU2	.949	43.37*			
Experience	EXP1	.975	22.98*	.952	.976	.954
	EXP2	.979	24.35*			
Learning opportunities	LO1	.834	96.49*	.886	.913	.637
	LO2	.746	68.68*			
	LO3	.800	92.57*			
	LO4	.805	84.69*			
	LO5	.797	88.47*			
	LO6	.805	79.90*			
Perceived usefulness	PU1	.868	73.65*	.917	.938	.752
	PU2	.846	66.33*			
	PU3	.896	68.56*			
	PU4	.855	73.47*			
	PU5	.870	78.34*			

Notes: CA = Cronbach's alpha; CR = Composite Reliability; AVE: Average Variance Extracted.
*$p < .01$.

because correlations between factors are always lower than their corresponding AVE square root (Fornell et al., 1982) and the ratio HTMT is less than .85 (Clark & Watson, 1995; Kline, 2005).

In addition, the model-fit indices show that the proposed hypothetical model fits the data well. The normal fit index (NFI) obtained is 0.841, and the standardized root mean square residual (SRMR) obtained is 0.045. A model is considered to be well-fitting if the NFI value is close to one (Bakhsh et al., 2017) and the SRMR is < 0.05 (Hair et al., 2010).

Structural model analysis

The structural model analysis provides support for the predictive relevance of the model. R^2 is greater than 40% for all dependent latent variables except curriculum-relatedness, and Stone-Geisser Q2 is positive for all constructs. Figure 2 presents the path coefficients and the percentage of explained variance for the dependent variables.

As indicated in Table 5—depicting the *t*-value of the path coefficient and f^2 statistics—twelve of the sixteen research variables could be confirmed. All hypotheses based on the original TAM theory are supported. The effect of PU (H1, $\beta = 0.371$, $p < 0.001$) and PEOU (H1, $\beta = 0.442$, $p < 0.001$) on behavioral intention is significant. The moderation of DGBL frequency has a significant negative effect on PEOU to behavioral intentions

Table 4. Discriminant validity.

Factor	F1	F2	F3	F4	F5	F6
F1. Behavioral intention	.956	.570	.549	.287	.679	.726
F2. Curriculum-relatedness	.522	.963	.404	.219	.684	.708
F3. Perceived ease of use	.494	.367	.950	.717	.426	.491
F4. Experience	.267	.206	.662	.977	.211	.277
F5. Learning opportunities	.610	.621	.381	.197	.798	.835
F6. Perceived usefulness	.663	.652	.444	.260	.754	.867

Note: Diagonal: square root of AVE; Lower triangle: factor correlation; Upper triangle: ratio HTMT.

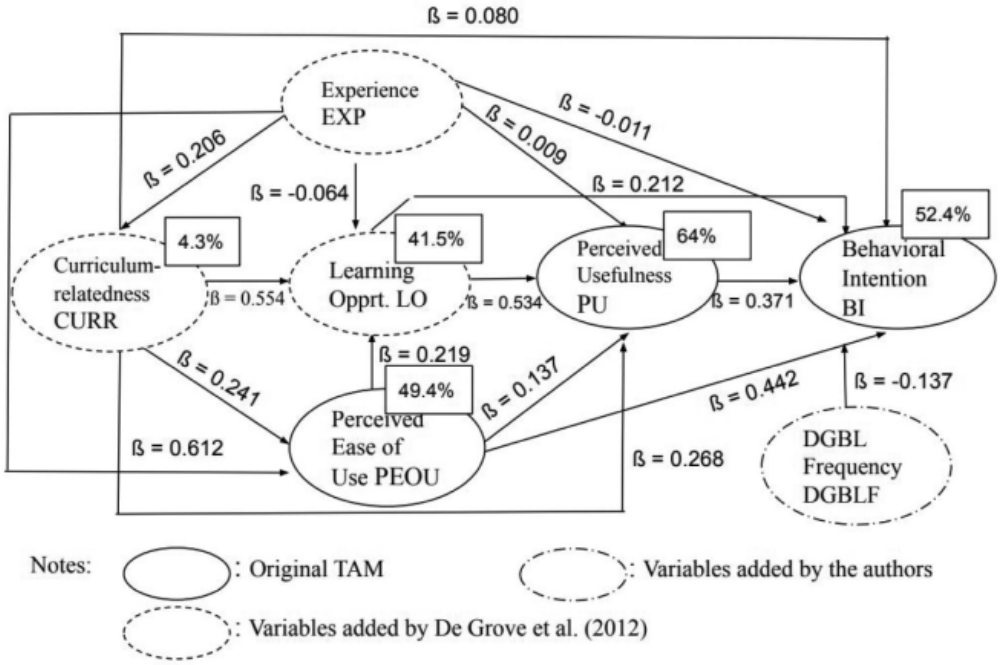

Figure 2. Path coefficients and percentage explained variance.

(H16, $\beta = -0.371$, $p < 0.05$). The effect of PEOU on PU is also significant (H3, $\beta = 0.137$, $p < 0.01$), indicating that ease of use can elicit behavioral intention in DGBL with or without the mediation of usefulness. The effect size analysis shows a small to medium effect for the hypotheses related to the TAM theory.

All hypotheses concerning learning opportunities could be confirmed. Learning opportunities have a positive effect on both behavioral intention (H4, $\beta = 0.212$, $p < 0.01$) and PU (H5, $\beta = 0.534$, $p < 0.001$). It is found that curriculum-relatedness has a positive effect on learning opportunities (H6, $\beta = 0.219$, $p < 0.001$), indicating that

Table 5. Results of the hypotheses testing.

Hypotheses	Path coeff.	t-value	*p* value	f^2	Results
H1: PU → BI	0.371	4.774	0.000*	0.101	Supported
H2: PEOU → BI	0.442	4.039	0.000*	0.061	Supported
H3: PEOU → PU	0.137	2.268	0.012***	0.025	Supported
H4: LO → BI	0.212	3.009	0.001**	0.037	Supported
H5: LO → PU	0.534	8.906	0.000*	0.464	Supported
H6: PEU → LO	0.219	3.379	0.000*	0.042	Supported
H7: EXP → BI	−0.011	0.154	0.439	0.000	Not supported
H8: EXP → PU	0.009	0.160	0.437	0.000	Not supported
H9: EXP → LO	−0.064	1.072	0.142	0.004	Not supported
H10: EXP → PEOU	0.612	15.035	0.000*	0.709	Supported
H11: CURR → BI	0.080	1.129	0.129	0.007	Not supported
H12: CURR → PU	0.268	4.786	0.000*	0.119	Supported
H13: CURR → LO	0.554	11.097	0.000*	0.452	Supported
H14: CURR → PEOU	0.241	4.660	0.000*	0.110	Supported
H15: EXP → CURR	0.206	3.393	0.000*	0.045	Supported
H16: PEOU X DGBLF → BI	−0.371	2.105	0.018***	0.013	Supported

*$p < 0.001$ **$p < 0.01$ ***$p < 0.05$; one tailed
f^2: > 0.02 small, ≥ 0.15 medium, ≥ 0.35 large effect size.

learning opportunities can mediate the relation between curriculum-relatedness and behavioral intention. The effect size is small to medium for the relation between learning opportunities and behavioral intention and PEOU and large in the case of the effect of learning opportunities on PU.

A surprising finding is that experience does not have a significant effect on behavioral intention (H7, $\beta = -0.011$, n.s.), PU (H8, $\beta = 0.009$, n.s.), and learning opportunities (H9, $\beta = -0.064$, n.s.). This statistical insignificance corresponds to the effect size, which shows a negligible effect for H7, H8, and H9. However, this study reveals that experience has a significant positive effect on PEOU and its effect is large (H10, $\beta = 0.612$, $p < 0.001$), showing that experience itself cannot elicit DGBL behavioral intention without the mediation of PEOU.

As predicted based on the extended TAM theory, curriculum-relatedness has a positive influence on PU (H12, $\beta = 0.268$, $p < 0.001$), learning opportunities (H13, $\beta = 0.554$, $p < 0.001$), and PEOU (H14, $\beta = 0.241$, $p < 0.001$). Although the effects of hypotheses 12 and 14 are considered minor, the effect of hypothesis 13 is significant because its values are greater than 0.35. However, the effect of curriculum-relatedness on behavioral intention appeared to be statistically insignificant (H11, $\beta = 0.080$, n.s.). In contrast, experience appears to predict curriculum-relatedness and its effect is rather weak (H15, $\beta = 0.206$, $p < 0.001$), demonstrating that experience can affect behavioral intention through curriculum-relatedness and PEOU.

Discussions and implications

Literature has shown that digital games have the potential to increase motivation and provide contextual experiences to students. However, DGBL adoption and effectiveness are heavily dependent on lecturers' acceptance because they are the true agents of change in learning (Fullan, 2015, p. 1; Teo, 2008; Usluel et al., 2008). Understanding lecturers' perceptions and beliefs underlying their decision-making processes are thus important, especially in the accounting and business domains, where literature on accounting education suggests that studies on teachers' intention to use DGBL are scarce (Calabor et al., 2019; Carenys & Moya, 2016). This study aims to examine factors determining the intention of accounting and business lecturers to use digital games in their courses using an extended Technology Acceptance Model (TAM). The research model is analyzed with PLS-SEM approach using data collected from 258 accounting and business lecturers in Indonesia through social media.

The results of the structural model analysis generally support the proposed hypotheses, with some notable findings. The results show that the proposed model can explain 52.4% of the variance in accounting and business lecturers' behavioral intention to use digital games in the classroom. All hypotheses based on the original TAM model (Davis, 1989) are supported, showing that the model can predict lecturers' behavioral intention to accept DGBL. Particularly, both PEOU and PU positively affect behavioral intention, and PEOU can mediate the relation between PU and behavioral intention. DGBL frequency appears to be a significant moderator in explaining the effect of lecturers' PEOU on lecturers' behavioral intention to accept DGBL. This study specifically finds that DGBL frequency negatively moderates the positive effect of PEOU on

behavioral intention, which is consistent with previous studies (Choi et al., 2010; Venkatesh & Bala, 2008).

Similarly, learning opportunities appear to be a significant predictor for behavioral intention, both directly and indirectly through PU. This implies that when lecturers believe that digital games benefit students' learning processes, they will also regard them as tools for improving lecturers' job performance, resulting in a higher adoption intention. In fact, learning opportunities can serve as mediator for the relation between PEOU and curriculum-relatedness. These findings are consistent with previous studies on the acceptance of digital game-based learning in secondary education settings (Bourgonjon et al., 2013; De Grove et al., 2012).

A remarkable finding is that experience does not have a significant effect on behavioral intention, PU, and learning opportunities. Assumptions that individuals with more experience (e.g. lecturers) will have more positive beliefs about the use of new technology (e.g. digital games) than individuals with less experience (Venkatesh, 2000) cannot be confirmed. It also partially contradicts the findings of De Grove et al. (2012), who found that experience plays an important role in predicting teachers' perceived usefulness and intention to use digital games. The discrepancy between this study and the existing literature on digital game acceptance could be attributed to the current stage of digital game-based learning adoption in Indonesia. Table 1 shows that most lecturers are inexperienced with digital gaming. Therefore, it is reasonable to assume that their adoption decisions are more strongly influenced by their perceptions of the usefulness and ease of use of game-based learning.

This study does not find a direct relation between curriculum-relatedness and lecturers' behavioral intention to adopt digital games for teaching accounting and business. However, curriculum-relatedness has a positive effect on behavioral intention through PEOU, PU, and learning opportunities. The insignificant finding could be attributed to digital games' inability to deliver curriculum-related content. Because educational digital games are not typically designed to fit the same content- and time-related boundaries as traditional learning content, their adoption is more difficult (Becker, 2007; Dele-Ajayi et al., 2017). Therefore, lecturers will first have to believe that the games are simple and useful to enhance learning before adopting them in their classes, suggesting a customized educational game or frequent exposure to ready-made games is necessary. Our findings support that experience with playing games can help lecturers relate the game and the curriculum goals.

Limitations and future studies

This study has the following limitations. First, the use of cross-sectional design limits our ability to better comprehend the process of game adoption and the effect of distinct factors over time. This is critical because, according to the findings of this study, the use of digital games in accounting and business education is still in its preliminary stages, with the majority of lecturers still developing beliefs and attitudes toward this approach. Therefore, the use of longitudinal design in subsequent study is essential. Second, this study examines factors determining intention to adopt DGBL at teacher level. In De Grove et al.'s (2012) study, the researchers include headmasters of secondary schools as respondents to investigate this issue at school level. Therefore, the

participation of other stakeholders such as students and heads of department in subsequent studies could be beneficial. Finally, it is noteworthy that behavioral intention differ from actual use (Venkatesh et al., 2003). Future study could investigate actual use and how it is associated with behavioral intention.

Conclusions

This study raises the question of what factors affect lecturers' intention to adopt DGBL in accounting and business courses based on the extended TAM. This study finds that the original TAM variables: PEOU and PU affect behavioral intention, indicating the model is applicable in the context of Accounting and Business education. Additionally, learning opportunities are the only variable proposed in the extended TAM affecting lecturers' behavioral intention. The new variable introduced in this study, DGBL frequency, was found to significantly weaken the effect of PEOU on behavioral intention, indicating a frequent exposure to DGBL is critical to enhance lecturers' intention to accept DGBL. Overall, the proposed model can explain 52.4% of the variance in accounting and business lecturers' behavioral intention to use digital games in the classroom.

This study contributes to theory and practice in several important ways. First, this study extends the literature on DGBL acceptance by evaluating the role of extended TAM in explaining lecturers' intention behavior to use DGBL in accounting and business education in Indonesia. Second, this study extends the modified TAM (De Grove et al., 2012) by adding the moderating role of DGBL frequency in explaining the relationship between PEOU and lecturers' acceptance of DGBL. Third, this study addresses curriculum and instruction issues in the field of accounting education which has rarely been empirically studied in the context of Asian countries. Fourth, this study contributes to empirical research by employing structural model analysis which has not been widely adopted in the accounting curriculum domain. Finally, this study informs educational game developers about the importance of collaborating with lecturers to understand their needs and assist them in developing games that align with curriculum goals. It also encourages regulators to heavily publicize the effectiveness of game-based learning to accountant educators.

Note

1. DGBL refers to the utilization of digital games to achieve learning objectives (Prensky, 2005).

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Data availability

The data that support the findings of this study are available from the corresponding author, T. M. K., upon reasonable request.

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