

## THE IMPACT OF PERSONAL INNOVATIVENESS ON THE BEHAVIORAL INTENTION TO USING TOURISM MOBILE APPLICATIONS OF GENERATION Z IN HO CHI MINH CITY, VIETNAM

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**Abstract:** The advancement of technology has significantly transformed various activities in human life, including tourism. Mobile technology, especially mobile applications, has become an integral part of users' travel experiences. Generation Z, with their natural and proficient access to technology, has become one of the primary user groups of mobile applications in the tourism industry. Recognizing the lack of research on the intention to use mobile applications in tourism, particularly of Generation Z in Vietnam, a generation expected to reshape the tourism industry in the future, this study aims to investigate how personal innovativeness influences the intention to use mobile applications in tourism among Generation Z and mediation of attitudes. To test the proposed hypotheses, the study conducted an online survey using Google Forms targeting Generation Z individuals living and working in Ho Chi Minh City, Vietnam. A total of 318 participants took part in the survey. The collected data were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method. Based on the research findings, the study proposed potential solutions for mobile application development businesses, destination management organizations, tourism businesses to enhance the intention to use mobile applications in tourism among Generation Z in Ho Chi Minh City and Vietnam as a whole.

**Keywords:** generation Z, technology acceptance model, technology readiness, personal innovativeness, TMAs, intention to use

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### INTRODUCTION

The development of digital technology has generated widespread impacts and altered the landscape of commerce, business, education, research, and even in the tourism sector (Agag and El-Masry, 2016; Santini et al., 2020). Technological advancements will influence the determination of demand models, the transformation of customer value, and the increasing need for competitiveness (Pae and Hyun, 2002). In the age of technology, through connectivity to the Internet, businesses can leverage this opportunity to innovate their service marketing structures better for customers based on progressive technological activities (Rajapathirana and Hui, 2018). In the tourism sector, the internet plays an incredibly important role. The internet serves as a tool for global connection, search, and information exchange. With the advancement of technology today, the internet is the primary tool where organizations and businesses can use to market products, and consumers can search for information related to their trips. By using a mobile phone, travelers can connect to the Internet and utilize travel applications on their phones to search for information and plan their trips, compare prices to choose services, and enable online payments. According to a survey of countries with the highest smartphone usage worldwide, Vietnam ranks in the top 10 with around 61.3 million smartphones (Statista, 2021). According to the report by Statista (2021), Vietnam has approximately 98.53 million people but there are up to 161.6 million mobile-connected devices (including mobile phones, tablets, personal computers), reaching 164.0% with a growth rate of 3.0% per year.

According to Vipin (2016), travel applications rank seventh among the most downloaded applications in app stores; statistics show that around 30% of app users search for cheap hotels and flight tickets, while 8% of customers often use them to plan trips and make reservations. In 2023, approximately 94.5% of mobile phone users connect to the Internet to serve their personal needs, entertainment, information search, and other utilities (Statista, 2021).

According to 2024 Travel Forecast Report of Booking.com, the majority of Vietnamese people (62%) want to take unforeseen trips, while 81% prefer a flexible schedule that can be changed. In this trend, AI is predicted to become a key tool in travel planning, with 65% of Vietnamese people confident that AI will help them organize trips in the future. Technology is also refreshing the way food is enjoyed, with Vietnamese tourists seeking diverse “virtual reality” (combination of reality and digital) dining experiences through VR or AR. Besides, Scott and Gössling (2015) predicted that by 2050, marketing and promotion services through applications and social networks will continue to develop, creating transparent, fair competition services, contributing to expanding the product market through the sharing economy; along with meeting the preferences and travel needs of the future market, the Gen Z and Alpha generations.

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Generation Z (Gen Z) is the demographic group between the Millennials (Generation Y) and Generation Alpha, born between the late 1990s and the early 2010s (Haddouche and Salomone, 2018). Nielsen (2018) estimated that by 2025, there will be 2 billions people in the Gen Z generation, accounting for 33% of the world's population. According to statistics in Vietnam, Gen Z accounts for about 15% of the population, with 14.4 million people. Gen Z can be seen as a generation exposed to Internet technology and smart mobile devices from an early age, living in the era of Industry 4.0 with the rapid development of modern technology. Therefore, they have a habit of using technology in all aspects of daily life and are considered a tech-savvy and knowledgeable generation (Francis and Hoefel, 2018; Haddouche and Salomone, 2018; Monaco, 2018; Ninan et al., 2020). Francis and Hoefel (2018) demonstrated that Gen Z is a generation with new influences under the impact of technology, so they often create new trends in behavior and experiential activities. According to the survey conducted by the Vietnam National Administration of Tourism (VNAT) (2020), the number of young tourists in Vietnam has tripled in recent years. According to the World Tourism Organization survey (2016), Gen Z has chosen "Travel and see the world" as the most important factor in deciding their travel expenses. Although Gen Z still has limitations in spending ability, they will choose to spend more on experiential trips with a local lifestyle rather than resort vacations as tourists.

Tourism mobile applications (TMAs) are no longer unfamiliar to today's youth; the majority of travelers have either heard of or used these applications for their trips. However, consumer behavior is influenced by many external and internal factors, especially the cultural environment, traditional consumption habits such as booking services directly at travel agencies, buying paper tickets, cash payments, therefore, research on consumer behavior changes, especially for generation Z, the potential consumer generation, plays a very important role.

Understanding consumer psychology, needs, and trends of tourists will help tourism managers build product promotion strategies, apply technology in tourism to enhance experiences of tourists. Especially, some travelers still have reservations about the usefulness and convenience of these TMAs on their mobile devices for various reasons such as: network security issue, confidentiality of personal information and the difference of consumer behavior culture. Based on previous studies on the use of TMAs, research on the TMA usage behavior of Gen Z travelers is still relatively new, and there is still limited research on the factors influencing Gen Z's intention to use TMAs, especially in Vietnam.

This study will focus on analyzing personal innovativeness (PI) with the perceived usefulness of TMAs (PU), perceived ease of use (PEU), Gen Z's attitude towards TMAs (AT), and the relationship of these factors to Gen Z's intention to use TMAs (IU) and assess the mediating role of Gen Z's attitude towards TMAs (AT) in the relationship between personal innovativeness (PI) and Gen Z's intention to use TMAs (IU). Finally, the study will propose implications and policies to promote the increase in Gen Z's intention to use TMAs in tourism in the context of the current Industry 4.0 era.

## LITERATURE REVIEW

### Tourism mobile applications (TMAs)

The emphasis on designing and developing travel applications in recent years has become extremely popular in the tourism industry worldwide. These applications have become convenient tools for connecting users with functionalities such as searching for ticket prices, booking accommodations, and accessing entertainment services. Leveraging the inherent characteristics of the tourism industry, technological development has brought numerous benefits to both the tourism and hospitality sectors (Gretzel and Kennedy Eden, 2012). Currently, there is a plethora of mobile applications catering to tourism, depending on the users' purposes and preferences (Wang and Fesenmaier, 2013).

Based on the study's synthesis of studies on tourists' attitudes, motivations, and intentions to use TMAs (Tourism Mobile Applications), De Oliveira Nunes and Mayer (2014) study indicated that survey participants' intentions to use the "Ilha Grande (Big Island) Mix" app in tourism mostly had positive attitudes towards it because it suited destinations and enhanced their experiences. Today's tourists are increasingly interested in the intricate interactions and connections of technology across all fields through mobile applications (Dorcic et al., 2019), as they find these apps convenient, user-friendly, and beneficial for their daily lives, work, and travel activities (Lu et al., 2005; Morosan and DeFranco, 2016). The development of mobile applications has made augmented reality (AR) apps more popular in tourism. AR provides tourists with sounds, 3D images through mobile apps to offer new experiences or additional information about destinations. Jung et al. (2016) study concluded that satisfaction and intention to propose and use AR are influenced by personalized content and management systems when used. Additionally, tourists' attitudes towards using AR apps at world heritage sites are highly positive due to the ease of use and convenience when experiencing them on personal mobile devices (Chung et al., 2015). Customers feel they save time and achieve higher quality efficiency when using services on apps (Bader, 2012), for purchasing travel services (García-Milon et al., 2021; Morosan and DeFranco, 2016), for looking up guides, information, and directions to destinations, etc. (Ngom et al., 2010), and enhancing the destination experience through TMAs (Kamboj and Joshi, 2021).

There are several factors driving tourists intention to use mobile applications. The more apps are upgraded in terms of interface and appearance, continuously updating information to create interaction, the more customers will have a positive liking attitude and intention to use them more (Tussyadiah et al., 2018). Some customers perceive apps as having diverse features, helping to save time and money due to their useful and user-friendly attributes (Jin, 2020; Oh et al., 2014). Additionally, Jin (2020) observed that some users experience joy and excitement when using them. Enjoyment is a psychological motivator and an important factor in purchasing intention and customer satisfaction when using services (Kim and Ko, 2013). Other studies also indicate that nowadays tourists are increasingly inclined to use mobile applications to serve their growing travel purposes. Travelers recognize that the attributes of usefulness and ease of use of these apps will benefit them on their trips. Attributes of ease of use, usefulness, and intelligence are demonstrated and supported by the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data, etc. (Adiyarta et al., 2018; Oh et al., 2014; I. Tussyadiah et al., 2018).

In particular, recent studies have shown that the latest topics related to mobile applications for tourists that have garnered attention recently are Near Field Communication (NFC) technology applications, which provide convenience and ease for tourists sightseeing and shopping needs-especially for younger generations of travelers (Liebana-Cabanillas et al., 2020). This research found that the perceived usefulness and ease of use of NFC applications significantly impact tourists' intention to use NFC, and utilizing NFC for communication and transactions will enhance the security of the ir personal information (Morosan and DeFranco, 2016).

### **Technology acceptance model (TAM)**

The Technology Acceptance Model (TAM), developed by Davis (1989), is an enhancement of the Theory of Reasoned Action (TRA). This model is used to explain users' acceptance of technology through three influencing aspects: perceived usefulness, ease of use, and intention to use technology.

Many studies by previous studys have shown that the intention to use new technologies is influenced and impacted by two factors: perceived usefulness and ease of use (Chiu and Wang, 2008). Morosan (2012) introduced innovation in perception as a new variable in TAM to study biometric identification systems in the hotel industry; exploring the intention to use mobile applications to search for travel information through the integration of three communication and information technology factors with TAM (Oh et al., 2014). In another study, to investigate the attitudes and intentions to use electronic airline ticket services among Chinese tourists, Lee and Wan (2010) combined TAM with two new variables: familiarity and self-efficacy. The research results showed that all factors positively impact the intentions of Chinese tourists.

In the technology environment, perceived usefulness is regarded as a factor that creates convenience for everyday activities, especially in the innovation of technology through mobile applications. Similarly to previous studies, Kuo et al. (2019) examined the factors influencing consumers intention to use travel apps. The results indicated that several factors impact tourists intentions: perceived usefulness, ease of use, technology service environment, and electronic word-of-mouth (eWOM). These findings align with previous studies utilizing the TAM model (Hsu and Ching, 2011). Ayeh (2015) integrated credible source theories to create an extended TAM model to study the acceptance and intention to use user-generated media in users travel planning. The research results revealed that two factors, perceived ease of use and usefulness, were crucial for survey respondents in forming their intention to use user-generated media. Huang et al. (2019) conducted an extended study of the TAM model by integrating the structural factor of the experience economy to gain a clearer understanding of customers mobile app usage behavior in the hotel industry. The research results identified factors influencing customer mobile app usage behavior shaped simultaneously by consumer experiences and cognizant beliefs. Another study applied the TAM model to evaluate the impacts of mobile travel applications on information-seeking behavior of Foreign Independent Travelers (FITs) (Lin et al., 2020). The research findings indicated that younger and university-educated individuals are more adept at using new smart technologies, and they often use these apps to seek information before making travel decisions, with their attitudes towards these apps also being perceived positively due to their user-friendly features.

### **Personal Innovativeness**

Agarward and Prasad (1998) defined personal innovativeness as an individual's readiness to experience a new feature of information technology or communication without being influenced by external factors. Alternatively, individuals with high personal innovativeness are believed to consistently exhibit more positive attitudes towards new technologies (Lewis et al., 2003; López-Nicolás et al., 2008). Personal innovativeness is also considered an important predictor of user technology acceptance (Lewis et al., 2003). Lian et al. (2012) found that attitudes and purchase intentions are strongly influenced and regulated by personal innovativeness. In this study, the authors observed that in the context of information technology usage, personal innovativeness impacts users positive attitudes towards online shopping intentions. In another study related to attitudes, user confidence, and personal innovativeness significantly impact users understanding of online shopping behavior (Amoroso et al., 2021; Hill and Troshani, 2009). Zhang et al. (2013) found in their research that the relationship between users' attitudes towards information technology and personal innovativeness is a mutually reinforcing positive relationship. Perceptions of usefulness, as studied and influenced by personal innovativeness in Lu et al. (2003) research, play a crucial role in determining users' technology acceptance intentions. The studies by Lu et al. (2005) concluded that social influence variables and personal innovativeness need to be considered in determining user technology acceptance, and perceptions of usefulness and ease of use are strong variables impacting the outcomes of this research.

Individuals with high personal innovativeness are often ready to embrace technological innovations with a receptive attitude and respond positively (Thakur et al., 2016; Lin and Filieri, 2015). Users with high personal innovativeness are more likely to adapt to new technologies easily, but there also needs to be appropriate design, structure, and functionality, such as perceived usefulness and ease of use factors from those technologies (Turan et al., 2015). Individuals with high personal innovativeness tend to value the usefulness of technologies in their decision to use them, as noted in studies by Lui et al., (2021), Chen et al. (2019), Shanmugavel and Micheal (2022). The research by Amoroso et al. (2021) agrees that personal innovativeness should be considered in determining user acceptance intentions, with the two important variables being perceived usefulness and ease of use as perceived by users in their intention to use technology.

### **The hypothesis development**

Personal innovativeness is perceived to have a certain influence on consumers' intention to use technology in certain cases. Kim and Ko (2013) hypothesized personal innovativeness divided into two dimensions of users: personal innovativeness in life and personal innovativeness in specific areas. Personal innovativeness has a positive impact on users' intention to use and repurchase on self-service technology applications (Chen, 2008). Previous studies have shown that

positive attitudes influence customers intention to use technology, and customers with positive attitudes are an indicator of brand loyalty (Yeo et al., 2017; Choe and Kim, 2018).

Limayem et al. (2000) demonstrated through their study that attitudes and purchasing intentions on Internet applications are influenced by user’s personal innovativeness. In another study on the relationship between the intention to use payment applications and personal innovativeness, Pham and Ho (2015) found a positive relationship between these two factors. Individuals with higher personal innovativeness tend to have a more positive attitude and earlier acceptance; they are willing to learn how to use these payment applications. Similarly, individuals with higher innovativeness tend to have a more positive attitude and intention to use new technology (Lui et al., 2021). Munoz-Leiva et al. (2017) conducted research on the intention to use online banking services. The results showed that attitude plays an important role in leading to customers usage intentions, surpassing variables related to usefulness and risk. Another study on advertising on mobile apps found that annoyance negatively affects user attitudes. However, the research results suggest that negative attitudes decrease when these ads are targeted at consumers with high personal innovativeness, leading to the conclusion that personal innovativeness and user attitudes toward using advertising on mobile apps have a positive relationship (Boateng et al., 2016).

The findings of the above-summarized studies provide evidence for the relationship of three factors including personal innovativeness, attitude, and intention to use TMAs. Recognizing the intermediate influence of attitude on the relationship between personal innovativeness and intention to use is necessary and reasonable. Therefore, this study proposes the mediating role of Attitude in the relationship between personal innovativeness and intention to use TMAs. Therefore, the study proposed the following relationships (Figure 1):

**Hypothesis 1:** Personal innovativeness positively influences the perceived usefulness when using TMAs of GenZ in Ho Chi Minh City, Vietnam.

**Hypothesis 2:** Personal innovativeness positively influences the perceived ease of use when using TMAs of GenZ in Ho Chi Minh City, Vietnam.

**Hypothesis 3:** Personal innovativeness positively influences the attitude when using TMAs of GenZ in Ho Chi Minh City, Vietnam.

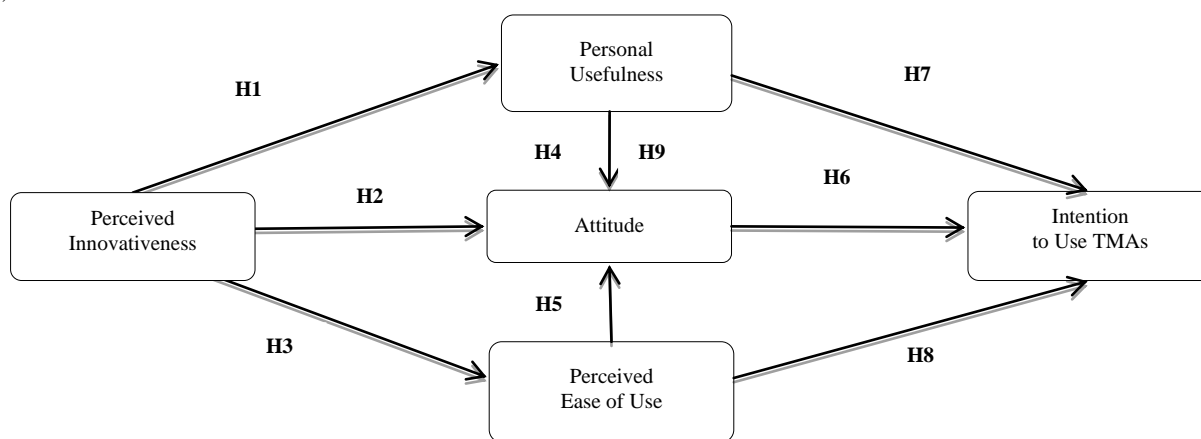


Figure 1. Conceptual framework

The perceived usefulness and ease of use technology are factors influencing users attitudes towards technology (Davis, 1989). Additionally, Tsai (2010) has pointed out that attitude is positively influenced by perceived ease of use and usefulness. Similarly, in the studies by Munoz-Leiva et al. (2017) and Syed-Abdul et al. (2019), it is shown that technology provides utility to users, thereby shaping users positive attitudes towards technology. In the study by Arif et al., (2016), it is argued that ease of use enables users to access technology more easily and simply, facilitating the use of services through mobile applications, resulting in a positive attitude and a sense of enjoyment when using them.

Therefore, the study proposes hypotheses for the following relationships:

**Hypothesis 4:** Perceived usefulness positively influences attitude in using TMAs of GenZ in Ho Chi Minh City, Vietnam.

**Hypothesis 5:** Perceived ease of use positively influences attitude in using TMAs of GenZ in Ho Chi Minh City, Vietnam.

Based on the theory of the TAM model, attitude, perceived usefulness, and perceived ease of use factors influence users intention to use technology. Many previous studies have demonstrated that users with positive attitudes, satisfaction, or preference for a particular technology tend to intend to use it for necessary activities in life (Alsamydai, 2014; Lee et al., 2011; Syed-Abdul et al., 2019). According to Lin and Chang (2011), the higher the intention to use technology, the higher the perceived usefulness and perceived ease of use. Consumers are likely to use a technology in their daily lives when they perceive it as useful (Alalwan et al., 2017). Dadvari and Do (2019) demonstrated in their study that communication technology influences the intention to use among GenZ users. Similar research results have been found in various studies such as destination travel apps (Kamboj and Joshi, 2021), health care travel apps (Chang et al., 2016), sports wearable apps (Seol et al., 2017), and online shopping and payment apps (Boes et al., 2015; Gupta and Arora, 2020; Morosan and DeFranco, 2016). Therefore, the study proposes hypotheses for the following relationships:

**Hypothesis 6:** Attitude positively influences the intention to use TMAs of GenZ in in Ho Chi Minh City, Vietnam.

**Hypothesis 7:** Perceived usefulness positively influences the intention to use TMAs of GenZ in Ho Chi Minh City, Vietnam.

**Hypothesis 8:** Perceived ease of use positively influences the intention to use TMAs of GenZ in Ho Chi Minh City, Vietnam.

Davis (1989) concluded in their study that attitude directly influences users intention to use technology, and intention is determined by their personal attitude. Several studies have demonstrated that individuals with high personal innovativeness tend to have a positive attitude towards adopting new technology (Chang et al., 2016; Lin et al., 2007; Chung et al., 2015). Pham and Ho (2015) identified a positive relationship between personal innovativeness and intention to use new technology; individuals with higher innovativeness perceive a higher attitude and intention to use new technology (Lui et al., 2021). Therefore, the study proposes the following research hypothesis:

**Hypothesis 9:** Attitude plays an intermediate role in the relationship between personal innovativeness and intention to use TMAs of GenZ in Ho Chi Minh City, Vietnam.

## RESEARCH METHODOLOGY

### Data collection procedure

The objective of this survey is aimed at the Generation Z population living in Ho Chi Minh City. Before conducting the official survey, the study piloted a survey with 50 individuals in Facebook group of Generation Z. The purpose of this pilot was to assess the accuracy and feasibility of the questions, identifying any errors and updating them based on real-time feedback from participants. Following the pilot phase, the actual survey commenced with a three-step process: Firstly, participants were selected from Generation Z, born between 1995 and 2010, currently residing in Ho Chi Minh City. Survey questions were adjusted from previous studies related to the topic. Secondly, the study utilized Google Forms for online data collection. To prevent multiple responses from participants, the study required the use of a unique email address for each survey response. Lastly, the survey ran from April 7th to April 26th, 2024 on online Facebook channel of the high schools and universities in Ho Chi Minh City such as Le Quy Don high school, Nguyen Thi Minh Khai high school, Ton Duc Thang University, Social science and Humanities University in Ho Chi Minh City, Hufit University, Van Lang University, etc. As a result, through random sampling, the survey successfully collected 318 samples, with 310 valid responses, yielding a response rate of 97.5%. Approximately 2.5% of the total samples in the questionnaire were deemed invalid due to 8 duplicate responses.

### Questionnaire Development

The questionnaire consisting of 2 parts: The first part contains general information related to the personal characteristics of those who participated in the questionnaire. The second part consists of items to measure variables in the study. The questionnaire comprises 5 main variables with 22 items, each item using a 5-point Likert scale to measure the study's constructs, ranging from (1) "Strongly Disagree" to (5) "Strongly Agree". These groups are as follows:

- Personal Innovativeness (PI) consisting of 5 items drawn from Jin (2020).
- Perceived Usefulness (PU) consisting of 5 items drawn from Compernelle et al. (2018).
- Perceived Ease of Use (PEU) consisting of 5 items drawn from Compernelle et al. (2018).
- Attitude (AT) consisting of 3 items drawn from Hapsari et al. (2023).
- Intention to Use TMAs (IU) consisting of 4 items drawn from Loan et al. (2023).

Descriptive statistics were analyzed using SPSS 26.0, and measurement model and structural model evaluation were conducted using SMARTPLS 3.0.

## IMPIRICAL RESULTS

### Descriptive analysis

Out of the 318 survey forms distributed, only 310 forms met the requirements after collection and verification, with 8 forms being excluded due to errors or lack of reliability. Thus, the total sample size for this study is 310 forms. These forms will undergo descriptive statistical analysis, including distribution based on gender, educational level, and income. Specific results will be presented in Table 1 as follows: Regarding the distribution of gender ratios, there were 138 male participants, accounting for 44.5% of the sample, and 172 female participants, accounting for 55.5%. From these survey results, it can be observed that the participation rate of females is 11% higher than that of males.

Table 1. Demographic characteristics of respondents

Characteristics	Criteria	Frequency	Percent (%)
Gender	Male	138	44.5
	Female	172	55.5
Education level	High school	36	11.6
	College	81	26.1
	University	172	55.5
	Postgraduate	21	6.8
Income (per month)	Not income yet	15	4.8
	Under 5 million	58	18.7
	From 5 to under 10 million VND	120	38.7
	From 10 to under 15 million VND	76	24.5
	From 15 to 20 million VND	29	9.4
	Over 20 million VND	12	3.9
<b>Total</b>		<b>310</b>	<b>100</b>

Regarding the educational level of survey participants, data analysis reveals that among Generation Z, there are 36 participants currently in high school, accounting for 11.6%. Additionally, there are 81 participants with vocational

education, representing 26.1%, and 21 individuals with post-secondary education, contributing 6.8%. Notably, the analysis results show that there are 172 participants who are either college students or have a university degree, comprising over half of the surveyed sample at 55.5%.

As for the monthly income of survey participants, the results indicate that the most common income bracket for Generation Z participants in the survey is between 5 to under 10 million VND, with 120 individuals, accounting for 38.7%. Ranking second in the survey are those with incomes between 10 to under 15 million VND, with 76 individuals, representing 24.55% of the total surveyed sample. The analysis recorded that there are 12 individuals, approximately 3.9%, with monthly incomes above 20 million VND. Moreover, there are 58 individuals with incomes below 5 million VND, making up 18.7%; and only 15 individuals, comprising 4.8%, with no income and are dependent on their families.

Table 2 illustrates the results of Cronbach’s Alpha analysis (computed using SPSS), which were utilized to assess the reliability of the scales measuring the five main variables in the study’s study, including: Personal Innovativeness (PI), Perceived Usefulness (PU), Perceived Ease of Use (PEU), Attitude (AT), and Intention to Use TMAs (IU).

Table 2. Cronbach’s Alpha coefficient test results

Observed variables	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Cronbach’s Alpha if item deleted
<b>Personal Innovativeness (PI): Cronbach’s alpha = 0.798</b>				
PI_1	16.28	6.298	.568	.764
PI_2	16.15	5.658	.667	.731
PI_3	16.35	5.781	.656	.734
PI_4	16.31	5.747	.570	.763
PI_5	16.34	6.398	.449	.799
<b>Perceived Usefulness (PU): Cronbach’s alpha = 0.858</b>				
PU_1	16.53	6.638	.713	.817
PU_2	16.56	6.383	.763	.804
PU_3	16.47	6.826	.671	.829
PU_4	16.53	6.832	.665	.830
PU_5	16.52	7.383	.554	.857
<b>Perceived Ease of Use (PEU): Cronbach’s alpha = 0.895</b>				
PEU_1	15.37	10.493	.706	.880
PEU_2	15.63	9.392	.749	.872
PEU_3	15.52	9.577	.797	.860
PEU_4	15.56	9.872	.722	.877
PEU_5	15.50	9.895	.744	.872
<b>Attitude (AT): Cronbach’s alpha = 0.797</b>				
AT_1	7.72	2.313	.693	.667
AT_2	7.70	2.514	.599	.765
AT_3	8.03	2.294	.632	.733
<b>Intention to Use TMAs (IU): Cronbach’s alpha = 0.798</b>				
IU_1	11.60	4.370	.630	.738
IU_2	11.72	4.130	.711	.696
IU_3	11.63	4.673	.565	.770
IU_4	11.81	4.755	.540	.781

According to the evaluation criteria by Sarstedt et al. (2021), Cronbach’s Alpha scores are considered acceptable if they are 0.6 or higher. The Cronbach’s Alpha reliability coefficient of Personal Innovativeness (PI) measured for the results is 0.798 (falling within the range of  $0.7 < \alpha < 0.8$ ), indicating that the reliability of this scale is acceptable. Additionally, the correlation coefficient between the total variables of the items on this scale is greater than 0.3; therefore, no items are excluded from this variable. Subsequently, Perceived Usefulness (PU) was measured using 5 items developed by Compernelle et al. (2018) and Jin (2020); while Perceived Ease of Use (PEU) was measured using 5 items developed by Compernelle et al. (2018); Jin (2020); and Chung et al. (2015). The analysis the Cronbach’s Alpha reliability coefficient of Perceived Usefulness (PU) indicate good reliability, with scores of 0.858 (PU) and 0.895 (PEU), both falling within the range of  $0.8 < \alpha < 0.95$  (good, indicating that the scale is highly usable). No items were excluded from the variables because the results show that the correlation coefficient between the total variables of the items is greater than 0.3, indicating that all variables meet the requirements. Finally, to measure Attitude (AT) and Intention to Use TMAs (IU), the study utilized 3 items developed by Hapsari et al. (2023) for the Attitude variable, and 4 items from Lin et al. (2007); Chung et al. (2015); Alalwan et al. (2017); Loan et al. (2023) for Intention to Use TMAs. The Cronbach’s Alpha values for AT and IU were found to be 0.797 and 0.798, respectively. These values both fall within the range of  $0.7 < \alpha < 0.8$ , indicating high reliability for the scales. Moreover, the correlation coefficients between the total variables of the items on the AT and IU scales are all greater than 0.3, thus no items were excluded.

**Exploratory Factor Analysis (EFA)**

In this analysis section, the study inputted 22 observed variables that passed the reliability test analyzed by Cronbach’s Alpha and Exploratory Factor Analysis (EFA). Principal component analysis with Varimax rotation and Kaiser normalization was employed. Additionally, to conduct EFA, the prerequisite conditions are to achieve  $KMO \geq 0.5$  and sig

Bartlett’s Test < 0.05. The analysis results are presented in Table 3 as follows: The KMO index is  $0.877 \geq 0.5$ , and the Chi-Square statistic for Bartlett’s Test is significant with  $\text{Sig.} = 0.000 < 0.05$ ; Chi-Square = 3502.935; df = 231; thus, EFA is considered appropriate. The results of the EFA are clearly displayed in Table 4. The findings indicate a stopping eigenvalue = 1.029 (Eigenvalues  $\geq 1$ ) and the number of extracted factors is 5, with a total variance explained of  $65.703\% \geq 50\%$ . The breakdown of results presented in Table 4 is detailed as follows: Personal Innovativeness (PI\_1, PI\_2, PI\_3, PI\_4, PI\_5); Perceived Usefulness (PU\_1, PU\_2, PU\_3, PU\_4, PU\_5); Perceived Ease of Use (PEU\_1, PEU\_2, PEU\_3, PEU\_4, PEU\_5); Attitude (AT\_1, AT\_2, AT\_3); Intention to Use (IU\_1, IU\_2, IU\_3, IU\_4).

Table 3. Bartlett’s test results and KMO coefficient

KMO and Bartlett’s Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)		.877
Bartlett’s Test of Sphericity	Approx. Chi-Square	3502.935
	df	231
	Sig.	.000

Table 4. Results of exploratory factor analysis – EFA

Factor/items	Factor loading	Eigenvalue	% Of variance explained
<b>Perceived Ease of Use (PEU)</b>		7.575	34.430
PEU_3	0.842		
PEU_5	0.832		
PEU_2	0.821		
PEU_1	0.788		
PEU_4	0.769		
<b>Perceived Usefulness (PU)</b>		2.412	45.395
PU_2	0.795		
PU_4	0.788		
PU_1	0.732		
PU_3	0.731		
PU_5	0.705		
<b>Perceived Innovativeness (PI)</b>		1.914	54.097
PI_2	0.819		
PI_3	0.742		
PI_1	0.727		
PI_4	0.670		
PI_5	0.569		
<b>Intention to Use (IU)</b>		1.524	61.024
IU_3	0.772		
IU_4	0.752		
IU_2	0.693		
IU_1	0.620		
<b>Attitude (AT)</b>		1.029	65.703
AT_2	0.806		
AT_1	0.659		
AT_3	0.639		

Furthermore, the factor loadings of the observed variables are all > 0.3, indicating that the correlation between the observed variables and the factors meets the minimum requirement. Moreover, if the study wishes to select variables with high factor loadings, indicating higher quality with factor loading > 0.5, then the observed variables and factors still meet this requirement. Therefore, all of them are retained (Sarstedt et al., 2021). After assessing the quality of the observed variables, the study proceeded to evaluate the reliability of the scales using two main indices: Cronbach’s Alpha ( $\alpha$ ) and Composite Reliability (CR). The analysis results are clearly presented in Table 5 below:

Table 5. Scale reliability results

	Cronbach’s Alpha ( $\alpha$ )	rho_A	Composite Reliability (CR)	Average Variance Extracted (AVE)
<b>Attitude (AT)</b>	0.797	0.821	0.880	0.710
<b>Intention to Use (IU)</b>	0.798	0.830	0.867	0.622
<b>Perceived Ease of Use (PEU)</b>	0.896	0.902	0.923	0.706
<b>Personal Innovativeness (PI)</b>	0.801	0.813	0.870	0.626
<b>Perceived Usefulness (PU)</b>	0.856	0.868	0.903	0.699

The research model proposed by the study comprises 5 main concepts that are measured and evaluated. The analysis results of Cronbach’s Alpha coefficients ( $\alpha$ ) via SmartPLS 3.0 software are detailed in Table 5. Based on the results, it is evident that all factors yield reliable outcomes with Cronbach’s Alpha coefficients ( $\alpha$ ) greater than 0.7. Specifically, the lowest Cronbach’s Alpha coefficient belongs to the Attitude scale (0.797) and the highest belongs to the Perceived Ease of Use scale (0.896). All factors meet the evaluation criteria according to Sarstedt et al. (2021) for Cronbach’s Alpha. Specifically, the

Cronbach’s Alpha ( $\alpha$ ) coefficients of the remaining scales are Intention to Use (0.798), Personal Innovativeness (0.801), and Perceived Usefulness (0.856). Therefore, the reliability of the scales AT, IU, PEU, PI, PU tested on SmartPLS 3.0 is deemed appropriate. According to Henseler et al. (2009), to achieve the highest internal reliability level in research, the Composite Reliability (CR) should be at least 0.70. This threshold has been used in previous studies such as those by Sarstedt et al. (2021) and Bagozzi and Yi (1988). The results of the CR indices for the scales are shown in Table 5 as follows: Attitude (AT) = 0.880, Intention to Use (IU) = 0.867, Perceived Ease of Use (PEU) = 0.923, Personal Innovativeness (PI) = 0.870, Perceived Usefulness (PU) = 0.903. From these results, it can be observed that the CR indices for each construct are all greater than 0.7, meeting the criteria and demonstrating good internal reliability among the scales.

Additionally, the study also measured the reliability of the scales based on the values of AVE (Average Variance Extracted coefficient). According to Sarstedt et al. (2021), the convergent validity of a scale is considered good when AVE  $\geq$  0.5. As per the analysis results in Table 5, the AVE for all scales is greater than 0.5. Therefore, the reliability of the measurement model based on this coefficient is established. Among them, Attitude is the scale that achieves the best convergence of all scales with AVE = 0.710. The AVE values of the other scales are as follows: Intention to Use (IU) = 0.622, Perceived Ease of Use (PEU) = 0.706, Personal Innovativeness (PI) = 0.626, Perceived Usefulness (PU) = 0.699.

Figure 2 visually presents the results of PLS-SEM analysis regarding the adequacy of the research data and the impacts of path coefficients. Furthermore, this analysis identified the direct and indirect relationships between latent variables. To elucidate the specific results of the PLS-SEM model and assess the level of significance, the study conducted parameter analyses such as T-values, significance levels (P), and Original Sample (O) using non-parametric bootstrapping methods. In this study, the non-parametric bootstrapping technique was tested by iterating 1000 times to ensure the requirements for testing the linear structural model. The study constructed and tested twelve direct hypotheses along with four indirect hypotheses.

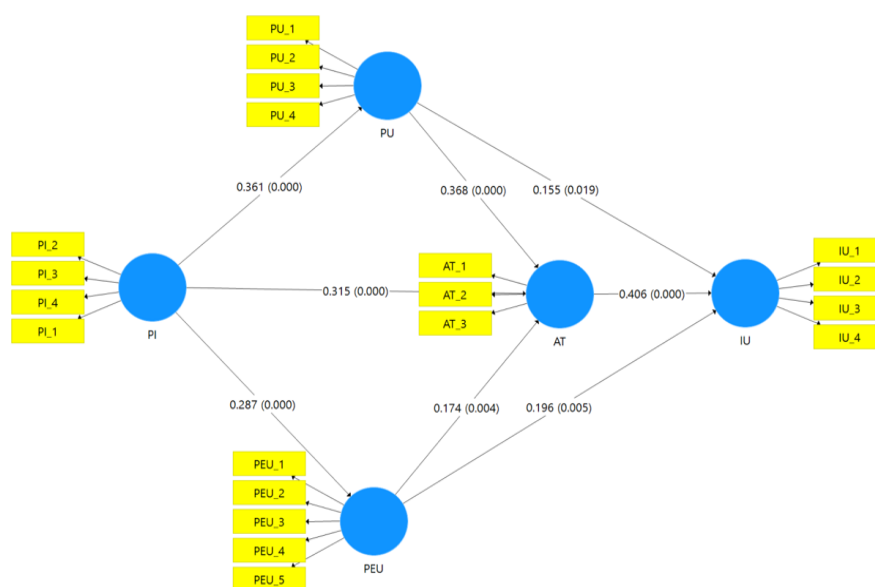


Figure 2. The PLS-SEM tested model

Table 6 presents the results of testing the proposed hypotheses, including direct influence hypotheses (H1, H2, H3, H4, H5, H6, H7, H8) and one mediating influence hypothesis (H9). In this section, the study focuses on evaluation through two factors: (1) Original Sample (O) (standardized regression weights) and (2) Significance Level (P) (comparison with the significance level of 0.05 -  $P < 0.05$  or statistically significant at 95% confidence level).

Table 6. Results of testing the direct hypotheses in the research

Hypothesized path	Original Sample (O)	T Statistics	P Values	Hypothesis validation
H1: Personal Innovativeness → Perceived Usefulness	0.361	6.319	0.000	Supported
H2: Personal Innovativeness → Attitude	0.315	4.982	0.000	Supported
H3: Personal Innovativeness → Perceived Ease of Use	0.287	4.200	0.000	Supported
H4: Perceived Usefulness → Attitude	0.368	4.930	0.000	Supported
H5: Perceived Ease of Use → Attitude	0.174	2.877	0.004	Supported
H6: Attitude → Intention To Use TMAs	0.406	5.007	0.000	Supported
H7: Perceived Usefulness → Intention To Use TMAs	0.155	2.351	0.019	Supported
H8: Perceived Ease of Use → Intention To Use TMAs	0.196	2.798	0.005	Supported
H9: Personal Innovativeness → Attitude → Intention To Use TMAs	0.128	2.982	0.003	Supported

### Discussion and implications

Nowadays, amidst the storm of the Fourth Industrial Revolution, smart mobile devices and applications have become extremely familiar concepts deeply ingrained in human life. Through Internet connectivity along with smart mobile devices, people are enabled to connect and share with each other in all aspects of life and society. In the current tourism



sector, following the crisis caused by the Covid-19 pandemic, new tourism trends have begun to emerge as an essential need for people. Smart tourism trends, touchless tourism, have begun to develop and gradually replace the traditional tourism trends of the past. Especially in the era of technological advancement, the operation and use of travel services through a smart application on the phone have become easier than ever. The use of travel apps is increasingly seen as a prominent consumer behavior trend, demonstrating real utility by enhancing experiences, saving time, and saving costs for users by providing “smart” experiences, offering smart travel services, conveniences for travelers; thereby creating value for tourism businesses and destinations. In this study, the study’s purpose is to examine the intention to use TMAs (Tourism Mobile Applications) among Generation Z in Ho Chi Minh City under the influence of personal innovativeness through perceived usefulness, perceived ease of use, and attitude. This research aims to contribute to a better understanding of the role of personal innovativeness in the intention to use TMAs by exploring the factors related to this relationship.

The study was conducted by applying two theories, including TAM (Technology Acceptance Model) and TR (Theory of Technology Readiness), along with various analytical techniques to test the validity and assess the reliability of the proposed hypotheses. The study proposed nine hypotheses in this study. The research results indicated that all nine hypotheses were accepted as valid and statistically significant in the study. Through the results, this study has identified that personal innovativeness has a positive influence on the perceived usefulness, perceived ease of use, and attitude of Generation Z towards the intention to use TMAs (Tourism Mobile Applications). Furthermore, when considering the Generation Z’s attitude towards the intention to use TMAs, the results were also evaluated positively; perceived usefulness and perceived ease of use were found to have a positive and significant impact on attitude. Additionally, perceived usefulness and perceived ease of use directly and positively influence the intention to use TMAs of Generation Z.

Moreover, regarding hypothesis 9, the study examined the mediating role of attitude in the relationship between personal innovativeness and intention to use TMAs. Through PLS-SEM analysis, it was revealed that the mediating role of attitude in the relationship between personal innovativeness and intention to use TMAs is valid and statistically significant for the study.

Online travel has been applied in many places, especially when the Covid 19 pandemic has given birth to many experiential travel activities entirely on the internet. However, online tourism is limited in terms of cooperation between components in the tourism industry and has not created a rich and effective seamless experience for tourists. To truly develop sustainably, it is necessary to connect key players in the tourism industry based on technology, to create a more effective environment for data collection and processing, improving user experience. Notable solutions proposed by the study include: enhancing the use of virtual reality (VR) and augmented reality (AR) elements to create novelty for applications, encouraging user involvement and participation in application development, optimizing utility for applications, emphasizing personalization and enhancing security for users, designing user-friendly interfaces with relevant and engaging content, promoting and accessing through social media platforms and leveraging the influence of influencers, and many other solutions specifically mentioned in the study’s study to enhance the intention to use TMAs among Generation Z (including in Ho Chi Minh City). Understanding the behavioral characteristics of the Generation Z customer group is extremely important. Generation Z individuals tend to personalize and react intuitively to travel experiences. This poses a challenge for developing and providing flexible services and products that can be adjusted to meet the diverse needs of customers. There is a need to create new travel applications focused on enhancing the customer experience through advanced technologies such as artificial intelligence (AI), virtual travel assistants, and interactive experiences.

These features can be designed to provide customers with personalized and unique experiences, tailored to their specific interests and needs. For example, AI technology can be used to generate travel suggestions and advice based on customers’ travel history and personal preferences. Virtual travel assistants can assist customers in booking accommodations, searching for travel information, and even providing real-time travel guidance. Moreover, enhancing outreach and promotion on social media platforms is crucial. Understanding the preferences and usage of social media by Generation Z is extremely important. Generation Z was born and raised in the digital age, so using social media apps is not only part of their daily lives but also a way to interact and connect with the world around them. Currently, social media platforms such as Facebook, Zalo, and TikTok are considered favorite apps among Generation Z. Therefore, utilizing these platforms to reach and promote travel applications is a smart strategy. Through social media platforms, the focus can be on highlighting the standout features of the travel app, tailored to the needs and interests of today’s youth. For example, creating short advertising videos on TikTok to introduce the app’s special features or using Facebook to share interesting travel experiences from actual users. This approach will attract the attention of young people and enhance their intention to use travel apps when they plan to travel. Additionally, reaching out on social media platforms helps create a strong interactive environment and connection between travel businesses and customers, thereby fostering close relationships and loyalty from customers. Finally, to promote development and create a smart tourism ecosystem, close collaboration is needed among relevant parties such as government agencies, app developers, tourism businesses, suppliers, and destination managers. This will help connect these entities with tourists through travel apps, creating a smart and convenient tourism environment. By integrating services and utilities into a smart tourism system, businesses and app developers can offer customers a comprehensive and attractive travel experience. Customers will have quick and convenient access to information and services, from searching for information to payment and booking. Specially, Vietnam’s Ministry of Information and Communications has taken an important step in protecting consumer rights with the issuance of new regulations to strengthen supervision of Information and Communications Technology (ICT) products, ensure technology products entering the Vietnamese market meet strict standards on safety and compliance. However, there are some difficulties in the process of digital transformation in tourism such as lack of modern technology, unsynchronized infrastructure, and specialized human resources. The application of technology is mainly paid for by tourism businesses themselves. Therefore, the ability of tourism businesses to access smart tourism is still limited and modest.

## LIMITATION AND FUTURE RESEARCH

This study targets Generation Z living in Ho Chi Minh City. However, during the survey sampling process, participants may not fully represent all Generation Z individuals living in Ho Chi Minh City, Vietnam. Therefore, the research sample may not be entirely representative, and consequently, the research results may still lack objectivity. Moreover, the research is limited by sample size. Initially, 318 samples were collected, but 8 samples were excluded due to errors or lack of reliability, resulting in only 310 valid samples. Therefore, the study proposes future research directions including studying the differences in TMAs usage behavior of Generation Z tourists compared to other generations. Additionally, expanding the scope of sample collection, possibly across multiple provinces and cities or regions, to achieve greater objectivity and representativeness. Moreover, the intention to use TMAs in tourism by Generation Z may be influenced by various factors. In this research, the study only focuses on analyzing 4 factors: personal innovativeness, perceived usefulness, perceived ease of use, and attitude. Therefore, in the future, the study proposes conducting further research to examine additional factors in the model such as user optimism, electronic word-of-mouth (eWOM), users' technology acceptance, and other additional factors. Due to time constraints in conducting the research, the survey was only conducted online via Google Forms, which may lead to difficulty in controlling the content of responses, which may be somewhat subjective. Therefore, in the future, the study suggests that if possible, consider conducting direct interviews to ensure better-controlled data collection and higher reliability to serve the research.

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