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Optimism and Innovativeness: Predictors of Gamified Apps Adoption Among Malaysian University Students

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Abstract

The increasing adoption of gamified applications in higher education has prompted researchers to investigate the factors influencing students' intentions to utilize these tools. However, limited research has focused on the role of psychological traits, such as optimism and innovativeness, in predicting gamified app adoption. This study aims to examine the influence of Malaysian university students' technology readiness, in terms of optimism and innovativeness, on their intentions towards adopting gamified apps for learning. A quantitative research methodology was employed, by which data was gathered through the use of online questionnaires. A total of 137 accounting students from UiTM Tapah, Perak participated in the survey. Data analysis was conducted using Smart PLS to assess the relationships between the variables. The findings reveal a significant positive relationship between optimism and behavioral intention, indicating that students with a more optimistic outlook are more likely to embrace gamified apps. Conversely, innovativeness did not show a significant impact on behavioral intention, suggesting that its influence may depend on contextual factors such as perceived usefulness and relevance of the apps to students' educational needs. This research contributes to the literature by highlighting the importance of optimism in technology adoption while suggesting that innovativeness alone may not suffice in predicting the use of gamified applications. The study offers valuable insights for educators and app developers aiming to enhance the adoption of gamified learning tools in higher education.

Keywords

Behavioral Intention, Innovativeness, Optimism, Gaming, Learning

1.0 Introduction

Gaming holds significant importance for students at higher learning institutions by offering interactive and immersive environments conducive to active learning, critical thinking, and problem-solving skill development. Through engaging gameplay, students can practically apply theoretical knowledge, leading to deeper understanding and retention of course material (Calza-Perez et al., 2024). Moreover, incorporating features such as competition, rewards, and progress tracking into gamification not only inspires students to set and achieve academic objectives (Liu et al., 2024) but also influences their behavioral intentions towards engaging with educational gaming tools (Rohan et al., 2021; Dehghanzadeh et al., 2024).

The rapid integration of technology in education, particularly through gamified applications, has raised questions about the factors influencing their adoption among students (Metwally et al., 2021; Vázquez-Cano et al., 2023). Despite the growing popularity of these tools, there is limited understanding of how psychological traits, such as optimism and innovativeness, affect students' intentions to engage with gamified learning platforms. While previous research has established that gamification can enhance user

engagement and learning outcomes (Ng et al. 2020; Roslan et al., 2023), the specific roles of optimism and innovativeness remain underexplored.

Understanding students' behavioral intentions towards gaming is crucial for effectively integrating these tools into higher education settings. Behavioral intention, which predicts individuals' actions, reflects their readiness and willingness to engage in behaviors such as using gamified apps (Lin et al, 2020). By exploring factors such as innovativeness and optimism in conjunction with the benefits of gaming, educators can gain insights into students' attitudes and motivations, informing the development of strategies to enhance the acceptance and effectiveness of gamified learning in educational contexts.

This study aims to unveil accounting students' readiness to integrate gamified apps into their learning experiences. It will assess their behavioral intention in respect to optimism and innovativeness, which holds significant importance in higher education, particularly in accounting courses. This understanding will enable educators to consistently refine the teaching methodologies and ensure ongoing enhancements in gamified apps development.

The paper is divided into several sections, with the remainder presented as follows: Section 2 reviews the relevant literature in relation to students' behavioral intention to use gamified apps in their learning activities. Section 3 discusses the research method. Meanwhile, the fourth section lays out the findings and empirical results. Lastly, Section 5 discusses the findings and concludes the study.

2.0 Literature Review

The Technology Readiness (TR) model, developed by Parasuraman (2000), offers valuable insights into individuals' readiness to embrace new technologies. It encompasses both positive and negative constructs, consisting of optimism, innovativeness, discomfort, and insecurity. Positive constructs, optimism and innovativeness, represent favorable attitudes and beliefs towards technology, encouraging individuals to embrace innovation and explore new technological solutions. In contrast, negative constructs, comfort and insecurity, encompass feelings of unease or skepticism towards technology, potentially hindering individuals' willingness to adopt new technologies and engage with technological advancements.

Considering that positive constructs like optimism and innovativeness typically strongly influence technology adoption behaviors (Parasuraman, 2000; Kaushik & Agrawal, 2021; Cruz-Cárdenas et al., 2021), they may more immediately affect individuals' intentions to adopt technology than negative constructs, prompting this study to concentrate solely on these positive aspects.Understanding these dimensions is crucial for designing strategies to promote technology adoption and integration, not only within education but also across diverse domains. Thus, this study examines the relationship between these technology readiness factors (innovativeness and optimism) with behavioral intention of accounting students based on the proposed framework as illustrated in Figure 1 below.

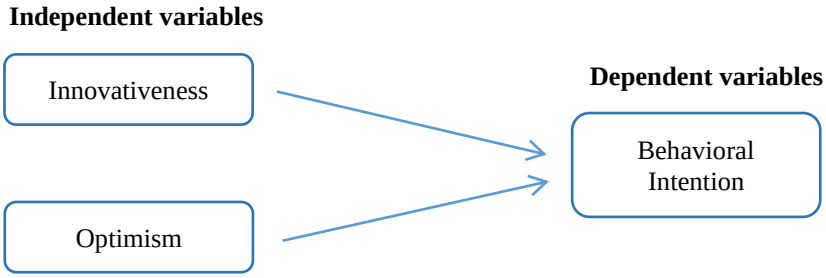

Figure 1: Research Framework

2.1 Innovativeness and Behavioral Intention

Innovativeness signifies a propensity and eagerness to explore and embrace new technologies (Salavou, 2004). Individuals with high levels of innovativeness are often early adopters of emerging technologies and actively seek opportunities to incorporate new tools into their routines (Cheng, 2014; Chavas & Nauges, 2020; Sousa et al., 2024). Their inclination towards innovation leads them to view gamified apps as innovative solutions to traditional learning challenges, embracing novel approaches to education (Alrashed et al., 2023).

Students' proactive stance towards innovation drives them to delve into the potential advantages of gamification, motivating their desire to incorporate these apps into their learning activities. This mindset plays a crucial role in forecasting their adoption of innovative technology and impacting their cognitive absorption, thereby shaping their intention to use or adopt technology. Students with higher levels of innovativeness typically maintain simpler beliefs about new technology and hold optimistic views about its usefulness, despite uncertainties and less apparent benefits. Therefore, the following hypothesis is posited:

H1. Innovativeness has a positive influence on students' behavioral intention to use gamified apps.

2.2 Optimism and Behavioral Intention

Optimism reflects the belief in the potential benefits and positive outcomes associated with technology use (Parasuraman & Colby, 2001; Tsikriktsis, 2004). Those with a high level of optimism tend to be more open and receptive to trying new technologies (Kampa, 2023; Buyle et al., 2018; Kim & Chiu, 2019). Such individuals perceive that new technology offers people more benefits such as increased control, flexibility, and efficiency to realize their expected results for their lives (Parasuraman & Colby, 2015). Technology optimists tend to employ more active coping strategies than their technology pessimist counterparts (Zhang et al., 2020; Flavián et al., 2022).

Moreover, technology optimism is prevalent among today's students, who are frequently referred to as digital natives (Cimbaljević et al., 2023) due to their upbringing in the digital technology era, which often results in proficient digital device usage skill. Their generally positive attitudes towards technology usage, as demonstrated by the extensive utilization of platforms like social media and video conferencing tools, underscore the influence of technology optimism on their learning behaviors. Students' level of

technological optimism can significantly impact their opinions and attitudes towards gamification, affecting their behavioral intention. Based on these arguments, the following hypothesis is formed:

H2. Optimism *has a positive influence on students' behavioral intention to use gamified apps*.

3.0 Research Method

This study used online questionnaires as its data collection method, aiming to explore the influence of technology readiness factors, specifically optimism and innovativeness, on students' behavioral intention to use gamified apps in their learning. The questionnaires were distributed to undergraduate accounting students at UiTM Tapah during the second semester of the 2023 academic year. Random sampling was employed to select participants from Part 3 to Part 5 of the accounting students, ensuring that each student in this group had an equal chance of being included, thus enhancing the representativeness of the findings. The diverse backgrounds of students, encompassing demographic factors, academic performance, and personal experiences that significantly influence their perspectives and engagement with gamified apps, enhance the study's validity and reliability by reflecting a wider range of student attitudes and behaviors. To ensure voluntary participation and honest responses, confidentiality was guaranteed, resulting in 137 valid responses being collected for analysis.

In social science research, a sample size of 100–200 respondents is generally considered adequate for surveys, especially when examining behavioral intentions (Fathi & Wandebori, 2024; Irtema et al., 2018), as supported by the Central Limit Theorem, which indicates that a sample size over 30 is sufficient for valid statistical inferences (Liu & Hu, 2024; Pett, 2015). Previous studies in similar contexts have utilized comparable sample sizes ranging from 80 to 200 respondents (e.g., Hall & Toke, 2018; Hamari & Koivisto, 2015; Jayathilaka, 2020), demonstrating that the 137 sample of this study is within a reasonable range for obtaining meaningful insights into student behavior and preferences in educational technology adoption.

The questionnaire comprised two sections: demographic information and behavioral intention constructs. The first section gathered demographic data such as gender, semester, and academic performance (CGPA) of the respondents. The second section aimed to assess the students' level of innovativeness and optimism, as well as their behavioral intention to use gamification in their learning. Responses were measured on a Likert scale ranging from 1 to 5, with options ranging from "Strongly Disagree" to "Strongly Agree." The Behavioral Intention (BI), Innovativeness (INN) and Optimism (OPT) constructs were adapted from the survey questionnaire of Kampa (2023).

4.0 Data Analysis and Findings

4.1 Demographic of Respondents

Table 1 provides the demographic profile of the 137 respondents. The students were all from the Diploma of Accountancy in UiTM Perak, Malaysia. The sample consisted of 34 (24.82%) male and 103 (75.18%) female students. Most of the respondents were in Semester 3 (84.67%). The CGPA scores of the respondents were predominantly 3.00 and above, with 38.69% having CGPAs between 3.00 to 3.49, while 49.64% had CGPAs between 3.50 to 4.00.

Table 1: Demographic characteristics of respondents

Characteristics	Items	Frequency	%
Gender	Male	34	24.82%
	Female	103	75.18%
Semester	3	116	84.67%
	4	4	2.92%
	5	17	12.41%
CGPA range	3.50 and above	68	49.64%
	3.00-3.49	53	38.69%
	2.50-2.99	13	9.49%
	2.00-2.49	3	2.19%
	Less than 2.00	0	0%

4.2 Assessment of the measurement model

The data from the questionnaire was analyzed using smart pls, 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.

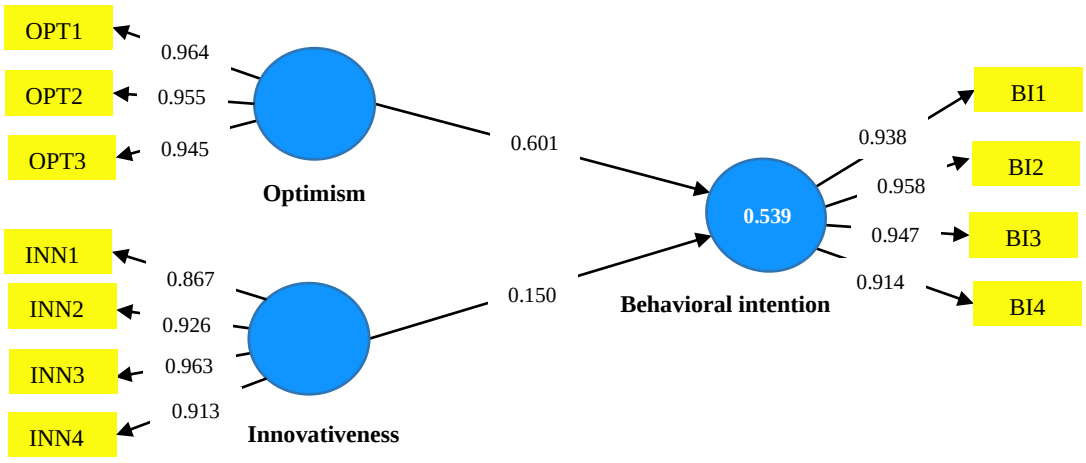

Figure 2: Path Model (measurement and structural model)

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. Hair et al. (2017) recommend that the loading, AVE, and CR values should be at least 0.6, 0.5, and 0.7, respectively, to establish convergent validity. Table 2 demonstrates that the reliability and convergent validity of the construct was satisfactory as the loading, AVE, and CR values exceeded the recommended values. The loading varied from 0.867 to 0.964, AVE ranged from 0.843 to 0.912, and CR ranged from 0.955 to 0.969, indicating that convergent validity was achieved.

Table 2: The measurement model assessment

Constructs	Measurement items	Loadings	Cronbach's α	CR	AVE
Innovativeness	INN1	0.867	0.937	0.955	0.843
	INN2	0.926			
	INN3	0.963			
	INN4	0.913			
Optimism	OPT1	0.964	0.951	0.969	0.912
	OPT2	0.955			
	OPT3	0.945			
Behavioral intention	BI1	0.938	0.956	0.968	0.882
	BI2	0.958			
	BI3	0.947			
	BI4	0.914			

Once the internal consistency reliability and convergent validity test requirements were met, the model's discriminant validity was tested. The Fornell and Larcker's method was used to evaluate discriminant validity by determining whether all the constructs were free from unidimensionality. Table 3 shows that the square value of AVE was greater than the correlation between the constructs, indicating that the model met the recommended requirements, and discriminant validity was confirmed for all the constructs in the study.

Table 3: Discriminant validity of measurement model using Fornell and Larcker

Constructs	Behavioral intention	Innovativeness	Optimism
Behavioral intention	0.939		
Innovativeness	0.666	0.918	
Optimism	0.73	0.859	0.955

4.3 Assessment of the structural model

After the measurement model had been validated, 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). A bootstrapping procedure with resampling of 5,000 was performed to test the direct effect, and the structural model is as depicted in Figure 2. Table 4 provides the results of hypotheses testing. Specifically, in *H1* it was hypothesized that Innovativeness would have a positive influence on Behavioral intention. The results showed positive but insignificant relationship (β= 0.152, t = 1.303, $p < 0.05$). Therefore, *H1* was not supported. Finally, in regard to H2, in which it was hypothesized that Optimism would positively influence Behavioral intention, the results showed that Optimism had a very significant and positive influence on the dependent variable (β= 0.598, t = 5.438, $p < 0.01$), and thus *H2* was also supported.

Table 4: Structural model assessment and hypothesis testing

Hypothesis	Relationship	Beta	Std Deviation	t value	p value	Decision
H1	Innovativeness -> Behavioral intention	0.152	0.115	1.303	0.193	Rejected
H2	Optimism -> Behavioral intention	0.598	0.111	5.438	0.000	Supported

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 0.539, which denoted that the exogenous variables (Innovativeness and Optimism) explained 53.9% of the variance in the endogenous variable (Behavioral intention). As regards the effect size, 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 exogenous variables (Innovativeness), f^2, = 0.013 and (Optimism), f^2, = 0.206 had a small and medium effect size, respectively on the endogenous variable.

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

Construct	R^2	f^2	Decision
Behavioral intention	0.539		
Innovativeness		0.013	Small
Optimism		0.206	Medium

5.0 Discussion and Conclusion

The objective of this study was to discover the impact of optimism and innovativeness on students' behavioral intention to use gamified apps in learning. The findings revealed a significant positive relationship between optimism and behavioral intention, indicating that students with a more optimistic outlook are more inclined to embrace gamified apps in their educational endeavors. This result aligns with prior studies that underscore the role of a positive outlook in technology adoption. Studies have shown that optimism enhances individuals' perceptions of the benefits associated with new technologies, thereby increasing their likelihood of adoption (Buyle et al., 2018; Kampa, 2023; Kim & Chiu, 2019). This study reinforces these findings within the context of gamified learning, highlighting that optimistic students are more inclined to engage with gamified apps. This underscores the importance of considering students' attitudes and perceptions towards technology when designing and implementing educational interventions involving gamification. This is particularly important in educational settings, where the adoption of new learning tools can significantly impact students' engagement and academic success. By confirming that optimism plays a critical role in students' willingness to embrace gamified apps, this study contributes to the growing evidence that fostering a positive attitude towards technology is essential for promoting its integration in educational environments.

While innovativeness did not yield a significant impact on behavioral intention in this study, which contrasts with several studies that have identified innovativeness as a key driver of technology adoption (Cheng, 2014; Chavas & Nauges, 2020; Sousa et al., 2024), its role should not be entirely dismissed. The lack of a significant impact from innovativeness offers a nuanced perspective on how students interact with gamified applications. Although previous research has suggested that innovativeness can lead to greater acceptance of new technologies, this study indicates that it may not be a decisive factor in the context of gamified learning tools. Fatima et al. (2017) asserted that students may exhibit positive attitudes and intentions toward technology adoption even without being particularly innovative. Supporting this, Kampa (2023) pointed out that the influence of innovativeness on adoption intention may depend on factors such as the structure, design, and content of the gamified apps. This suggests that even students who are generally innovative may not feel compelled to engage with gamified apps if they do not perceive them as beneficial or relevant to their educational needs. Therefore, this study contributes to the literature by indicating that in the context of gamified learning, innovativeness alone may not be a sufficient predictor of adoption, and a more comprehensive understanding of students' motivations and perceptions is necessary.

Understanding the drivers behind students' willingness to adopt gamified apps is crucial in the contemporary educational landscape, where technology plays an increasingly prominent role. By shedding light on the influence of optimism and innovativeness, this study provides valuable insights for educators, game developers, as well as decision-makers aiming to enhance learning experiences through gamification. It emphasizes the need to foster positive attitudes towards technology among students, as well as the importance of creating innovative and engaging learning environments.

Several limitations were identified in this study. Firstly, the sample selection was limited to accounting students at UiTM Tapah, which may restrict the generalizability of the findings. Future research should aim to include a more diverse sample from different higher learning institutions to ensure a representative sample of the overall population. Secondly, it is recommended that future studies explore other technology readiness (TR) constructs (Parasuraman, 2000) that may contribute to students' behavioral intention, such as comfort, confidence and control. This would provide a more comprehensive understanding of this gamification approach.

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