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Exploring the Influential Power of Embedding the Gamification Approach in Mobile Payment: The Case of Gen Z in Malaysia

Lai Yee Mun[1], Ahmad Danial Zainudin[1], *Nurhuda Nizar[2]
[1]School of Accounting and Finance, Asia Pacific University of Technology and Innovation, Malaysia
[2]Faculty of Business and Management, UiTM Cawangan Selangor, Puncak Alam, Malaysia
Email: *hudanizar@uitm.edu.my
Corresponding Author: Nurhuda Nizar

Abstract: This study examines the factors influencing behavioral intentions of Generation Z individuals in Malaysia towards adopting mobile payments, specifically from a gamification perspective. The sample comprised 602 participants who completed a Google Forms survey, and the data were analyzed using SPSS software. The sample was predominantly undergraduate students, with the largest concentration of respondents from the Federal Territories. Reliability testing was conducted to ensure the validity of the independent and dependent variables, and normality tests were performed to assess distribution characteristics. Most independent variables demonstrated a positive correlation with the dependent variable, except for perceived cost, which exhibited a negative correlation. Multiple regression analysis revealed that performance expectancy, trust, perceived cost, gamification, and social influence significantly affected the intention to adopt mobile payments, albeit to varying degrees. The findings contribute to the existing body of knowledge on gamification by empirically validating its impact on the adoption of mobile payments. This study extends the theoretical framework of gamification by demonstrating that game-like elements in mobile payment applications significantly influence user adoption intentions among Generation Z. Educational institutions and programs that aim to enhance digital literacy can benefit from these findings by incorporating gamified learning modules. These modules can effectively teach Generation Z members about the benefits and usage of mobile payment systems, thus promoting wider adoption.

Keywords: *Gamification, Mobile Payment, Gen Z, Malaysia.*

1. Introduction and Background

Generation Z, born between 1997 and 2012, is a digital age native cohort raised with pervasive access to the internet and social media. Business Insider (2020) projects that by 2020, Gen Z will be the predominant user of e-wallets and other electronic payment methods. This trend reflects the significant evolution of mobile payments over time, with a notable decline in cash transactions as digital payment options become more prevalent (Rahman, Ismail & Bahri, 2020).

The history of payment systems dates back to the 1800s, but technological advancements have led to the emergence of the current digital payment landscape. In Malaysia, the transition to electronic payments is viewed as a cost-saving measure and a driver of economic growth (Bank Negara Malaysia, 2020). Electronic payments could theoretically save Malaysia 1% of GDP, or around RM13 billion, by replacing paper-based instruments such as bank drafts and checks (Tan, 2020). Despite this, only 67% of Malaysians currently prefer cashless transactions (Business Insider, 2020). E-money transactions were valued at RM13.9 billion in 2019, up from RM11 billion a year earlier, according to Central Bank figures (Tan, 2020). A total of 1.72 billion transactions were processed. It is evident from these statistics that e-wallets and e-payments represent a growing trend in Malaysia, despite their gradual adoption. Moreover, credit card transactions increased in 2019, totalling RM117.3 billion. E-wallets are used by almost 48% of Malaysia's 32.6 million inhabitants (Tan, 2020), or 15.7 million people. GrabPay, Boost, and Touch 'n Go eWallet are three prominent Malaysian e-wallet companies. There has been a rise in the usage of e-wallets, which has been primarily attributed to the Covid-19 pandemic (Aji, Berakon & Husin, 2020). Karim, Haque, Ulfy, Hossain & Anis (2020) predict that e-wallets will become an immensely popular method to pay for products and services in the future, indicating a potential increase in the desire to use them in Malaysia.

Mobile payments involve carrying out financial transactions using digital tools like smartphones and computers. This method includes internet-based purchases, digital wallets, and electronic banking. The rise in mobile payments corresponds with a decline in cash transactions, driven by the widespread use of mobile

devices. Statista (2021) reports that there were over 6.4 billion smartphone users globally, with this number expected to grow.

Gamification has emerged as a prevalent strategy to enhance user engagement and motivation in various industries. Pandey and Ansari (2023) state that the current study identifies gamification as a potentially effective strategy that can increase users' intention to use the service going forward, in addition to their actual usage conduct, which will enhance customer retention. With millions of dollars spent by businesses on acquiring and retaining customers, this may be an essential tactic for the sector to use. Gamification is defined as the use of design elements of games in non-gaming contexts (Deterding et al., 2011). Games have been added to a growing number of mobile applications in areas including learning, coding, fitness, exercise, and sustainable energy use in recent years. According to industry projections, the gamification market is expected to grow at an accelerating rate and reach USD 37 billion by 2027 (Insights, 2020). Increased usage, user engagement, customer loyalty, and user motivation are among the goals of these interventions (Mitchell, Schuster & Jin, 2020). Although these impacts are evident, certain research (Koivisto & Hamari, 2019; Xi & Hamari, 2019) has drawn criticism for treating gamification as a black-box concept without exploring the precise definition of what defines 'gamifying' an application.

Incorporating game elements into mobile payment systems has been shown to increase user intention and loyalty. Despite the rise in mobile payment usage, research on the impact of gamification on mobile payment adoption among Generation Z consumers in Malaysia remains limited. This study aims to bridge this gap by investigating how gamification affects customer behaviors and enhancing our understanding of mobile payment adoption, especially as there have been no previous studies exploring this issue in the context of mobile payments. Specifically, the research will examine how the incorporation of gamification into mobile payment systems influences Malaysian Generation Z consumers. To assess the factors influencing Generation Z individuals aged 18 to 26 in Malaysia regarding their acceptance of mobile payments, this study will employ a survey methodology. The sample comprised 602 participants who completed a Google Forms survey, and the data were analyzed using SPSS software.

This study contributes to existing literature on mobile payments and gamification by providing insights into the factors that influence Gen Z's acceptance of mobile payments in Malaysia. Businesses can use these findings to enhance their mobile payment systems and increase user engagement through gamification. Understanding the factors influencing the behavioral intent of Generation Z individuals in Malaysia towards adopting mobile payments is crucial for businesses and policymakers. This study aims to provide valuable insights that can inform future strategies and enhance the adoption of mobile payments among this demographic.

2. Literature Review

As per the research from Wong, Liu, Meng-Lewis, Sun, and Zhang (2021), an increasing trend in recent years has been to include game-like elements in business apps in an effort to increase user engagement and utilization of mobile payment technologies. This strategy, dubbed gamification, seeks to enhance user experience by promoting adoption and active involvement. Gamification was first used in health-related technologies such as gerontechnology, with the goal of increasing user engagement. Its use has grown over time, attracting the attention of the financial industry. Even though mobile payments are widely used, little is known about the potential and effectiveness of gamification in promoting the use of these payments. Furthermore, research on gamification frequently focuses on younger audiences.

Performance Expectancy (PE) and Behavioral Intention to Adopt Mobile Payment.

Another factor that has been influential in affecting adoption decisions is the performance expectations of the system. For instance, Al-Saedi et al. (2020) claim that performance expectancy is the most influential factor affecting acceptance of M-payments. The results show that performance expectancy is a significant, positive determinant of technology adoption and is congruent with the findings of Koksal (2016) and Yu (2012). For Singh and Srivastava (2018), performance expectancy was one of the important dimensions impacting adoption. According to Patil et al. (2020), the performance expectancy within consumers has a positive relationship with attitude. Further, according to Shaikh et al. (2015), performance expectancy affects the behavioral intention to adopt mobile payment. The hypothesis of this study is: Performance expectancy may

increase customer acceptance of mobile payment.
H1: Performance expectation influences consumer behavioral intention to adopt mobile payments favorable manner (BI).

Social Influence (SI) and Behavioral Intention to Adopt Mobile Payment.
As Lu (2014) points out, social influence is important during the first stages of adoption, but its effects fade as time passes. In agreement with Koenig-Lewis et al. (2015), social influence affects the acceptance of highly technological innovations. However, few studies have examined its impact on the behavioral intention to adopt mobile payments from a societal viewpoint. As a result, it has been proposed that this social influence concept serves as an external force that may influence customer acceptance of contactless payments.
H2: The acceptance of mobile payments by customers is positively influenced by social influence (BI)

Trust (TR) and Behavioral Intention to Adopt Mobile Payment.
Online payments are considered to be a form of mobile payment. This indicates some risks may be associated with certain payment methods, including the possibility of security breaches, hacking, and other issues. Utilizing technology, particularly online payments, without risks is almost impossible (Grabner-Kräuter & Faullant, 2008). Therefore, trust is one way to deal with the issue in an entirely unpredictable scenario. Previous studies have demonstrated that trust is crucial in a person's decision to use technologies (Kalinic et al., 2019; Sabbir, Islam, and Das, 2020). In light of this justification, the following hypotheses for this study can be proposed:
H3: Behavioral intention to adopt mobile payments (BI) is significantly influenced positively by trust

Perceived Cost (PC) and Behavioral Intention to Adopt Mobile Payment.
The degree to which a person feels that using mobile payments will cost money is known as perceived cost (Luarn & Lin, 2005). Users must pay two extra fees to use mobile payments. On the one hand, consumers must pay for brand-new mobile devices like iPads, smartphones, and Wi-Fi gadgets. However, users must also pay some costs for communication, services, and subscriptions. The costs associated with mobile payments are higher for users than those associated with internet payments. Consumers would assess this extra cost. They could conclude that adopting mobile payments is not financially advantageous if these costs are higher than anticipated. Users are less likely to utilize mobile payment services if they believe they cost more. Similarly, Chong et al. (2012) claimed that in Malaysia and China, customer decisions to adopt mobile commerce are significantly correlated negatively with perceived cost. As per Lu et al. (2014), consumers' inclination to use mobile payment services is negatively impacted by their perception of cost. As stated in Hanafizadeh et al. (2014), adoption of m-banking services is negatively impacted by perceived cost. Furthermore, Ahmad and Khalid (2017) stressed that cost is one of the main barriers to user adoption of m-government. As a result, the following theory is put forth:
H4: Behavioral intention to adopt mobile payments (BI) is adversely affected by perceived costs

Gamification (GA) and Behavioral Intention to Adopt Mobile Payment.
Gamification, which is defined as using game design concepts outside of gaming environments (Deterding et al., 2011), has been the subject of much research on how user behaviors are affected by motivation and engagement (Koivisto & Hamari, 2019). According to Landers, Auer, Collmus, and Armstrong (2018), more research is required to understand how gamification affects people's attitudes and behaviors fully. Research recently indicates that gamification increases user engagement through relatedness, competence, and autonomy, positively influencing users' intentions by making participation enjoyable (Lee & Jin, 2019). The intention to utilize is thereafter strengthened by this involvement (Bitrian, Buil and Catalán, 2021). These results are corroborated by recent systematic studies, which emphasize how gamification may affect users' intentions to utilize.
H5: Behavioral intention to adopt mobile payments (BI) is positively impacted by gamification.

Theories and Theoretical Grounding
The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), the Technology Acceptance Model (TAM) (Davis, 1989), and the Theory of Planned Behavior (TPB) are some other models that may be used to gauge the acceptance and use of technological instruments. However, we selected the UTAUT for this study (Venkatesh et al., 2003). Adoption models suggest a relationship between consumer beliefs (Lu, 2014). Venkatesh et al.

(2003 indicated that the most important theory is the UTAUT, which integrates the correlation between the constructs. In the field of information systems, the UTAUT has been used and proven to be valid and reliable (Shaikh & Karjaluoto, 2015). Expanding upon the Unified Theory of Acceptance and Use of Technology (UTAUT), UTAUT2 adds new components such as price value, habit, and hedonic motivation to improve the model's predictive power in various technological scenarios. To analyze Malaysian consumers' behavioral intention to adopt mobile payments, UTAUT2 is the best model.

UTAUT2 can represent how customers conduct financial transactions, following Tan et al. (2010). Building upon the UTAUT2 model, performance expectancy, social influence, trust, perceived cost, and gamification are the most important variables influencing digital payment adoption. Malaysian customers' acceptance of digital payment systems is unaffected by price, value, or habit, so this study uses a hedonistic incentive. UTAUT2 can provide a more detailed understanding of how customer behavior affects mobile payment acceptance. These information technology considerations primarily drive the behavioral intention to adopt mobile payment. These elements could affect the spread of mobile payments. In a cashless economy, customers transfer goods and services electronically instead of using actual money. Six hypotheses are put forth in this study based on the literature review and the current theoretical evaluations of the UTAUT and UTAUT2 models (Venkatesh et al., 2003).

3. Research Methodology

In this study, self-administered surveys were conducted using Google Forms to gather primary data from Malaysian individuals belonging to Generation Z, aged between 18 and 26 in the year 2024. The choice of Google Forms for the online survey was made due to its practicality, reliability and ability to maintain confidentiality. Additionally, it enables regular response tracking, which boosts the accuracy of data collection. Out of 732 responses received through email and other communication channels like LinkedIn and Instagram, 602 complete responses were utilized for analysis after data cleaning and removal of incomplete responses, forming the final sample without nonresponse bias.

Given the substantial sample size, this study utilizes non-probability convenience sampling to select reachable participants and achieve the target sample size. By using the Krejcie and Morgan (1970) formula, the population size of 10,025,664 (representing 29% of Malaysia's current population as of Thursday, March 21, 2024; Worldometer, n.d.) and the number of respondents (732) were considered to determine the appropriate sample size. According to the Krejcie and Morgan table, a population size of 10,000,000 and a 95% confidence level suggest a sample size of approximately 383. However, the number of respondents (732) exceeded the suggested sample size, providing a robust dataset for improved statistical power and analysis precision. Despite this, a larger sample size can enhance the study's statistical power and accuracy of analysis, leading to more reliable conclusions.

The collected data were standardized and measured to facilitate statistical analysis using SPSS, enabling the examination of causal relationships. The study's design provided a comprehensive analysis of the connections between variables, making the primary data well-suited for the research. The online survey comprised 23 items using 5-point Likert scales, excluding demographic information. The survey was derived from previous studies by Phonthanukitithaworn et al. (2016) and Rahman et al. (2020) to ensure validity.

In this work, the pre-adoptive appraisal model theory, through data analysis, is tested using the SPSS program. SPSS has been extensively employed, especially in quantitative research, due to its efficacy for performing various statistical tests, including comparative and Pearson correlation. In this framework, the correlational methodology is used to clarify the connection between the variables. Cronbach's alpha values are a component of SPSS that enable the assessment of the reliability of constructs. They indicate the degree of positive correlation among items and are considered reliable if above 0.5 (Chiu, Zhu & Corbett, 2021). Principal component analysis ensures validity, while inferential testing assesses the hypothesis. Multi-collinearity is also investigated through tolerance and the variance inflation factor (VIF) of the individual components. There will be three sequential stages of the examination. The Pearson Correlation Test aims to demonstrate that the independent variables are not multicollinear, ensuring the predictors' independence and preventing biased outcomes. Correlation values reflecting the direction and magnitude of correlations among the independent

variables will be shown, ranging from -1 to +1. Multiple regression measures the model where the Behavioral intention to adopt mobile payment (AMP) is predicted by Performance Expectancy (PE), Social Influence (SI), Trust (T), Perceived Cost (PC), and Gamification (GA).

The following tests are outlined: descriptive statistics (including average, maximum, minimum, standard deviation, variance and frequency distribution) to provide a thorough picture of the data; Pearson correlation test to prove the independence of independent variables by ensuring no multicollinearity, with correlation values ranging from -1 to +1; multiple regression to measure the model predicting behavioral intention to adopt mobile payment (AMP) by Performance Expectancy (PE), Social Influence (SI), Trust (T), Perceived Cost (PC), and Gamification (GA). For robustness, Cronbach's Alpha will be conducted to analyze the internal reliability of variables, and ANOVA (Analysis of Variance) will be performed to verify the overall significance of the model, ensuring the reliability of the regression analysis.

The regression equation will be formulated as follows:

$$\text{AMP} = \beta\beta_0 + \beta_1 PE + \beta_2 SI + \beta_3 T + \beta_4 PC + \beta_5 GA \quad (1)$$

Cronbach's alpha was used to analyze the internal reliability of the variables, and ANOVA was used to verify the overall significance of the model and the dependability of the regression analysis.

4. Results

The dependent variable in this study is behavioral intention to use mobile payments. In contrast, independent variables include perceived cost (PC), performance expectancy (PE), social influence (SI), trust (TR), and gamification (GA). This connection is demonstrated in various important sections. This study utilized online questionnaires (Google Forms) to distribute the surveys. The survey successfully collected 731 respondents; however, 129 responses were disregarded since one of the variables was not included in the pilot test. Consequently, 602 replies were selected for analytical testing. The data analysis and presentation were conducted using SPSS software.

Descriptive Analysis

Table 1: Demographic information of respondents in the main survey (N = 602)

Demographic variables	Category	Number of people	Percentage
Gender	Male	225	37.4
	Female	377	62.6
Age	18 to 21 years old	261	43.3
	22 to 26 years old	341	56.6
Education background	SPM	67	11.1
	Professional Certificate	34	5.6
	Foundation/Diploma	118	19.6
	Undergraduate	314	52.2
	Postgraduate	54	9
	Others	15	2.5
Location	Federal Territories	133	22.1
	Melaka	38	6.3
	Pahang	31	5.1
	Selangor	103	17.1
	Penang	55	9.1
	Kedah	11	1.8
	Perlis	5	0.8
	Perak	57	9.5
	Negeri Sembilan	37	6.1
	Kelantan	9	1.5
	Johor	63	10.5

	Terengganu	4	0.7
	Sabah	23	3.8
	Sarawak	33	5.5
Experience in Mobile Payment Usage	< 1 year	38	6.3
	1 year to 2 years	110	18.3
	Over 2 years	454	75.4
Occupational Status	Student	427	70.9
	Full-time employee	133	22.1
	Freelancer	29	4.8
	Unemployed	13	2.2

Based on the data collected, the survey respondents encompassed both male and female participants, with 225 men (37.4%) and 377 women (62.6%) out of 602 respondents. This indicates a significant gender disparity, with a higher proportion of female respondents participating in the online survey than male respondents. The age distribution of respondents was divided into two categories: 18 to 21 years old and 22 to 26 years old. Most respondents (341, or 56.6%) fell within the 22 to 26 age group, while the remaining 261 respondents (43.4%) were aged between 18 and 21. This demonstrates that the study was more representative of individuals in the older age range within the given categories. Regarding educational attainment, the survey data revealed a diverse range of educational backgrounds. The largest respondents were undergraduates, comprising 52.2% (314). This was followed by those with a foundation/diploma (19.6%, or 118 respondents), SPM (or equivalent) qualifications (11.1%, or 67 respondents), postgraduate degrees (9%, or 54 respondents), professional certificates (5.6%, or 34 respondents), and others (2.5%, or 15 respondents). The predominance of undergraduate respondents suggests a relatively high level of educational achievement among the survey participants.

The geographical distribution of respondents encompassed 14 states and the Federal Territories (Kuala Lumpur, Labuan, and Putrajaya). The Federal Territories comprised the largest share of respondents, with 133 participants (22.1%). Selangor followed with 103 respondents (17.1%), while other significant states included Johor (10.5%, or 63 respondents), Perak (9.5%, or 57 respondents), and Penang (9.1%, or 55 respondents). The lowest participation came from Terengganu, with only four respondents (0.7%). This distribution highlights the varied regional representation within the survey, with a substantial concentration of respondents in the Federal Territories and Selangor. Regarding mobile payment experience, the data reveal that most respondents (75.4%, or 454 individuals) have been using mobile payments for more than two years. This is followed by those with one to two years of experience (18.3%, or 110 respondents), and a smaller group with less than a year of experience (6.3%, or 38 respondents). These statistics indicate a well-established familiarity with mobile payment systems among the respondents, with most having substantial experience.

The occupational status of respondents was classified into four groups: students, full-time employees, freelancers, and unemployed individuals. The largest group was students, 70.9% (427) of the respondents. Full-time employees represented 22.1% (133 respondents), freelancers accounted for 4.8% (29 respondents), and unemployed individuals comprised 2.2% (13 respondents). The prevalence of student respondents is significant, reflecting the demographic composition of the survey sample.

Table 2: Descriptive information

	PE	SI	TR	PC	GA	BI
Mean	4.4070	3.7000	3.9743	2.0282	4.3252	4.4668
SD	0.67833	0.94	0.90073	0.93954	0.69454	0.67331
Skewness	-1.634	-0.559	-0.797	1.097	-1.329	-1.449
Kurtosis	3.622	-0.182	0.181	0.937	2.099	2.281

Note. PE is Performance Expectancy, SI is Social Influence, TR is Trust, PC is Perceived Cost, GA is Gamification, and BI is Behavioral Intention to Adopt Mobile Payment.

In data analysis, descriptive statistics are employed to summarise and describe the fundamental characteristics of a dataset. This approach enables researchers to present data meaningfully, allowing readers to understand

the underlying patterns and trends. One crucial component of descriptive statistics is the measurement of variability, often expressed by the standard deviation. The standard deviation indicates how much variation exists within the data, offering insights into the distribution and dispersion of the variables relative to the mean. In addition to standard deviation, skewness and kurtosis are vital metrics for assessing the distributional properties of the data, as shown in Table 2. Skewness measures the degree of asymmetry in a distribution, with values indicating whether the distribution is skewed to the left (negative skewness), to the right (positive skewness), or is perfectly symmetrical (skewness of zero). A negative skewness value implies that the distribution has a longer tail on the left side, suggesting the presence of more extreme values in the negative direction. Conversely, a positive skewness value denotes a longer tail on the right side, with more extreme values in the positive direction.

The data in Table 2 demonstrates that the dependent variable, Behavioral Intention to Use Mobile Payment (BI), exhibits a negative skewness of -1.449. A negative skew means the tail of the distribution is on the lower end, so the data is concentrated at the higher end of the scale. Similarly, the skewness values for the independent variables are as follows: Performance Expectancy (PE) at -1.634, Social Influence (SI) at -0.559, Trust (TR) at -0.797, Perceived Cost (PC) at 1.097, and Gamification (GA) at -1.329. These values provide insight into the asymmetry of the distributions for each variable. Kurtosis, alternatively, measures the tailedness of a distribution, indicating whether the data have heavy or light tails compared to a normal distribution. High kurtosis values suggest the presence of more extreme outliers, while low kurtosis values indicate fewer outliers and a distribution more concentrated around the mean. The dependent variable, Behavioral Intention to Adopt Mobile Payment (BI), has a kurtosis value of 2.281, implying a distribution with heavier tails. For the independent variables, the kurtosis values are as follows: Performance Expectancy (PE) at 3.622, Social Influence (SI) at -0.182, Trust (TR) at 0.181, Perceived Cost (PC) at 0.937, and Gamification (GA) at 2.099.

The kurtosis values for Performance Expectancy (PE) and Gamification (GA) signify distributions with heavier tails, suggesting more extreme values than those expected in a normal distribution. Conversely, the lower kurtosis values for Perceived Cost (PC), Trust (TR), and Social Influence (SI) indicate distributions with lighter tails, showing that these variables are more tightly clustered around the mean. According to Sovey, Osman, and Mohd-Matore (2022), acceptable kurtosis values should range between -10 and +10, while acceptable skewness values should fall within the range of -3 to +3. Hair et al. (2010) propose that normal data typically exhibit kurtosis values between -7 and +7 and skewness values between -2 and +2. Furthermore, Tabachnick and Fidell (2019) observe that deviations from normality in skewness and kurtosis are typically negligible in sample sizes exceeding 200. In this analysis, all items' skewness and kurtosis values fall within the acceptable ranges of -1.634 to 3.622, indicating that the data distribution lies within the acceptable limits of normality.

Pearson Correlation Analysis

Table 3: Pearson correlation analysis

	PE	SI	TR	PC	GA	BI
Performance Expectancy (PE)	1	0.405**	0.501**	-0.254**	0.612**	0.660**
Social Influence (SI)	0.405**	1	0.586**	-0.175**	0.464**	0.377**
Trust (TR)	0.501**	0.586**	1	0.290**	0.563**	0.563**
Perceived Cost (PC)	-0.254**	-0.175**	-0.290**	1	-0.277**	-0.299**
Gamification (GA)	0.612**	0.464**	0.563**	-0.277**	1	0.700**
Behavioural Intention to Adopt Mobile Payment (BI)	0.660**	0.377**	0.531**	-0.299**	0.700**	1

This study will examine the relationship between the dependent and independent variables using Pearson's correlation. Pearson correlation is commonly employed when the data follows a normal distribution, whereas Spearman correlation is used when the data is non-normally distributed. However, while the frequency analysis indicates that not all variables in this study have a normal distribution, the Spearman correlation method is not applicable here because the variables involved are continuous rather than ordinal. Therefore, despite the non-normal distribution, Pearson correlation will still be utilised to analyse the relationships between variables. Pearson correlation coefficients range from -1 to 1, where -1 indicates a perfect negative

correlation, 1 indicates a perfect positive correlation, and 0 indicates no correlation between the variables (Tabachnick & Fidell, 20; Pallant, 2007).

The Pearson correlation coefficient (r) for Performance Expectancy (PE) and Behavioral Intention to Adopt Mobile Payment (BI) is 0.660, indicating a substantial positive relationship between the two variables. This suggests that the Behavioral Intention to adopt mobile payments increases as Performance Expectancy increases. The R^2 value is 0.436, meaning that 43.6% of the variability in Behavioral Intention (BI) can be explained by Performance Expectancy (PE). The p-value is less than 0.05, and the significance level is below 0.001, leading to the acceptance of Hypothesis 1. A correlation coefficient of 0.377 demonstrates a moderate positive relationship between Social Influence (SI) and Behavioral Intention to Adopt Mobile Payment (BI). This correlation indicates that social influence shapes the intention to use mobile payment systems. The R^2 value of 0.142 implies that Social Influence accounts for 14.2% of Behavioral Intention (BI) variability. Given that the significance level is below 0.001, Hypothesis 2 is accepted.

According to the data in Table 3, Trust (TR) demonstrates a significant positive correlation with Behavioral Intention to Adopt Mobile Payment (BI), with a correlation coefficient of 0.531. The R^2 value is 0.282, indicating that Trust explains 28.2% of the variability in behavioral intention (BI). The significance criterion is less than 0.001, supporting the acceptance of Hypothesis 3.

Perceived Cost (PC) exhibits an inverse relationship with Behavioral Intention to Adopt Mobile Payment (BI), as indicated by a correlation coefficient of -0.299. This suggests that as the perceived cost of using mobile payments increases, the intention to adopt such payments decreases, and vice versa. The significance level is less than 0.001, and the R^2 value is 0.089, meaning that Perceived Cost accounts for 8.9% of Behavioral Intention (BI) variability. Consequently, Hypothesis 4 is accepted. The correlation coefficient for Gamification (GA) and Behavioral Intention to Adopt Mobile Payment (BI) is 0.700, demonstrating a strong positive relationship. This indicates that incorporating gamification features significantly enhances the intention to use mobile payment systems. The R^2 value is 0.489, meaning Gamification explains 48.9% of Behavioral Intention (BI) variability. With a significance level below 0.001, Hypothesis 5 is accepted.

Overall, the findings from Pearson correlation analysis reveal that most independent variables maintain a significant positive relationship with the dependent variable, Behavioral Intention to Adopt Mobile Payment (BI), except for Perceived Cost (PC), which shows a significant negative correlation. Among the independent variables, Gamification (GA) demonstrates the strongest positive correlation with Behavioral Intention (r = 0.700), while Social Influence (SI) exhibits the weakest positive correlation (r = 0.377). The correlation values across the independent variables range from moderate (±0.377) to strong (±0.700), indicating that none of the variables are highly correlated. This suggests that multicollinearity is not a concern in this analysis, as a correlation exceeding 0.8 could indicate significant multicollinearity (Simon Fraser University, n.d.).

Multi-Regression Analysis

Multiple regression analysis (Table 4) was employed to ascertain whether there is a significant link between the dependent and independent variables because correlation analysis cannot indicate whether such a relationship exists, as well as an independent variable. The significance threshold of 5% was applied in this investigation to evaluate the hypotheses.

Table 4: Multi Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.769	0.591	0.587	0.43261
Predictors: GA, PC, SI, PE, TR				
Dependent Variable: BI				

The correlation coefficient, or R, in the table above indicates how strongly the dependent and independent variables are related. R is 0.769 in this research, suggesting that the dependent and independent variables have a substantial connection. R-squared demonstrates the extent to which the independent variables explain the variability in the dependent variable. R^2 equals 0.591, indicating that the independent factors account for 59.10% of the variation in behavioral intention to use mobile payment (BI). However, additional variables not

included in the model account for 40.90% of the variation. An additional metric for evaluating goodness of fit is R-squared. R-squared may be used to determine the model's reliability.

Faraway (2004) states that 0.6 is the minimal R-squared benchmark, indicating that the independent variables should explain 60% of the variations in the dependent variable. The R-squared for this study is 0.591, which is marginally lower than the 0.6 benchmark. The efficacy of the regression model typically increases with higher R^2.

Nevertheless, this does not mean the regression model used in this study is inappropriate, even though the R^2 value falls below the required threshold. Although a high R-squared merely indicates that the current model fits the available data, it is not a sole indicator of a model's usefulness for prediction. R^2 is a quantitative measure of goodness of fit. It solely displays the relationship between the dependent variables and the independent variables. R^2 was below 0.6 in the studies by Bùi & Bùi (2018) and Rahman et al. (2020) (R2 = 0.510). Therefore, the regression model employed in this study can be considered suitable.

Table 5: ANOVA

Model	df	Sum of squares	F value	F	*P*
Regression	5	160.916	171.96	171.96	<0.001
Residual	596	111.545			
Total	601	272.461			
Dependent Variable: BI – (Dependent)					
Predictor: Constant), GA, PC, SI, PE, TR					

The ANOVA in Table 5 describes how well the regression equation fits the data. Determining whether the regression model predicts the dependent variable's significance depends critically on the data in the regression row. According to Pallant (2005), the hypothesis is accepted if the p-value is less than 0.05. The F-test indicates that this model contains a regression relationship, with a significant value of 0.001 and a p-value of less than 0.05, as shown in the above table. Given these circumstances, it is reasonable to conclude that this model significantly impacts the behavioral intention to use mobile payment (BI).

Brereton (2018) asserted that the F-value is obtained by dividing the mean square by the mean square residual, which is computed by the sum of squares and mean square. In order to calculate the p-value, which is located under the Sig. Column, the F-value computation is essential. The significant value (represented by p) that the independent variable has on the dependent variable is displayed in this column. If the p-value is less than or equal to 0.05, it indicates that there is a significant relationship between the two variables, and the null hypothesis will be rejected; if the p-value is greater than 0.05, it indicates that there is no significant relationship between the two variables, and the null hypothesis will not be rejected. Additionally, the degree of freedom (df) indicates the number of independent variables; to calculate it, subtract 1 from the total number of variables (df = n-1). The degree of freedom provided by five factors, including Performance Expectancy (PE), Social Influence (SI), Trust (TR), Perceived Cost (PC), and Gamification (GA), is shown in Table 5, where the df is 5. Furthermore, the sample size of 602 responses received corresponds to the residual degrees of freedom. The five variables are subtracted from this 602-sample size to provide 596. Then, 5 is added for the degree of freedom calculation, yielding a total degree of freedom of 601. Thus, it can be concluded that the degree of freedom, df, increases as the sample size increases. Additionally, the computation yields the 171.96 F-ratio displayed in Table 5 from the mean square regression division to the mean square residual (32.183/0.187=171.96), which is significant at p values greater than or equal to 0.05. Furthermore, the alternative hypothesis is accepted and the null hypothesis is rejected based on the significance level of 0.000, which is less than 0.05. 95% of the time, the alternative hypothesis is correct. Thus, there is a substantial correlation between Behavioral Intention to Adopt Mobile Payment (BI) and Performance Expectancy (PE), Perceived Cost (PC), Social Influence (SI), Trust (TR) and Gamification (GA).

Table 6: Multiple Regression Analysis

Model	Unstandardized Coefficients (B)	Standardized Coefficient	t	*P*	Collinearity Tolerance	Statistics VIF
Constant	1.045	0.15	6.967	<0.001		
PE	0.335	0.034	9.848	<0.001	0.584	1.714
SI	-0.031	0.024	-1.317	0.189	0.626	1.597
TR	0.098	0.027	3.616	<0.001	0.519	1.927
PC	-0.047	0.02	-2.37	0.018	0.819	1.122
GA	0.408	0.035	11.59	<0.001	0.521	1.918

The final coefficient values of the multiple regression analysis are displayed in the table above. When the effects of the other predictors in the model are considered, the beta values in this regression model, which represent the standardized coefficients, indicate the strength of the association between the dependent and independent variables. With a p-value of no more than 0.05, the coefficients table shows the findings of whether each independent variable influences the dependent variable. Additionally, each variable in the model has a variance inflation factor (VIF) value that shows the extent to which the other independent variables influence the variance of that specific variable. Therefore, if the value of VIF is not more than 10, there is no multicollinearity (James, Witten, Hastie & Tibshirani, 2013).

Gamification (GA) has the highest Standardized Coefficients Beta value of β = 0.421 with a significance value of less than 0.001, as shown by the data in Table 21. Based on this, it can be demonstrated that the behavioral intention to utilize mobile payment (BI) is most significantly impacted by Gamification (GA). The VIF for Gamification (GA) is at 1.918, where it can be concluded that there is no multicollinearity. Furthermore, with a significance value less than 0.001 and a Standardized Coefficient Beta value of β = 0.338, Performance Expectancy (PE) is the second most influential factor on the behavioral intention to utilize mobile payment (BI). Performance Expectancy (PE) has a VIF of 1.714, indicating the absence of multicollinearity. Additionally, with a Standardized Coefficients Beta value of β = 0.132 and a significance value of less than 0.001, Trust (TR) has the third highest influence on the behavioral intention to use mobile payment (BI). With a VIF of 1.927, Trust (TR) does not exhibit multicollinearity.

Conversely, Social Influence (SI) has a coefficient of -0.031. This indicates that the behavioral intention to utilize mobile payment (BI) will decrease by 3.1% for every unit increase in complexity. The beta value of Social Influence (SI) is β=-0.044. The standard deviation of the dependent variable will then decrease by 0.044 units for every unit rise in the Social Influence (SI) standard deviation. The results show that Social Influence (SI) has a p-value of 0.189, which is more than 0.05 (p-value > 0.05). We demonstrate that behavioral intention to utilize mobile payment (BI) is not significantly influenced by Social Influence (SI). Therefore, it can be said that Social Influence (SI) has no detrimental effect on the behavioral intention to use mobile payment (BI), and the null hypothesis is accepted. Social Influence (SI) does not show multicollinearity, with a VIF of 1.597.

Finally, -0.047 is the coefficient for perceived cost (PC). This suggests that the behavioral intention to utilize mobile payment (BI) is reduced by 4.7% for every unit rise in perceived cost (PC). The standardized coefficient is -0.066 for perceived cost (PC). Consequently, a rise of one standard deviation unit in the dependent variable's standard deviation will decrease by 0.066 units as a result of the perceived cost (PC). The p-value for the independent variable, perceived cost (PC), is 0.018, meaning that the value is less than 0.05 (p-value < 0.05). We conclude that perceived cost (PC) has a significant impact on behavioral intention to utilize mobile payment (BI). With a VIF of 1.122, perceived cost (PC) does not exhibit multicollinearity.

The relationship between Performance Expectancy (PE) and Behavioral Intention to Adopt Mobile Payment (BI)

There is a positive relationship between Performance Expectancy (PE) and Behavioral Intention to Adopt Mobile Payment (BI) constitutes the first hypothesis in this study. The findings demonstrated a correlation between Behavioral Intention to Adopt Mobile Payment (BI) and Performance Expectancy (PE), with the latter exhibiting a standardized beta (0.338) and a sig value of p<0.001. This study indicates that Performance Expectancy (PE) represents a crucial and influential variable. The standardized beta value indicates a positive correlation between Behavioral Intention to Adopt Mobile Payment (BI) and Performance Expectancy (PE).

This aligns with studies by Yu (2012) and Koksal (2016), who found that performance expectations positively and significantly impact technology adoption. The 2020 research by Patil et al. revealed a high correlation between customer perceptions and performance expectations. Shaikh et al. (2018) assert that behavioral intention to accept mobile payment is influenced by performance expectation, where this study develops the following hypothesis: Customers' adoption of mobile payments may be enhanced by performance expectations. Furthermore, customers are more inclined to accept cashless payments if they believe doing so will increase their expectations for overall performance, according to a study by Rahman, Ismail, and Bahri (2020). This finding corroborates the findings of previous research by Patil, Dwivedi, and Rana (2017). Consequently, Hypothesis 1, which states that Performance Expectancy (PE) and Behavioral Intention to utilize mobile payment (BI) are related, is supported.

The relationship between Social Influence (SI) and Behavioral Intention to Adopt Mobile Payment (BI

The second hypothesis in this study is that Behavioral Intention to Adopt Mobile Payment (BI) and Social Influence (SI) are positively correlated. The results of this study show that social norms have a standardized beta value of -0.044 and a significance value of 0.189, indicating no significant association between social influence (SI) and behavioral intention to use mobile payment (BI). Stated differently, the results of this investigation do not support the second hypothesis. Consequently, this study's findings run counter to some of the earlier research that this study cited, which found that social effect strongly predicts users' propensity to use (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019; Islam et al., 2024). As Lu (2014) notes, social influence has a significant role in the early stages of adoption but loses impact with time. It is agreed with Kulviwat, Bruner, and Al-Shuriah (2009) that social factors influence the adoption of highly technical innovations. However, Singh and Sravistava (2018) have shown that social influence minimally impacts behavioral intention to use mobile devices and e-wallets.

Nevertheless, research by Bùi & Bùi (2018) found no evidence to support the notion that behavioral intention and social influence are related. Specifically, one reason for this finding might be that a transaction is more likely to result from an individual's decision rather than influence from friends, family, or other third parties. According to some earlier research by Schierz et al. (2010), social influence is one of the elements driving the use of mobile payment services. This contradicts those findings. Few studies, meanwhile, have examined its impact on behavioral intentions to use mobile payments from a societal perspective. Therefore, social influence has been proposed as an external factor that might affect consumers' adoption of contactless payments. Thus, to conclude, Hypothesis Two is unsupported.

The relationship between Trust (TR) and Behavioral Intention to Adopt Mobile Payment (BI)

There is a positive relationship between Trust (TR) and Behavioral Intention to Adopt Mobile Payment (BI), which is the third hypothesis in this study. The study's results indicate a substantial correlation between Behavioral Intention to Adopt Mobile Payment (BI) and Trust (TR), with a significance value of less than 0.001. Its standardized beta value is 0.132. In terms of mobile payment methods, according to Chandra et al. (2010), trust has an impact on adoption. Zhou (2011) looked into user trust in mobile payments by considering self-perception-based characteristics like ubiquitous connectivity and effort expectation in addition to transference-based characteristics like structural certainty and faith in online payment systems. Perceived system trust substantially impacts attitudes, especially among women, according to José Liébana-Cabanillas et al.'s (2014) examination of how a consumer's gender influences the behavioral intention to use mobile payments. Zhou (2011) found a favorable association between online payment trust and mobile payment perceptions after conducting an empirical inquiry on customers' moves from online to mobile payment methods. Therefore, it has been established that Hypothesis 3, which states a strong correlation between behavioral intention to use mobile payment (BI) and trust (TR), is validated.

The relationship between Perceived Cost (PC) and Behavioral Intention to Adopt Mobile Payment (BI)

The fourth hypothesis in this study is that Behavioral Intention to Adopt Mobile Payment (BI) and Perceived Cost (PC) have a negative relationship. The study's findings show a significant relationship, with a significance value of 0.018 for perceived cost (PC), between behavioral intention to utilize mobile payment (BI) and perceived cost (PC). Moreover, the standardized beta value of -0.066 provides additional insights into the type and direction of this correlation. A negative beta value implies an inverse relationship, indicating that behavioral intention to utilize mobile payments decreases as perceived cost increases. These findings suggest

that higher perceived prices are inversely connected with people's intentions to use mobile payment solutions. Several studies show that one of the main obstacles to the adoption of new technologies in mobile services is perceived cost (Wang, Lin, & Luarn, 2006). One of the barriers that emerged during a similar study by Wei et al. (2009) on the findings in Malaysia was the cost of the services, which also relates to this research. The impact that cost has on m-banking adoption is significant.

Moreover, Zhou (2011) says that high expenses related to mobile payments, such as transaction and transmission fees, could be another simple reason for the extreme use. Thus, perceived cost is analogous to the relative advantage component of Innovation Diffusion Theory (IDT) and determines the decision about adopting innovations. The higher the perceived costs of a mobile payment system are, the less likely users are to use it. Similarly, Chong et al. (2012) also said a significant negative correlation exists between consumer decisions to adopt mobile commerce and perceived cost in Malaysia and China. Lu et al. (2011) also mentioned that customers' impression of the cost of mobile payment services hurts their inclination to adopt them. According to Hanafizadeh et al. (2014), perceived cost detrimentally affects m-banking service acceptance. Ahmad and Khalid (2017) also emphasized that cost is a significant obstacle to m-government user uptake. Consequently, based on all these preceding illustrations, it is proven that Hypothesis Four is supported, in which there is a significant relationship between Perceived Cost (PC) and Behavioral Intention to Adopt Mobile Payment (BI).

The relationship between Gamification (GA) and Behavioral Intention to Adopt Mobile Payment (BI)

There is a positive relationship between gamification (GA) and behavioral intention to adopt mobile payment (BI), states the fifth hypothesis in this study. The results indicated a relationship between behavioral intention to use mobile payment (BI) and gamification (GA), with a significance value of $p<0.001$ and the highest standardized beta (0.421) for GA. This suggests that gamification (GA) has the most significant impact and importance research variable. Recent research shows that relatedness, competence, and autonomy are how gamification boosts user engagement. This, in turn, favorably improves users' intentions by making participation joyful (Lee & Jin, 2019). This engagement thus reinforces the intention to use (Bitrian, Buil, and Catalán, 2021). Bùi and Bùi (2018) discovered that the research model verifies the association between gamification and behavioral intention about the Gamification construct, a unique inclusion in our study. This is consistent with previous research from Sin et al. (2025). While gamification has a minimal impact on consumers' adoption of new technology compared to other factors, it indicates that consumers would likely react favorably to the prospect of a pleasant banking experience and extrinsic incentives like discounts, points, and rewards.

5. Conclusion

This study comprehensively examines factors influencing the behavioral intention of Generation Z individuals in Malaysia (aged 18 to 26 in 2024) towards mobile payment adoption. By assessing the relationships between independent variables (performance expectancy, social influence, trust, perceived cost and gamification) and the dependent variable (behavioral intention to adopt mobile payment), the study aims to test and evaluate these relationships using survey data from 602 respondents in Malaysia. The findings suggest a significant relationship between performance expectancy, trust, perceived cost and gamification with behavioral intention, while social influence plays a lesser role. In particular, gamification emerges as the most influential factor affecting the intention to adopt mobile payment. This study contributes to research on mobile payment determinants and gamification effects, offering valuable insights for academics and practitioners to enhance service design and implementation strategies for improving customer acceptance rates. This study aims to test, verify and evaluate the relationships between independent factors and dependent variables using 602 responses from Generation Z in Malaysia, comprising individuals aged 18 to 26 (in 2024).

The hypothesis that social influence (SI) positively impacts behavioral intention (BI) is not supported. There is a significant relationship between performance expectancy (PE), trust (TR), perceived cost (PC), and gamification (GA) with behavioral intention to adopt mobile payment (BI); only social influence (SI) has a relatively minor role in deciding behavioral intention to adopt mobile payment (BI). The performance expectancy (PE), perceived cost (PC), trust (TR), and gamification (GA) hypotheses have been accepted, and the results show that gamification (GA) has the most decisive influence on behavioral intention to adopt mobile

payment (BI). Therefore, it can be said that the main element that will have the most significant impact on the desire to utilize mobile payments. In summary, this study expands on previous research about the causes of mobile payments and the gamification effects, which provides valuable information for academics. Meanwhile, the results help practitioners better understand the major factors influencing customers' behavioral intentions, which is crucial for designing, improving and implementing services to increase customer acceptance rates.

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