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The effect of tourists' technology adoption propensity on the acceptance of smart tourism apps

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ABSTRACT

STA are becoming popular as tourists' increasing relies on mobile devices in their trip to explore the destination. Therefore, the adoption of STA is crucial to the development of smart tourism. Extant literature mainly focuses on the application of different technology acceptance models. This study explores the impact of tourists' attitude about technology on their intention to use STA. The technology adoption propensity (TAP) scale was used to measure the technology readiness of tourists in this study. A survey with a structured questionnaire was used to collect data in this study. The respondents were asked to study the introduction of a STA similar to those displayed on an App store and then complete the questionnaire. A total of 355 valid questionnaires were collected. The data were analyzed using the Partial least-squares method (PLS). Since TAP is a multi-dimensional scale, a second-order analysis was performed. From the TAP measures, tourists generally believe that technology changes and improve their daily lives, making their lives easier. However, technology is a double-edged sword, which will bring some adverse effects while improving the tourist's living standard. The result of the path analysis reveals that all the hypotheses proposed in this study are valid. The TAP of tourists has a positive influence on usage intention with trust and curiosity as two partial mediating variables. TAP has a stronger influence on the tourists' curiosity than trust, and curiosity has a stronger effect on tourists' intentions to use STA than trust. Tourists with higher TAP will plead to increased curiosity about STA, that will prompt them to try, understand, and continue using the STA. The higher the tourists' trust in the STA, the more willing they would choose and use STA.

Keywords: *Smart tourism; Smart tourism apps; Technology Adoption Propensity*

***JEL codes*:** Z31

1. INTRODUCTION

Smart has been a catchword that describes the development driven by edging science and technology. The progress depends on technological communication means of connecting and exchanging important data, sensors, knowledge and information, such as the Internet of Things, near field communication (Vasavada & Padhiyar, 2016). Vasavada and Padhiyar (2016) define smart tourism as tourism, with the support of destination, using the information generated by physical infrastructure, government relations and social resources, transforming information into destination service experience through advanced technology, paying full attention to the sustainable development of destination, service efficiency and accumulating experience to prevent risks. It is an omnipresent tourism information service during travelling, providing specific travel information based on the specific requirements of tourists (Li, Y., Hu, C., Huang, C., & Duan, 2017).

Smart tourism experience is rich and efficient in meaning. In the process of creating smart tourism, tourists not only consume services but also create, annotate or strenghthen information, which forms the basis of experience, such as uploading photos in social media, sharing travel strategies in blogs, evaluating the consumption of accommodation and catering, etc. Tourists can also be value creators and regulators in tourism.

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Smart tourism is no longer "one person" tourism; it is not only a meaningful and sustainable link between tourists and destinations but also a resource sharing and value creation between tourists and stakeholders.

Smart tourism App (STA) is a mobile application that integrates various functions, forecasting and meeting tourists' need, including recommending travel routes and guiding tourists according to their preferences to reach the destinations and scenic spots around, discover new things around them, and establish relationships and satisfy real-time demand of tourists. STA are used in all stages of tourism consumption, the impact on travel decision-making and behavior is growing. With the maturity of mobile network infrastructure, mobile applications have become an emerging industry with business opportunities (Hoehle & Venkatesh, 2015). However, not all applications are highly accepted and used (Deloitte, 2012). The top 10% of applications account for 80% of total downloads, while only 25% of downloads are used for the second time (Dredge, 2011). If STA is considered a new business opportunity, it is crucial for enterprises to understand why tourists adopt this technology to create or upgrade produces to attract more users.

At present, most of the studies mainly focus on the impact of the degree of scientific and technological awareness on the intention to use, and lack in relevant research on the trend of scientific and technological adoption in tourism. Extant literature in technology acceptance mostly using models such as technology acceptance model by Davis (1989), the Unified theory of acceptance and use of technology by Venkatesh, Morris and Davis (2003) or other custom models created to suit specific research contexts. Little is studied on the influence of tourists' attitude on technology on their technology acceptance behavior. The tourists' attitude on technology could be measured by Technology adoption propensity (TAP). TAP is an efficient way to measure the possibility of consumers adopting a variety of new high-tech products and services. Therefore, the objective of this study is to explore whether TAP can affect tourists' intention to use STA, and the associated mediating variables.

2. LITERATURE REVIEW

Technology Adoption Propensity

Maskus (2003) defines technology as " the information necessary to achieve a certain production outcome from a particular means of combining or processing selected inputs which include production processes, intra-firm organizational structures, management techniques, and means of finance, marketing methods or any of its combination." Technology may affect different cognitive and emotional structures (such as interesting, happy, anxious, frustrated and confused. The consumers' attitude towards technology was first measured using the Technology readiness index (TRI) developed by Parasuraman (2000). TRI consists of 36 items in four dimensions: optimism, innovationess, discomfort, and insecurity. TRI is a lengthy one and is difficult to manage in practice (Stanton, Sinar, Balzer, & Smith, 2002). TRI's reference to specific technologies limits its use to measure overall scientific and technology readiness.

Ratchford and Barnhart (2012) propose a new scale called technology adoption propensity (TAP) to measures consumers' possibility to adopt products and services of various new technologies in a more efficient way. TAP is much more compact with only 14 items in four dimensions: Optimism, proficiency, dependence, and vulnerability. Optimism is a 'belief that technology provides increased control and flexibility in life.' Proficiency refers to 'confidence in one's ability to quickly and easily learn to use new technologies, as well as a sense of being technology competent.' Dependence is 'a sense of being overly dependent on and a feeling of being enslaved by technology.' Lastly, vulnerability is 'a belief that technology increases one's chances of being taken advantage of by criminals or firms' (Ratchford and Barnhart, 2012).

Compared with longer questionnaires, shorter questionnaires tend to yield more realistic answers and avoid respondents 'reaction fatigue (Narayana, 1977). Parasraman (2015) has updated TRI to TRI 2.0 that has only 16 items with the original dimensions. However, by comparing TAP with TRI 2.0, the items in TAP, such as those in the dependence and vulnerability dimension, are more relevant to the addiction and privacy issues that are the concerns of the tourists. Based on the reasons mentioned above, this study uses TAP to measure tourists' scientific and technological awareness. Although TAP is not widely used, as a measure on consumers' attitude towards technology, and similar scales like TRI has demonstrated that consumers' attitude towards technology can influence their behavior intention, this study put forward the following hypothesis:

H1: TAP has a positive impact on tourists' adoption of STA.

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Trust

Trust is a prerequisite for social behavior. In tourism, trust can lead to confidence of tourists in hotels, airlines, travel agencies, etc. Trust has become more important in high-tech environments (Fukuyama, 1996) and has been a significant predictor of technology use (Mcknight & Chervany, 2001), playing a crucial role in building consumer willingness to adopt technology.

Albarracin n, D., Johnson, B. T., Fishbein (2001) asserted that behavioral intention is the premise of a particular individual's behavior. Individuals' knowledge of certain things or behaviors leads them to believe that certain behaviors can be associated with specific outcomes, and their attitudes and opinions can influence their behavior. In this study, based on the same logic, tourists' knowledge of science and technology will affect their trust in new technology, and then affect their behavioral intentions to use smart tourism applications.

Whether in the environment of e-commerce, high-tech or hotel tourism, a large number of studies agree that trust has a significant relationship with personal behavior intention. For instance, trust will affect the willingness to purchase of intangible products/services (Grewal, Gotlieb and Marmorstein, 1994). Trust can reduce consumers' perceived risk, and have a positive influence on tourists' behavior in the use of technology (Lee & Song, 2013). Sparks and Browning (2011) has found that trust can influence tourists' intention of booking a hotel room. Few studies attempt to explain how the TAP affects trust, thereby affecting the intention of tourists to accept new technologies such as smart tourism applications. Based on the reasoning presented in this study, we hypothesized the followings:

H2: TAP has a positive impact on the trust of tourists.

H3: Trust has a positive impact on the intention of using STA

Curiosity

Curiosity is an advance-oriented state of motivation related to exploration (Kashdan & Silvia, 2012), which guides you to explore your own environment, solve uncertainty, make novelty known, and is a powerful motivation for action. In tourism, curiosity is also the motive of tourist travelling to destinations. Mehmetoglu (2012) examined whether external or internal factors have 、a direct impact on people's interest in leisure vacation. The results of the curiosity model show that cognitive curiosity has a significant and positive impact on people's interest in vacation. Okazaki, Navarro, Mukherji, and Plangger (2018) suggest that highly curious consumers may be more inclined to scan QR codes in an advertisement.

In marketing, software and communication fields, curiosity is generally regarded as the source of intrinsic motivation (Moon and Kim 2001, Huang,M.H 2003, Shiau and Wu 2013). Items in TAP's dimension are either positive or negative issues that motivate or inhibit the tourists to use new technologies. Tourists with high curiosity may be more inclined to think that the smart tourism application is interesting, thus making them more likely to use the application. Given the above, the following hypotheses were proposed in this study:

H4: TAP have a positive impact on tourists' curiosity.

H5: Tourist' curiosity has a positive impact on the intention of using STA.

3. METHODS

This study proposes the following research model, as shown in Figure 1, from the formulated hypotheses. TAP is the independent variable that will affect tourists' intention to use STA directly (H1) or indirectly through two mediating variables, trust and curiosity.

This study collects data through a survey using a structured questionnaire. The questionnaire consists of three main parts. The first part is about reading materials that briefly summarizes the essential functions and characteristics of the STA that was designed based on the features critical to the success of smart tourism. The reading material was presented in a style that consumers would usually read in the App store. Since currently there is no STA contained all the functions required, simulated screens are produced using parts of the screen taken from existing travel apps that provide a specific function required in smart tourism. The operation of the STA was explained to the respondents face to face in advance before they fill in the questionnaire. The second part consists of the scale for the variables. The TAP measurement scale is adopted from Ratchford and Barnhart (2012). The items for trust is taken from Cheng and Loi (2014). The scale for curiosity is adopted from

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Litman and Silvia (2006) and Mehmetoglu (2012). Finally, the items for usage intention is adopted from Cheng and Loi (2014) and Nelson, Kuo, Bishop and Goodman (2012). All the items in this study were measured by Likert Scale seven-point scale based on " disagree 1" and " agree 7". The third part is simple demographics related questions. There is a total of five questions about the age, gender, education, nationality, and preferred mode of travel (independent travel or group travel) of the respondents.

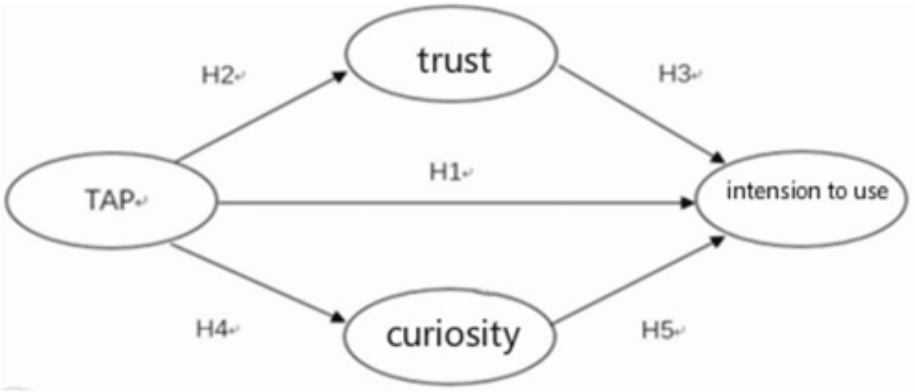

Figure 1. Research Model'

According to SOHU China report, (2017). China smartphone utilization rate reaches 74%. It can be predicted that a substantial amount of users of STA in the future will be Chinese tourists. The questionnaire was distributed in Shenzhen and Macao. Shenzhen is the first special economic zone established in China. It is the youngest city in China, which has convenient information exchange and high usage of smartphones and the Internet. The main reason for choosing Shenzhen is that the majority of young people travel to Shenzhen, and most of the respondents will use smartphones, which makes it easier for the respondents understand the information provided in the reading material. The service industry is the most prominent in Macau, including tourism, hotel industry, and gambling industry which are the pillar industries of Macau. There are many festivals in Macao every year. Tourists choose Macau as their destination come from all over the country. The STA presented in this study is to facilitate tourists to plan and guide before and during tourism. The respondents may better appreciate the functions and characteristics of the STA.

In this study, convenience sampling was used. In the study of Grissemann and Stokburger-Sauer (2012), the convenience sampling method was proved to be effective and reliable. Paper questionnaires are distributed to passerby tourists in well-known tourist attractions, such as Shenzhen Bay Park, Window of the World, and the Ruins of St. Paul the city center, the City Hall, The Venetian Resort Entrance in Macao.

4. ANALYSIS AND RESULTS

A total of 352 valid questionnaires were received, with an effective recovery rate of 99.2%. The subjects of the study are Chinese tourists. From table 1, the respondents consist of 155 males, accounting for 44% of the total respondents, and 197 females, accounting for 56% of the total respondents. The majority of the respondents were young people aged between 18 and 35 (81%). Most of the respondents preferred to independent travel, while a small number of respondents expressed their preference for group travel. A majority of the respondents (82.4%) had received higher education with a university degree.

Anderson and Gerbing (1988) suggested that a two-stage analysis with measurement model analysis and structural model analysis carried out sequentially in path analysis. SmartPLS v.3 was used for the analysis since the research focus on building a predictive model, and the reporting facility is comprehensive and easy to use. The result of the measurement model test are shown in Table 2.

Cronbach's α coefficient should be greater than or equal to 0.7. All the variables have an α greater than 0.7, indicating that the data has a high consistency. The composite reliability (CR) value should be higher than 0.60, and a value between 0.70 and 0.90 is considered satisfactory in more advanced research stages (Nunnally & Bernstein, 1994). It can be found that the CR of all the variables exceeds the value of 0.70; the reliability of the scales are satisfactory.

All the AVE values are greater than 0.50, indicating that the convergent validity is satisfied. The discriminant validity was tested using Fornell and Larcker (1981) criterion. The result is shown in Table 3. The average

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variance extracted (AVE) of each variable is greater than the highest square value of the variable and any other variable. Therefore, discriminant validity is satisfied.

Table 1. Respondents' demographic Profile (N = 352).

Variable	Category	Frequency	Percent	Cumulative percent
Gender	Male	155	44	44
	Female	197	56	56
	Total	352	100	100
Age	18-25	175	49.7	49.7
	26-35	110	31.3	81.0
	36-45	47	13.4	94.3
	46-55	19	5.4	9.7
	56-55	1	0.3	100
	Total	352	100	
Education	High school or below	12	3.4	3.4
	College	50	14.2	17.6
	Bachelor's degree or higher	210	59.7	77.3
	Total	352	100	
Tourism way	Independent travel	316	89.8	89.8
	Group travel	36	10.2	100

Table 2. Variable Reliability and Validity Analysis

Variable	Item	Cronbach's α	CR	AVE
Trust	T1			
	T2	0.894	0.927	0.76
	T3			
Curiosity	T4			
	C1			
	C2			
	C3	0.923	0.940	0.723
	C4			
	C5			
	C6			
Use Intention	I1			
	I2	0.920	0.944	0.807
	I3			
	I4			
Optimism	TAP1			
	TAP2	0.912	0.938	0.792
	TAP3			
	TAP4			
Proficiency	TAP5			
	TAP6			
	TAP7	0.852	0.9	0.693
	TAP8			
Dependence	TAP9			
	TAP10	0.792	0.877	0.704
	TAP11			
Vulnerability	TAP12			
	TAP13	0.797	0.881	0.712
	TAP14			

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Table 3 . Discriminant Validity Analysis.

Variables	Curiosity	Dependence	Use Intention	Optimism	Proficiency	TAP	Trust	Vulnerability
Curiosity	0.850							
Dependene	0.506	0.839						
Use Intention	0.846	0.473	0.899					
Optimism	0.638	0.398	0.694	0.890				
Proficiency	0.560	0.449	0.579	0.625	0.833			
TAP	0.712	0.693	0.735	0.859	0.837	0.665		
Trust	0.816	0.464	0.795	0.604	0.525	0.665	0.872	
Vulnerability	0.454	0.538	0.445	0.375	0.387	0.654	0.411	0.844

Variance Inflation Factor (VIF) was calculated to test whether the indicators have high multicollinearity. The VIF value of all indicators is less than 3, indicating that all indicators of the variables do not have significant multicollinearity effect. Since the test of the measurement model is satisfactory, the next step is to evaluate the structural model. The procedure recommendation by Hair, et al. (2017) was followed to carry out a second-order analysis on TAP and incorporate the results into the final model. The result of the structural model analysis is shown in Table 5. The result of the second-order analysis of the TAP variable is shown in Figure 2. The final structural model is shown in Figure 3.

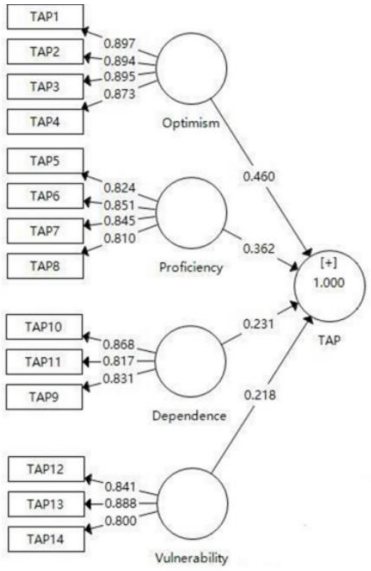

Figure 2. First order model analysis results

The R^2 value of dependent variables and the level of significance of path coefficients are the main evaluation criteria of structural models. The R^2 value in the structural model is considered as high, moderate, and weak at 0.75, 0.5, and 0.25, respectively. The R^2 values are shown within the circle in Figure 3 for respective variables.

Curiosity was positively affected by the tendency of technology adoption, and the model explained curiosity by 50.7% (R^2=0.507). Trust is affected by TAP, and the variance explained of trust is 44.2% (R^2=0.442). The usage intention is affected by the three variables: TAP, trust and curiosity, and the explanatory degree of the model for use intention is 77.2% (R^2=0.772).

The salience of each path can be assessed using the Bootstrapping step. Bootstrap repeated the estimate 5000 times with 95% confidence. The following table 5 shows whether the hypotheses are supported.

5. CONCLUSIONS

The purpose of this study is to explore the influence of TAP of tourists to adopt STA with relevant mediating variables. The research results show that TAP has a positive influence affecting tourists' intention to use STA. That is to say, the higher the propensity of technology adoption, the greater the intention of using STA. Meanwhile, respondents generally believe that technological changes and improvements in their daily lives make their lives more convenient. However, technology is a double-edged sword. While technology improves

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people's living standards, it will also bring some adverse effects. For instance, social network hinders people's face-to-face communication, and criminals use the network to cheat.

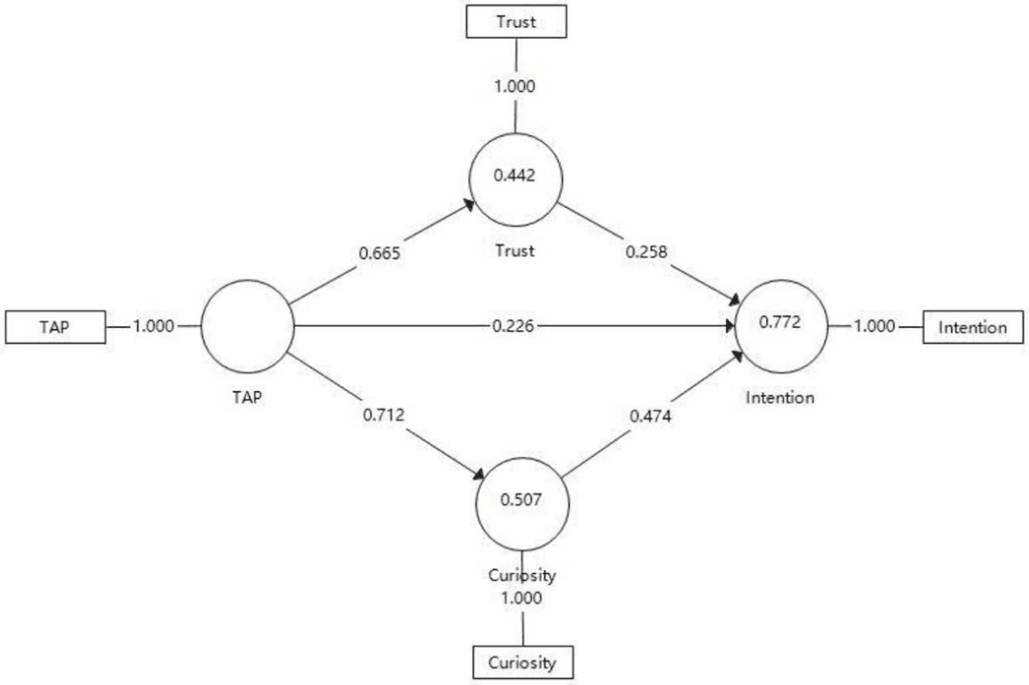

Figure3. Second order model analysis results

Table 5. Path Analysis of Research Model and Research Hypothesis Results

Hypotheses	Path	Path Coefficients	T-value	P-value	Results
H1	TAP -> Use Intention	0.226	24.311	0.0000	supported
H2	TAP ->Trust	0.665	20.187	0.0000	supported
H3	Trust -> Use Intention	0.258	4.409	0.0000	supported
H4	TAP -> Curiosity	0.712	22.760	0.0000	supported
H5	Curiosity->Use Intention	0.474	8.203	0.0000	supported

TAP positively affected trust and curiosity, and influences the intention of use through intermediary effect. Tourists with higher TAP have stronger trust and curiosity in STA. If visitors already have a certain knowledge of STA or technology, the higher their trust in STA, the more comfortable they will choose and use the STA. Tourists with higher TAP tend to have more curiosity about technology, which will encourage them to try, understand or use STA to satisfy their curiosity.

Tourists' curiosity is more influenced by TAP than trust. From the result of path analysis, the path coefficient from TAP to curiosity is 0.712, and the path coefficient from technology adoption propensity to trust is 0.665. Tourists' curiosity has a stronger impact on their intention to use STA than their trust. From the result of path coefficient, the path coefficient from curiosity to intention to use is 0.474, and the path coefficient from trust to intention to use is 0.258. Tourists' knowledge of technology and STA will encourage them to use technology products, such as product and equipment release conference on the market, mostly to introduce the functions and performance of new products. Novelty functions can win the audience's attention. The degree of trust in science and technology is more than a long process of accumulation. The results show that trust and curiosity have mediating effects on tourists' intention to use STA, which confirms that curiosity and trust play a vital role in building consumers' willingness to adopt science and technology in the tourism industry. Meanwhile, the study also confirms that tourists' awareness will influence tourists' trust and curiosity.

The study also contributes to the literature of TAP by confirming that TAP proposed by Ratchford and Barnhart's (2012) can be applied to the study on the adoption of STA by tourists. Secondly, the study provides support on the validity of TAP as a scale that measures who measures users' scientific and technological awareness.

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The study has certain limitations that may be addressed by future research. A parsimony model was built in this study to test the effect of TAP on behavior intention. Only two variables, curiosity, and trust, were selected in this initial work. Other factors such as perceived value and hedonic effects may be incorporated in future studies to enrich the current model. Also, only Chinese respondents were involved in the study that excluded cultural effects that may present. This limits the possibility to generalize the findings and future cross-cultural studies can address this.

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