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ORIGINAL ARTICLE

Factors enhancing independent tourists' experience through convergence of smartphone-based services and information searching

Guozhong Li[1] · Joung-Hae Seo[2] · Eun-Mi Park[2]

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Abstract
The aim of the present study is to identify influential factors of travel intention under the context of highly developed IT society today. Due to the development of IT and diversified ways of technology convergence, individual travelers become highly efficient in travel-related information processing. As predicted, the results of both Korean and Chinese samples show that acquaintance recommendation, autonomy, relatedness, and technology self-efficacy are significantly related with the travel information acquisition and travel intention. In this study, smartPLS, which is widely used in social science, was used. PLS is a useful analytical tool for determining causality between variables. The present study will make practical contributions by enhancing the accuracy of travel recommendation services from the perspective of technology convergence. The results of this study are expected to provide guidelines for travel-related companies to develop personalization and customization services through big data and artificial intelligence techniques when they want to design travel recommendation systems.

Keywords autonomy · relatedness · travel intention · convergence

1 Introduction

Digital transformation has expanded the effects of informationization and intellectualization based on internet and PC, which has drawn the attention of many researchers [1]. DNA is the dominant power of digital transformation [2].

The proliferation of smartphone provided the users with abundant information produced by SNS. Apart from the original functions of calling and texting, smartphone provides abundant services such as GPS and recommendation services for restaurants and travel destinations to people. The development of technology such as deep learning, machine learning, big data, IOT, and clouding has seen the trend of innovation acceleration [3, 4]. SNS plays a role of window by sharing diversified information and forming public opinions [5]. The emergence of smartphone and wide application of big data have made personalization and intellectualization possible, and this also has boosted the relative system development.

Travel is regarded as the most popular way of relaxation that prevents people from burning out from a tight life pattern. More and more people choose overseas travel instead of domestic travel. The fever of overseas traveling is still strong in both China and Korea traveling markets. The travelers feel they get more healing from overseas traveling than from domestic traveling because they have the opportunity to experience foreign culture, foods, and diversified fun things.

To relish the traveling, travelers today must master some basic skills via smartphone. These skills make the traveler smart enough to deal with all problems. It is possible for travelers to maximize the convenience and minimize the troubles.

Individual travels are more popular among travel lovers today than group travels. Individual travelers could enjoy more diversified ways of relaxation than group travelers during traveling. Individual travelers could also enjoy more freedom when arranging all the component elements of travel.

According to the investigation by Market Hub Asia 2019 [6], the world economy's growth fluctuated with an average of

✉ Eun-Mi Park
issack38317@naver.com

[1] Department of MSIS, Kunming University of Science and Technology, No. 68, Wenchang Road, 121, Street, Kunming 650093, Yunnan, China

[2] School of Business, Kyungpook National University, 80 Daehakro, Buk-gu, Daegu 41566, South Korea

3% growth during the period of 2011 and 2018. The travel industry's growth also experienced a fluctuation with a 5% increase in 2011 and a 4% increase in 2018.

The volume of global travel booking has reached 1 trillion and 400 billion dollars in 2018; this is a stable growth compared with the volume of 1 trillion and 200 billion dollars in 2015. It is reasonable to predict a growth of 5% in 2021, reaching 1 trillion and 600 billion dollars.

The volume of online booking showed an increase of over 400 billion dollars in 2015 and 638 billion in 2018, and it will possibly surpass 800 billion dollars by 2021.

A wide application of online booking induced the great change in the global travel market. The trend of travel pattern of the Chinese market shows a great difference with the market of the other area.

Travelers from the great part of the areas seldom think about other destinations when they have made a plan. However, the Chinese travelers show an opposite tendency. Online booking systems via mobile devices are very popular among the users in the Asia-Pacific market with China at the center (Fig. 1).

In 2018, China overwhelms the market of online travel via mobile devices followed by India, Japan, Britain, and Germany.

Looking at the tourism industry trends in 2020, the tourism industry is expected to be covered by various ICT technologies [7].

In particular, services that can target customers through personalization and super personalization are expected to emerge. In addition, the newly coined word, Bleese Travel, which combines business trips and leisure, is expected to spread.

The future will also allow the hotel to control all of the room's systems through various recognition technologies such as voice, face, and fingerprint. Chatbot systems and self-check-in are also expected to expand further.

Before start traveling, one can have an indirect experience of accommodation, food, scenery, transportation, culture, etc., via various routes (blogging, YouTube, Facebook, WeChat, Instagram, Weibo, etc.) in advance.

The present study aims to identify the influential factors that might play significant roles for the independent travelers when arranging their travel plan under the environment of technology convergence. Based on the previous literatures, the authors applied two of three factors (autonomy, relatedness) as independent variables; in addition, online friend recommendation and technology efficacy were selected as independent variables.

2 Related work

2.1 Acquaintance recommendation

The social recommender systems predict the utility of items, users, or groups based on the multi-dimensional social environment of a given user. A study performed by Chip (1996) which had shown recommendation from others is a guarantee of keeping the self-image for the information conveyor when conveying negative information [8].

Investigation of customer satisfaction is insufficient to have a thorough prediction or analysis of customer behaviors. NPS (Net Promoter Score) is an important method used to understand customers' behaviors due to its direct connection to businesses' financial performance [9].

Similar with the definition of acquaintance recommendation, NPS is the consequential indicators that are practically used to measure the users of certain products or services of their recommendation intention. During this process, a recommender recommends certain products or service with individual assessments to the acquaintances. The recommenders'

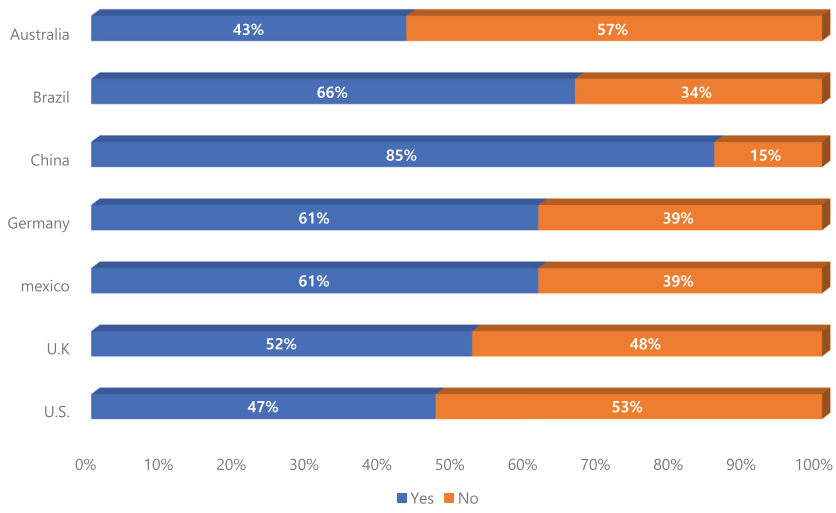

Fig. 1 First visit to a destination

behaviors convey their strong loyalty to these products or services and are closely related with the risks of damaging the personal relationship network.

For example, an alternative that can be chosen in a situation where you are immersed in a game is to purchase an item or recommended by an acquaintance. Acquaintances' messages are one of the influential factors of consumers' purchasing behaviors, and the power of influence is determined by the strength of ties between acquaintances, which can be measured with the dimensions such as intimacy and emotional depth between acquaintances [10].

Strong tie means an intimate emotional relationship between acquaintances which has significant effects on purchasing behaviors [11, 12]. Looking at prior studies on this, Kim et al.'s (2006) study revealed the difference in oral behavior by dividing acquaintances into classmates between close friends and close friends [13]. The results indicate that the WOM intentions of negative messages are higher than that of positive message when acquaintances are in strong tie, whereas no significant results were found when acquaintances are in weak tie.

The results show that evaluative messages have greater effects than factual message when the acquaintances maintain strong ties. Furthermore, the interactive effects were found between the types of negative messages by product attributes and types of acquaintance ties. Lee et al. (2012) clarified the effects of oral messages in accordance with the strength of ties between online acquaintances [14].

Maintaining strong ties, the Facebook acquaintances were found to have higher WOM effects with their evaluative messages; contrastively, the Twitter acquaintances, who keep weak ties, were found to have higher WOM effects with factual messages.

2.2 Autonomy

Self-determination theory (SDT) is an important human motivation that is closely related with behavior. People's behaviors are usually motivated when they are satisfied with three fundamental psychological factors, relatedness, competence, and autonomy [15], and these factors would lead to an increased vitality. Autonomy refers to one's willingness of people with their behaviors to be initiative and decision free from others.

Independent travelers need to deal with various information-related tasks to make highly efficient decisions during the whole journey; thus, they are more dependent on services based on smartphone. The independent travelers with a higher level of autonomy would more likely to take part in independent travels.

In terms of self-regulation, the basic concern is whether a person's actions are based on free will or control by others. Autonomy is defined as individuals' thought or behaviors that are dependent on self-decision not on outside authority or control. Autonomy refers to individuals' judgement in choosing how to behave based on principles, norms, and regulations of their own, which is different from heteronomy that refers to the power or aim from outside [16].

Self-regulation of a professional group that can be controlled on its own without such outside control means that it has external conditions and economic and political power to gauge the autonomy of professionals [17]. People gain benefit when the environment support and meet their self-decision demand [18].

Boggiano et al. (1993) addressed that the atmosphere of autonomy prefers appropriate challenge and verified that self-determination is the source of positive relationship to the behaviors [19]. For instance, people spontaneously participate in dance sports and higher level of autonomy usually arouses more positive behaviors.

2.3 Relatedness

Humans are positive organisms and inherit psychological growth and development power. People endeavor to control challenge from the environment and integrate them into self-concept. Self-determination theory (SDT) supports three basic psychological needs in order to achieve good performance and well-being. These needs can be applied in various environments.

Relatedness is one of the three core psychological factors in self-determination theory: relatedness, competence, and autonomy. Relatedness refers to one's perceptions that he or she has relations with others. People concern their feelings of belongingness in the society.

In a broad sense, more than two objects of thoughts could be figured out uniformly; these objects are related to each other. The objects that exist together in space, those that have similarities, and those that contradict each other can be identified uniformly in terms of coexistence, similar, and imitation, respectively, and are in a coexistence, similar, and mocking relationship. Relationships also include logical relationships between concepts or judgments, time and space relationships, and de facto relationships such as causality.

Relatedness plays an important role in maintaining inner motivation and play an more important role in enhancing inner motivation comparing with efficacy and autonomy [20].

Individuals are reluctant to take actions because the actions motivated by others are not interesting at all. And individuals would not like to take actions until they feel the other people are someone meaningful [21].

Relationship refers to a tendency to pursue and develop strong relationships with others in a social context. Desire for relatedness is related to individuals' feelings that they are closely related to others who they feel important to them in a certain social context [22].

The feeling of satisfaction with relationship desire is requisite in inducing the inner motivation. To promote the relatedness, it is desirable to build an empathic and amicable interpersonal relationship and maintain a stable attachment relationship.

2.4 Technology self-efficacy

Self-efficacy is one's self-perception that he or she is capable of fulfilling a certain task based on special skills [23]. Different from one's competence to achieve certain effects, self-efficacy is related with belief that one can finish a certain task with great effectiveness.

Computer users with a higher level of self-efficacy have a more positive attitude in adoption of m-Health [24]. Higher self-efficacy has found to be positively related with learning motivation and helps students to produce higher performance [25, 26].

The wide spread of smartphone has changed our daily life, people have become so addicted to them. Smartphone users try to find solutions to make life more convenient, and self-efficacy plays an important role in adoption of various functions provided by smartphone. Travelers have become accustomed to information acquisitions and processing, for instance, transportation, accommodation, and ticket booking, and these help to enhance decision makings.

3 Research method and hyphothesis

3.1 Research model

The present study seeks to figure out the influential factors of travel intention from the perspective of self-determinant theory (SDT). Acquaintance Recommendation, Autonomy, Relatedness, Technology Self-efficacy are selected as the independent variables and selects travel intention as dependent variable. Travel Information Acquisition as the moderator variable. The study seeks to examine the cause and effect relationships.

Additionally, age and gender are used to test the moderating effects. The research model in the present study are developed as shown in Fig. 2.

Based on the previous research, the authors developed the hypotheses as follows.

Strong tie means an intimate emotional relationship between acquaintances which has significant effects on purchasing behaviors [11, 12]. It revealed the differences of the effects of negative oral message on WOM intention under the environment of acquaintance ties.

The results show that evaluative messages have greater effects than factual message when the acquaintances maintain strong ties. Furthermore, the interactive effects were found between the types of negative messages by product attributes and types of acquaintance ties [13].

Generally, people have high reliability on products or services that are recommended by acquaintances of strong tie and eventually to purchase these products or services.

In case of travel package products and recommendations from acquaintances with similar thoughts, behavioral patterns will have significant effects on travel intention. Based on the above considerations, we come to the following hypotheses.

H1. Acquaintance recommendation (AR) is predicted to have positive effects on travel intention.

Autonomy refers to the self-regulating will that enables people to solve problems by themselves, and it is an opposite concept of heteronomy.

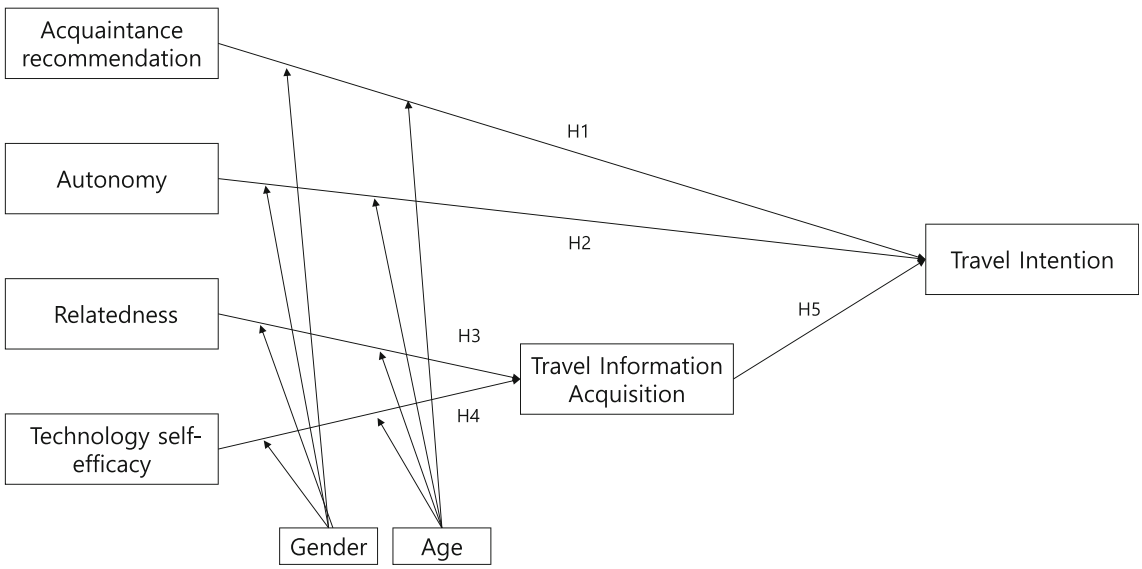

Fig. 2 Research model

People gain benefit when the environment supports and meets their self-decision demand [18]. Boggiano et al. (1993) addressed that the atmosphere of autonomy prefers appropriate challenge and verified that self-determination is the source of positive relationship to the behaviors [19].

Individuals with a higher level of autonomy are more positive with their intention to travel and therefore more likely to take actions. Based on the above considerations, we come to the following hypotheses.

H2. Autonomy is predicted to have positive effects on travel intention.

Relatedness refers to the tendency that people seek for good relationship with others under the social context. Desire for relatedness is related to individuals' feelings that they are closely related to others who they feel important to them in a certain social context [22].

Based on the above considerations, we come to the following hypotheses.

H3. Relatedness is predicted to have positive effects on travel information acquisition (TIA).

Technology self-efficacy refers to the ability to bring a particular task to a greater effect. For example, individuals with a higher level of technology self-efficacy have more positive attitudes towards certain IT devices than those with low level of technology self-efficacy.

Compeau & Higgins (1995) defined computer self-efficacy as a judgment on the ability to use the computer and reported that a person with a higher level of computer self-efficacy has more good feelings and confidence about computer instead of fear, and computers are very useful tools in their daily life and works [27].

On the other hand, Eastin & LoRose (2000) argued that Internet self-efficacy (ISE) and computer self-efficacy (CSE) should be distinguished because Internet self-efficacy is based on computer technology.

Eastin & LoRose (2000) defined Internet self-efficacy as a belief in one's ability to use the Internet. People with low Internet self-efficacy are less likely to perform actions related to accepting and using the Internet in the future than people with higher Internet self-efficacy [28]. This technological self-efficacy is also expected to have a positive impact on the acquisition of information for travel.

Based on the above considerations, we come to the following hypothesis.

H4. Technology self-efficacy (TSE) is predicted to have positive effects on travel information acquisition (TIA).

If you are curious about a product or service, you will search for relevant information. Various information about products and services are obtained through such process.

In general, consumers who are loyal to companies that provide specific products and services are likely to perceive information failures as temporary and infrequent, even if they face information failure [29].

Consumers can no longer be passive recipients but take the initiative and engage in discovering new business opportunities from planning products and services for service providers [30]. This information acquisition is expected to have a positive impact on travel as well. Based on the above considerations, we come to the following hypotheses.

H5. Information acquisition (TIA) is predicted to have positive effects on travel intention (TI).

Based on the previous literature reviews, gender and age will moderate among independent and dependent variables.

UTAUT's research model has validated the effects of adjustments based on gender, age, etc. There are many studies showing that verification has a positive effect. This level of information acquisition and travel intention is likely to vary in accordance of gender and age.

Based on the above considerations, we come to the following hypotheses.

H6. Gender will moderate between TIA and TI.
H7. Age will moderate between TIA and TI.

3.2 Operational definition

Operational definitions used in this study are based on previous researches. The following is a summary of these operational definitions (Table 1).

3.3 Sample

The respondents are smartphone users and have independent travel experiences from China and Korea. The questionnaire surveys were conducted in February 2020, and 250 samples were finally selected among the total 280 distributed samples. The 250 samples were used for statistical analysis.

The respondents are composed of Korean and Chinese with experiences of using smartphone to deal with information (transportation, foods, cultures etc.) during independent travel. The selection of these samples is necessary to reveal the effects of influential factors on travel intentions under the context of convergence of IT and tourism (Table 2).

The results of the demography indicate that the total population includes 114 (45.6%) males and 136 (54.4%) females. The respondents are divided into 5 age groups including 4

Table 1 Operational definition

Variables	Definition	Researchers
Acquaintance recommendation	Technical self-efficacy refers to the ability to bring a particular task to a greater effect.	[8, 11, 12]
Autonomy	Autonomy is defined as individuals' thought or behaviors that are dependent on self-decision not on outside authority or control.	[15, 16, 18]
Relatedness	Relatedness refers to a tendency to pursue and develop strong relationships with others in a social context.	[20–22]
Technology self-efficacy	The user of a special device is confident that he or she is able to bring a particular task to a greater effect.	[23, 25, 26]
Travel information acquisition	Individuals are able to access necessary traveling information via mobile SNS	[29, 30]
Travel intention	Individuals take advantage of various IT devices or communicate with other users which induce them to travel	[29, 30]

respondents under 20 years of age (2.4%), 122 respondents between 20 and 29 years of age (48.8%), 96 respondents between 30 and 39 years of age (38.4%), 22 respondents between 40 and 49 years of age (8.8%), and 6 respondents over 50 years of age (2.4%).

Respondents' education are classified into 5 groups including 103 with university degree (41.2%), 68 with junior college degree (27.2%), the two biggest groups. Staffs are the biggest group with 123 accounting for 49.2%. Fifty-two are professional (20.8%), and 49 students (19.6%).

The sample is divided into 4 groups with monthly earnings including 54 (21.6%) less than 1 million won, 96 (38.4%) respondents' earnings between 200 and 299 million won, and 62 (24.8%) respondents' earnings over 300 million won.

Table 2 Descriptive statistics of respondents

		Frequency	Percent (%)
Gender	Male	114	45.6
	Female	136	54.4
Age	Under 20	4	1.6
	20~29	122	48.8
	30~39	96	38.4
	40~49	22	8.8
	Over 50	6	2.4
Education	High school	12	4.8
	Junior college	68	27.2
	University	103	41.2
	Master degree	47	18.8
	PH.D.	20	8
Job	Student	49	19.6
	Staff	123	49.2
	Self-employed	8	3.2
	Professional	52	20.8
	Others	18	7.2

The analytics indicates that the respondents can afford to pay for spending in independent travel.

One hundred percent of Korean respondents have the experience of using the smartphone to search for travel information, and 143 of 148 have smartphone usage experience.

Sixty-three percent Koreans (63) have over 3 years' experience of using travel information experience, and 27.2% of Chinese (41) have 2~3 years of such experience, 26.35% of Chinese have over 3 years of experience, and 25% (37) have 1~2 years of experience.

One hundred forty-three of the Chinese respondents (97%) show interest on independent travels, and the Korean counterparts show a very close result between group and independent travel (Table 3).

To the Chinese traveler, the order of importance is accommodation, meals, and transportation, whereas to a Korean traveler, the order of importance is as accommodation, transportation, meals, and destination information.

4 Results

To support the hypotheses and the model developed in this study, structural equation modeling (SEM) is applied. SmartPLS 2.0 is a popular tool of SEM, and it is a suitable tool to use or examine theories in the early stage of development [31].

PLS is outstanding in testing the path coefficient and minimizing the error of measurement and the error of prediction.

4.1 Reliability and validity

PLS analysis makes up steps of testing item measurement and constructs. Internal consistency, convergent validity, and discriminant validity are the key to supporting this study [32].

Internal consistency is a measure to test if the several items support the same constructs.

Table 3 Descriptive statistics of respondents for travel

		China		Korea	
		No.	%	No.	%
Information usage experience via smartphone	Yes	143	96.62	102	100
	No	5	3.38	0	0
Experience of travel information usage vis smartphone	6 months	14	9.46	15	14.99
	6 months~1 year	17	11.49	9	8.98
	1~2 years	37	25	9	8.98
	2~3 years	41	27.7	6	6.02
	Over 3 years	39	26.35	63	63.04
Smartphone usage experience	Yes	119	80.41	72	72.01
	No	29	19.59	30	29.99
Travel types (multiple-choice)	Group	61	41.22	84	84.05
	Individual	143	96.62	93	93.02
Critical information in traveling (multiple-choice)	Accommodation	142	95.95	78	78.03
	Transportation	131	88.51	78	78.03
	Map	75	50.68	42	42.02
	Meals	134	90.54	59	59.98
	Shopping	60	40.54	27	27.03
	Destination information	79	53.38	59	59.98

To examine the convergent validity, it is required to use bootstrap function of PLS and analyze the accumulated factors and *T* value. The results of factor loading are greater than 0.5, and all of the *T* values are greater than 1.96, which are acceptable as required in PLS (Table 4).

Composite reliability values are used to support the internal consistency, and the Cronbach's alpha supports reliability. Cronbach's alpha values are required to be greater than 0.7 in PLS [33].

$$\mathrm{CR} = \frac{\left(\sum_i \lambda_{ij}\right)^2}{\left(\sum_i \lambda_{ij}\right)^2 + \left(\sum_i \mathrm{var}\left(\varepsilon_{ij}\right)\right)}$$

λi loadings of indicator i of a latent variable
εi measurement error of indicator i
j flow index across all reflective measurement model

This study uses Cronbach's alpha to verify reliability. Cronbach's alpha is drawn by the following equation [34].

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{n} \sigma_i^2}{\sigma_y^2}\right)$$

k number of indicators assigned to the factor
σ_y^2 variance of the sum of all assigned indicators' scores
σ_i^2 variance of indicator i

The results in this study are found to be significant. All of the AVE values are greater than 0.5 which indicates significance.

$$\mathrm{AVE} = \frac{\left(\sum_i \lambda_i^2\right)}{\left(\sum_i \lambda_i^2\right) + \left(\sum_i \mathrm{var}(\varepsilon_i)\right)}$$

$\lambda^2 i$ squared loadings of indicator i of a latent variable
$\mathrm{var}(\varepsilon i)$ squared measurement error of indicator i

To support the discriminant validity, confirmatory factor analysis is required, and 0.7 is the threshold. The results in this study are found greater than 0.7 [35] (Table 5).

Discriminant validity is tested by comparing the values of the correlation coefficient of all the constructs and the square root values of AVE. According to the results, the smallest square root values of AVE (0.7194) is greater than the constructs' correlation coefficient values of all the constructs [35]. The discriminant validity did not find any problems, and therefore, it is accepted. All the results required in the PLS

Table 4 Discriminant validity analysis

	Factor loading	Composite reliability	AVE	Cronbach's alpha
AU1	0.8024	0.8636	0.5175	0.8095
AU2	0.7749			
AU3	0.7467			
AU4	0.7796			
AU5	0.5624			
AU6	0.6157			
FERE1	0.6528	0.8523	0.662	0.7515
FERE2	0.8818			
FERE3	0.8845			
IF1	0.7487	0.8353	0.5592	0.7374
IF2	0.7239			
IF3	0.7475			
IF4	0.7704			
RE1	0.7994	0.8075	0.6773	0.5248
RE2	0.8458			
SE1	0.7934			
SE2	0.7304	0.8118	0.5201	0.6931
SE3	0.7005			
SE4	0.6534			
TI1	0.7987	0.8666	0.619	0.7949
TI2	0.7738			
TI3	0.7594			
TI4	0.8142			

analysis meet the threshold, and therefore, the PLS analysis supports the developed research model.

The test of hypotheses is conducted by testing the path coefficients of the model, and the bootstrap test is used in the PLS tool.

The R^2 value of travel intention is 52.1%, and the information acquisition value of R^2 is 46.4%, which are greater than the threshold 0.1, which means the research model has very high explanation power [36].

The results of all hypotheses are found significant and all accepted (Table 6; Fig. 3).

4.2 China vs Korea

The results of hypothesis analysis of both Korea and China are as follows.

H2, which represents autonomy which is positively related to TI, was found significant and therefore accepted. H4, which represents the positive relationships between TSE and travel TI, and H5, which represents that TIA is positively related with TI, are accepted.

However, H1, which predicted a positive relation between AR and TI, was not found significant and therefore not supported. H3 was found not supported either.

The results found that Korean smartphone users' information acquisition behaviors have positive effects on travel intention. The smartphone users will be found to have a higher level of travel intention when they are able to acquire travel information more easily. Thus, information acquisition has positive effects on travel intention. However, online friends' recommendation was not significantly related with travel

Table 5 Correlation between latent variables

	AR	AUT	RE	TI	TIA	TSE
AR	0.8136					
AUT	0.2958	0.7194				
RE	0.3683	0.6053	0.8230			
TI	0.4887	0.5423	0.5283	0.7868		
TIA	0.5108	0.5661	0.5625	0.6753	0.7478	
TSE	0.4218	0.7183	0.6314	0.5854	0.6529	0.7212

Table 6 Hypothesis testing

	Path	Coefficient	*T* value	Result
H1	AR -> TI	0.1924	5.0923***	Accept
H2	AUT -> TI	0.2336	5.8313***	Accept
H3	RE -> TIA	0.2499	5.7903***	Accept
H4	TSE -> TIA	0.4951	11.9601***	Accept
H5	TIA -> TI	0.4448	10.2849***	Accept

***$p < 0.001$; **$p < 0.05$; *$p < 0.01$

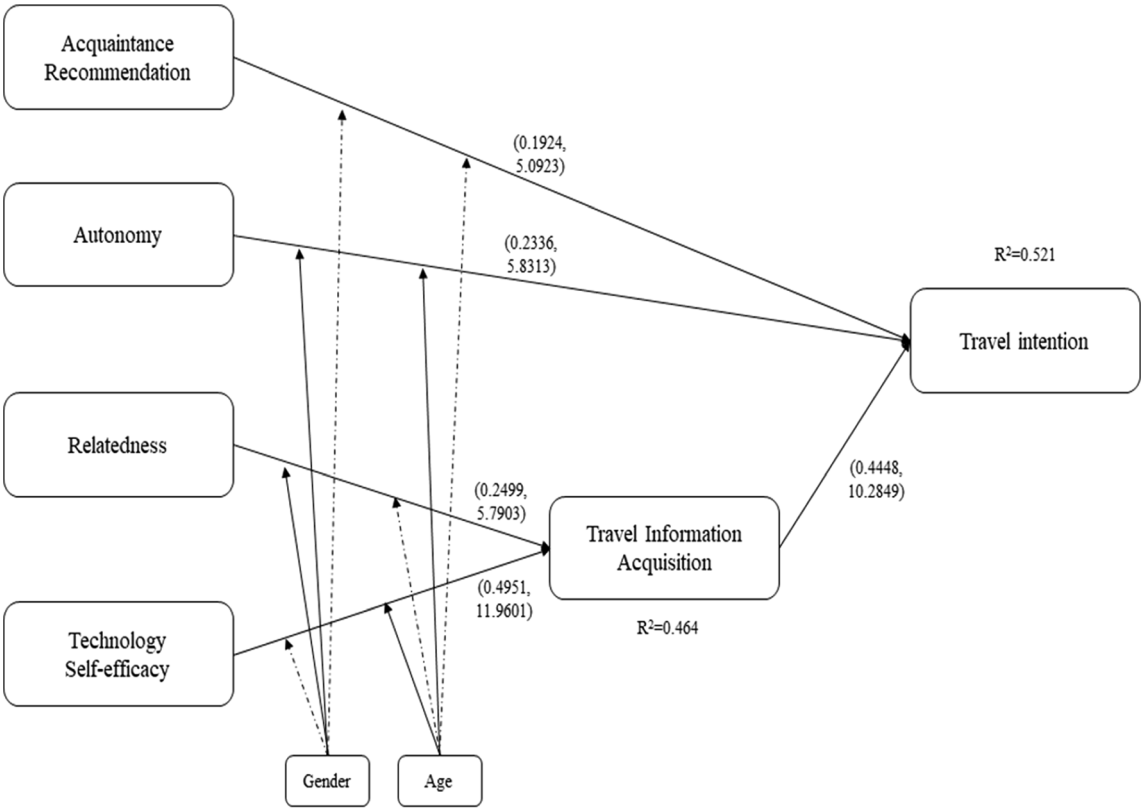

Fig. 3 Hypothesis testing

intention; relatedness was found not significantly related with travel information acquisition (Table 7).

The following hypotheses are Chinese cases.

H1, which represents the positive relationship between AR and TI; H2, which represents the positive relationship between autonomy and TI; H3, which represents the positive relationship between relatedness and TIA; H4, which represents the positive relationship between TSE and TIA; and H5, which represents the positive relationship between TIA and TI, are all supported and accepted.

In Chinese cases, friend recommendation, travel information acquisition, and autonomy are found to have positive effects on travel intention.

The Chinese travelers with a higher level of TSE perform better in acquiring travel information.

Additionally, TIA is positively related with TI.

4.3 Moderating effects

4.3.1 Gender

The results of moderating effects of gender are as follows.

Age's moderation effect does not exist between friend recommendation (FR) and TI; however, age was found to moderate autonomy and TI (Table 8).

The examination of moderation effects of gender illustrates that gender moderates between relatedness and TIA and does not moderate between SE and TIA.

4.3.2 Age

The results of moderation effect of age are as follows.

Table 7 Comparison of Korea and China (hypothesis testing)

		Korea			China		
Hypothesis		Path coefficient	*t* value	Result	Path coefficient	*t* value	Result
H1	AR -> TI	− 0.0141	0.5029	Reject	0.3083	7.3835***	Accept
H2	AUT -> TI	0.311	8.8111***	Accept	0.2147	5.0042***	Accept
H3	RE -> TIA	0.1101	1.6809	Reject	0.351	8.2062***	Accept
H4	TSE -> TIA	0.6693	23.088***	Accept	0.3253	9.3901***	Accept
H5	TIA -> TI	0.7192	12.026***	Accept	0.2095	4.5715***	Accept

***$p < 0.001$; **$p < 0.05$; *$p < 0.01$

Table 8 Gender moderating effect

Path	Path coefficient	T value	Result
AR * ge -> TI	0.0355	0.5655	Reject
AUT * ge -> TI	0.2878	3.5391	Accept
RE * ge -> TIA	0.12	2.3557	Accept
TSE * ge -> TIA	− 0.1193	1.8399	Reject

***$p < 0.001$; **$p < 0.05$; *$p < 0.01$

*means modelling effect

The examination of moderation effects of age illustrates that age does not moderate between FR and TI, and age moderates between autonomy and TI (Table 9).

According to the results, age was found to have moderation effects between SE and TIA. However, age does not moderate between relatedness and TIA.

4.4 Discussion

The present study seeks to reveal the relationships between the influential factors and travel intention by comparing the Korean and Chinese respondents. All of the hypotheses were supported. Independent travelers are more likely to decide to travel when friends recommend a certain travel destination.

When traveling, the independent travelers seek for necessary information via smartphone-based services such as SNS or travel applications. The travelers prefer to seek for information instead of asking for help from other people. Sharing information was found to have impacts on TIA. The information sharing is carried out through SNS. The result suggests that smartphone users with a higher level of self-efficacy perform better in information acquisition.

The TIA was found to be significantly related with TI.

WeChat and Douyin are very popular smartphone-based SNS in China, and Chinese people use these SNS to acquire information. Instagram and Facebook are popular media for information sharing in Korea.

These SNS have become popular tools for information sharing, which have drawn much attention by many companies. More and more travel agencies take active advantage of these platforms to diffuse information and attract customers.

Table 9 Age moderating effect

Path	Coefficient	*T* value	Result
AR * age -> TI	0.054	1.4491	Reject
AUT * age -> TI	− 0.1534	2.9968	Accept
RE * age -> TIA	− 0.0253	0.6581	Reject
TSE * age -> TIA	0.1099	2.3685	Accept

***$p < 0.001$; **$p < 0.05$; *$p < 0.01$

All of the hypotheses on Chinese samples were found acceptable. This may be related with cultural factors.

Chinese travelers prefer to accept recommendation from friends and value the relationship. The functions such as calling, messenger, photo, payment, and many functions were available from WeChat; therefore, people become more addicted with WeChat. WeChat just supplies whatever services users need. WeChat pay has nearly replaced the cash and credit card, and most people get accustomed to the WeChat functions.

Korean smartphone users were found less influenced by FRI compared with the Chinese counterpart. The individualism develops fast in recent Korean society, and under such context friend recommendation becomes less important on the travelers' decision makings. The travelers share information for the purpose of helping others instead of expecting rewards or interests, and these behaviors have no impact on TIA.

Korean people are characterized with higher autonomy and self-efficacy; thus, Korean travelers more actively search for information and enhance travel intention.

In this study, we looked at the importance of information sharing and the desire to acquire information about travel through the interface of ICT technology, internet, mobile, and smartphone technology. In particular, as smartphones began to function as PCs in their hands unlike the past, information could be easily searched or found through smartphones.

In addition, services that incorporate these SNS technologies are expected to expand as the culture of posting and sharing travel information on various SNSs such as WeChat and Instagram is emerging.

Of course, companies that provide travel-related services are developing services by introducing new techniques. However, as we saw in this study, ICT technology, smart technology, and app technology are being utilized by real consumers. In particular, as satisfaction varies depending on the level of use of smart technology, services using big data and artificial intelligence-related technologies will be needed, as shown in this study.

In particular, it seems necessary to develop a variety of recommended systems that can be easily accessed by consumers who are not familiar with the use of smartphones and SNS technologies. Recently, travel services incorporating big data have been on the rise, and various travel-related products and services such as travel courses using deep learning and in-depth learning, travel recommendations, and attractions are expected to be released in the future among artificial intelligence techniques.

5 Conclusions

The present study focused on the influential factors of travel intention with Korean and Chinese samples under the

environment of convergence of information technology and travel industry. Smart tourism has become a trend, and travelers prefer independent travel than the group travel.

The results are as follows.

The results illustrate that H1~H5 are all accepted. H2, which represents the positive relations between autonomy and TI; H4, which represents the positive relations between TSE and TIA; and H5, which represents the positive relations between TIA and TI, were accepted, with Korean samples.

However, H1, which represents the positive relations between FR and RI, H3, which represents the positive relations between relatedness and TIA, were not accepted.

The results of hypotheses test with Chinese travelers. H1, which represents the positive relations between FR and TI; H2, which represents the positive relations between autonomy and TI; H3, which represents the positive relations between the relatedness and TIA; H4, which represents the positive relations between SE and TIA; H5, which represents the positive relations between TIA and TI were all accepted.

The implications of this study are as follows.

The academic implications of this study are as follows.

Previous studies did not take into account all the variables used in this study. However, in addition to the intellectual recommendation variables, this study is meaningful at an academic level in that it has identified causality between them by using variables such as autonomy, relevance, information acquisition, and technology self-efficacy.

This study seeks to identify influential factors concerning travel intentions. In accordance with literature reviews, FR, TSE, autonomy, and relatedness were selected as independent variables.

A comparison was conducted between Korean and Chinese travelers with a questionnaire survey. Moderation effects of age and gender were tested which has academic implications.

The practical implications of this study are as follows.

The results of this study are expected to provide practical guidelines to travel-related companies, portal sites, and various companies interested in travel-related services.

In particular, the recommendation, autonomy, and acquaintance recommendation used in this study are expected to make practical contributions to enhancing the accuracy of travel recommendation services through various learnings and trainings by utilizing machine learning and deep learning among artificial intelligence techniques that have recently become an issue.

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The results identified in this study have the following technical implications that this study can contribute to the following.

First of all, the recommendation system used by global companies that currently provide Internet services will be matched with the results of this study to create a new recommendation system. For example, the recommended system used on Facebook is EdgeRank algorithm which is a prioritized algorithm used based on affinity, weight, and time.

The algorithm that Netflix used is CineMatch algorithm which recommends the right movie for the users, and as a hybrid recommendation algorithm it uses content-based and collaborative filtering together.

There is a Bayesian classifier, which is the probability that people who have watched A movie will see B movie, producing a simultaneous correlation, a good relationship between A and B at the same time, and a neural network that determines the weight of cinematic attributes including A and B's relationship, co-occurrence, and consumer preferences.

There will be a plan to expand and apply variables such as acquaintance recommendation, autonomy, relevance, and technology self-efficacy used in this study to algorithms used by Facebook and Netflix. In the future, it is expected that real-time context data and granular profiling will be possible through an in-depth inference layer (context recognition and user modeling) of all signals that can be used in the future, and ultimately super personalization technology will be implemented.

References

1. Li G, Park EM, Jin SJ (2019) The impacts of personal traits on knowledge discovery behaviors via mobile SNS. Pers Ubiquit Comput:1–12. https://doi.org/10.1007/s00779-019-01240-1
2. Cui X, Yang N, Wang Z, Hu C, Zhu W, Li H et al (2015) Chinese social media analysis for disease surveillance. Pers Ubiquit Comput 19(7):1125–1132
3. Song GY, Cheon Y, Lee K, Lim H, Chung KY, Rim HC (2014) Multiple categorizations of products: cognitive modeling of customers through social media data mining. Pers Ubiquit Comput 18(6):1387–1403
4. Park ST, Oh MR (2019) An empirical study on the influential factors affecting continuous usage of mobile cloud service. Clust Comput 22(1):1873–1887
5. Jin H, Miao Y, Jung JR, Li D (2019) Construction of information search behavior based on data mining. Pers Ubiquit Comput:1–13. https://doi.org/10.1007/s00779-019-01239-8
6. 2019 MarketHub Asia, https://www.themarkethub.com/asia/en/home. Accessed 8 Apr 2020
7. Travel Trends: 12 Opportunities for the Travel Industry. https://www.revfine.com/travel-trends/. Accessed 8 Apr 2020

8. Chip MC Jr, Simonian PT, Agnew SG, Mann FA (1996) Radiographic recognition of the sacral alar slope for optimal placement of iliosacral screws: a cadaveric and clinical study. J Orthop Trauma 10(3):171–177
9. Reichheld FF (2003) The one number you need to grow. Harv Bus Rev 81(12):46–55
10. Granovetter M (1983) The strength of weak ties: a network theory revisited. Sociol Theory:201–233. https://doi.org/10.2307/202051
11. Dichter E (1966) How word-of-mouth advertising works. Harv Bus Rev 44(6):147–166
12. Richins ML (1983) Negative word-of-mouth by dissatisfied consumers: a pilot study. J Mark 47(1):68–78
13. Kim JH, An EM, Kim GH (2006) Effects of information directionality and types of information based on tie strength between senders and receivers on senders` word-of-mouth intention. Korean Journal of Consumer and Advertising. Psychology 7(1):93–112
14. Lee J, Doh SJ, Hwang JS (2011) The effectiveness of online WOM (Words-of-Mouth): the role of direction, usefulness, and IR (Interaction Readiness). Korean Journal of Consumer and Advertising. Psychology 12(2):283–307
15. Roca JC, Gagné M (2008) Understanding e-learning continuance intention in the workplace: a self-determination theory perspective. Comput Hum Behav 24(4):1585–1604
16. Dempster JS (1994) Autonomy: a professional issue of concern for nurse practitioners. Nurse Pract Forum 5(4):227–232
17. Freidson E (1994) Method and substance in the comparative study of professions. In Conference on Regulating Expertise, Paris
18. Reeve J (2002) Self-determination theory applied to educational settings
19. Boggiano AK, Flink C, Shields A, Seelbach A, Barrett M (1993) Use of techniques promoting students' self-determination: effects on students' analytic problem-solving skills. Motiv Emot 17(4): 319–336
20. Deci EL, Ryan RM (2002) Overview of self-determination theory: an organismic dialectical perspective. Handbook of self-determination research, 3-33
21. Levesque C, Zuehlke AN, Stanek LR, Ryan RM (2004) Autonomy and competence in German and American university students: a comparative study based on self-determination theory. J Educ Psychol 96(1):68
22. Standage M, Duda JL, Ntoumanis N (2003) A model of contextual motivation in physical education: using constructs from self-determination and achievement goal theories to predict physical activity intentions. J Educ Psychol 95(1):97
23. Bandura A (1986) The explanatory and predictive scope of self-efficacy theory. J Soc Clin Psychol 4(3):359–373
24. Zhang X, Han X, Dang Y, Meng F, Guo X, Lin J (2017) User acceptance of mobile health services from users' perspectives: the role of self-efficacy and response-efficacy in technology acceptance. Inform Health Soc Care 42(2):194–206
25. Pajares F (1996) Self-efficacy beliefs in academic settings. Rev Educ Res 66(4):543–578
26. Honicke T, Broadbent J (2016) The influence of academic self-efficacy on academic performance: a systematic review. Educ Res Rev 17:63–84
27. Compeau DR, Higgins CA (1995) Computer self-efficacy: development of a measure and initial test. MIS Q 19(2):189–211
28. Eastin MS, LaRose R (2000) Internet self-efficacy and the psychology of the digital divide. J Comput Mediated Commun 6(1): JCMC611
29. Ko SH, Yeo JS, Kim YJ, kim JY (2007) Moderating effect of BRQ in the influence of parent-extension similarity on extension evaluations. J Bus Res 22(4):231–248
30. Prahalad CK, Ramaswamy V (2004) Co-creation experiences: the next practice in value creation. J Interact Mark 18(3):5–14
31. Park ST, Park EM, Seo JH, Li G (2016) Factors affecting the continuous use of cloud service: focused on security risks. Clust Comput 19(1):485–495
32. Chin WW, Gopal A (1995) Adoption intention in GSS: relative importance of beliefs. ACM SIGMIS Database 26(2-3):42–64
33. Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 18(1):39–50
34. Nunnally JC, Bernstein IH (1967) McGraw-Hill series in psychology. Psychometric theory. McGraw-Hill, New York
35. Thompson R, Barclay DW, Higgins CA (1995) The partial least squares approach to causal modeling: personal computer adoption and use as an illustration. Technology studies: special issue on Research. Methodology 2(2):284–324
36. Falk RF, Miller NB (1992) A primer for soft modeling. University of Akron Press. https://www.researchgate.net/publication/232590534_A_Primer_for_Soft_Modeling. Accessed 06 Jun 2020