

A Structural Equation Model for Consumers' Mobile-based Information Search: A Case of Outbound Chinese Tourists

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Abstract—This research responds to the call for more studies to validate a comprehensive model incorporating mobile Internet and other information channels to investigate their effects within the search process. Using 104 Chinese outbound tourists as the sample, this study investigates how they utilize multiple sources for trip planning. The research findings indicate that mobile-based search actions have been undertaken step by step: internal search → mobile search → preliminary collaborative TIS → saving information → summarizing information. Two search patterns were identified by using other information sources: 1. mobile Internet → advanced collaborative TIS → editorial communications; 2. mobile Internet → PC Internet → editorial communications. In spite of the study's limitations in relation to generalizing the results, this study presents new avenues for further research.

Keywords—*Mobile search; Information Search; Decision making.*

1. Introduction

Information search is an important part of the decision process for consumers considering the buying merchandise [1]. With the rapid development of Information and Communication Technology (ICT), mobile phones have also become inseparable from consumers searching for information or purchasing goods. Mobile searches include more location-based services, real-time information search, and social network search and recommendations [2]. Some studies indicate that consumers make mobile searches with a combination of other information sources [3]-[4] and achieve purchasing decision-making [5]. Under the impact of ICT, from the perspective of the

marketers, understanding how consumers search and browse information during the purchasing process is vital to the optimal allocation of entrepreneurial resources. Some researchers have recognized information search as a construct in models of the consumer decision process and test its effect [6]-[7]. However, there are no comprehensive models incorporating a variety of information channels to investigate their effects on the contemporary era. In addition, it seems necessary to identify the inter-relationships between the information sources.

Researchers have acknowledged the nature of mobile-based information search, for example, by incorporating search activities as constructs in the conceptual model and through an empirical data set by testing the relationships among the constructs (factors) [8], [4]. However, whether or not the findings reflect the information search behaviour in general remains to be determined. Using the other sample to re-examine the hypothesized relationships proposed in the model would lead to advances in the literature. Mainland China, an economically rising country, has generated the largest outbound market for leisure vacations. However, looking does not always lead to online booking [9]. According to a report [10], Internet and related are the services most frequently used by Chinese tourists to obtain tourism information. Therefore, in the current study, Chinese outbound tourists serve as the sample for the further validation of the model to know how they utilize multiple sources for trip planning. Specifically, an empirical attempt is made to examine the inter-dependence of tourism information sources within the search process. Although the model is drawn from tourism domain, it can be tested for broader application beyond the original setting. Behaviour characterized by a better understanding of information search may facilitate online purchasing. Knowledge regarding tourist information search patterns may also contribute to

developing marketing strategies and market segments.

2. Mobile-based TIS Model

The studies by Ho and her colleagues [8], [4] describe the decision points of mobile-based TIS and the evaluation of alternative information sources, which propose and validate the TIS process of smartphone users. From the smartphone user-centric perspective, their framework which explains what, when and how TIS activities pertain to trip planning, provides an appropriate theoretical lens for developing our research model. Typically, the search activities are performed on the mobile Internet, and other channels are used for further searches. The properties of the 10 constructs are briefly introduced below.

Internal search (IS):

Potential tourists rely on their recollections of previous searches and their previous travelling experiences when they perform TIS.

Mobile search (MS):

The seven most commonly mobile search strategies have been utilized.

Preliminary collaborative TIS (PCTIS):

Collaborative activities can be achieved by synchronously and asynchronously gathering, obtaining, sharing, updating and verifying tourism information.

Saving information in the smartphone (SAD):

The actions include writing down the URLs, cloning the web pages, saving the links or web pages as bookmarks.

Barriers to mobile Search (BMS):

Potential tourists encounter the three categories of disturbances during the mobile search: website content, mobile Internet connections and mobile appliances.

An end of mobile search (EMS):

Potential tourists stop their one-spot searching on the mobile Internet for some reasons.

Summarizing information in the smartphones (SUI): When ending the mobile searches, potential tourists summarize the information that they have or have gathered.

PC Internet searches (PCIS):

Potential tourists further utilize the PC Internet for advanced searches based on their previous search results.

Advanced collaborative TIS (ACTIS):

This mainly refers to further communications and discussions with travel companions to evaluate and filter the information as well as seeking personal recommendations from acquaintances, intermediaries or travel-related service providers.

Searches involving editorial communication (EC):

Potential tourists rely on editorial communications,

such as guidebooks/brochures, newspapers and magazines.

The research hypotheses are as follows.

H1: The internal search of TIS leads potential tourists to their mobile search.

H2: The mobile search leads potential tourists to save the obtained information.

H3: The mobile search leads potential tourists to their preliminary collaborative TIS.

H4: The search barriers of potential tourists are positively associated with their mobile search for tourism information.

H5: The preliminary collaborative TIS leads potential tourists to save their search information.

H6: Potential tourists summarize the information obtained after saving their search information.

H7: The preliminary collaborative TIS leads potential tourists to summarize the information obtained.

H8: The search barriers lead potential tourists to end their mobile search.

H9: Summarizing information by using smartphones leads potential tourists to PC Internet search.

H10: Summarizing information by using smartphones causes potential tourists to engage in advanced collaborative TIS.

H11: The PC Internet search leads potential tourists to advanced collaborative TIS.

H12: The PC Internet search leads potential tourists to searches involving editorial communications.

H13: Advanced collaborative TIS leads potential tourists to searches involving editorial communications.

3. Research methods

Data for this research were obtained using a traditional paper-based survey. The sample comprised Chinese tourists who were over 18 years old and intended to travel overseas. They were restricted to those who had searched for tourism information by using smartphones within the last 6

months. The respondents were selected using the convenience sampling method at three popular destinations in northern Taiwan. In total, 104 usable responses were obtained for the data analysis.

As for their measurement, reference was made to the scale items provided by Ho et al. [8], [11] and the data subsequently validated. The scale items were measured using a 7-point Likert-type scale to indicate the survey participants' responses. To ensure that the referred scale items effectively represented the opinions of the respondents, some preliminary analysis was performed to test the reliability and validity of the scales [12]. First, a series of exploratory factor analysis (EFA) was conducted to delineate the factors underlying each construct. Then, each scale was subjected to a Cronbach-alpha reliability test. Three multi-dimensional constructs were identified: including mobile search, preliminary CTIS and search barriers, where two or more factors were extracted. The others were all uni-dimensional constructs. This study used Harman's one-factor test [13], and the results showed that the one-factor model did not fit the data very well, indicating a lack of concern for the common method bias.

The proposed model and associated hypotheses were tested using structural equation modeling because the evaluation of both the measurement and the structural model could be performed equentially. The Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was adopted in the present study, and the non-parametric bootstrapping technique was also used. The SmartPLS 2.0 (<http://www.smartpls.de/forum/index.php>) software was employed as an analytical tool. Both the measurement model and the structural equation model were tested.

4. Results

The assessment of a measurement model should examine (1) reliability, (2) convergent validity, and (3) discriminant validity. The results (shown in Appendix) indicate that the factor loading and composite reliability of most items exceeded the suggested value of 0.7. The discriminant validity was achieved because the values of the square root of average variance extracted (AVE) exceeded those of the bivariate correlations between the main constructs.

The structural equation model was examined to test the structural equations among the latent constructs, determining their significance as well as the predictive ability of the model. The bootstrap re-sampling method (5,000 re-samples) was used to

determine the path coefficients and the R2 values. The results (as indicated in Figure 1) reveal that most of the links in the model were significant at the 5% level. Except for two hypotheses (H7 and H11) that were rejected, none of the other hypotheses was rejected and the R2 values of the constructs ranged from 0.155 to 0.488, which were greater than the recommended .15 value [14]. Another assessment referred to in the PLS-SEM literature as cross-validated redundancy measures [15]. Using the blindfolding procedure for the estimations, all values of Q2 were larger than zero, suggesting predictive relevance in explaining the endogenous latent variables and the adequate prediction quality of the model.

5. Discussions

This study analyzed mobile Internet and other major external information sources utilized by Chinese outbound tourists for trip planning. All the hypothesized paths which represent the search activities that took place on the smartphone platform were supported except for two paths. Although tourism information search is an ongoing process and that problem solving takes place prior to decision making [16], compare to the research findings of [8], the model in this study is simpler. The mobile-based search actions have been undertaken step by step: internal search → mobile search → preliminary collaborative TIS → saving information → summarizing information. As to the combination of other information sources, two search patterns were identified: 1. mobile Internet → advanced collaborative TIS → editorial communications; 2. mobile Internet → PC Internet → editorial communications. It seems that the selection and utilization of external information sources for these respondents is relatively straightforward. Frequent interchange between PC Internet search and advanced collaborative TIS did not occur.

Along with the search process, information sources shift between mobile search and other information sources. While the mobile Internet has become the dominant tourism information source, the other channels have complementary roles in various information types and enable comprehensive, less biased judgment for decision-making. This finding is consistent with that reported by [17], claiming that the offline sources are a "boutique" for travellers seeking product advices. The characteristics of advanced collaborative TIS identified in this study contradict the finding of [16], indicating that personal experience, travel agencies, and friends or relatives were not used alone. This may contribute to the development of technology reducing the resistance

of personal communication so that potential tourists can easily consult with the reference groups

6. Conclusion

The respondents used multiple tourism information sources, indicating the coexistence among the mobile Internet, PC Internet, interpersonal information and editorial media. Our research results differ slightly from the findings regarding media rivalry [3], [18]. The outbound Chinese tourists surveyed in this study seemed to have the attitude of “reinforcement” rather than “displacement” toward the media choice for their vacation planning. However, the effect of media rivalry was still identified. Among the constructs representing the various information channels, the R² value of advanced CTIS is higher than that of the other constructs, indicating that reference group is the most important source apart from the mobile Internet. Its ubiquity enables consumers to search for information at any time or in any place, but it may not completely substitute for other media. However, it cannot be denied that the mobile Internet has resulted in a decrease in the usage of the other information sources, especially for the PC Internet and travel guides/books/magazines.

Nevertheless, this study imposes limitations on the generalization of the findings and also presents new avenues for future research. There may also be other information sources that are specific to the national culture of mainland China. Studying the nation-specific information sources may enhance the understanding of search patterns. This model explains generic and common aspects of information search that can be tested for goodness of fit in different subjects and settings such as durable goods (for houses or automobiles) or the digital libraries through smartphones have important implications for retrieval, access, and information use.

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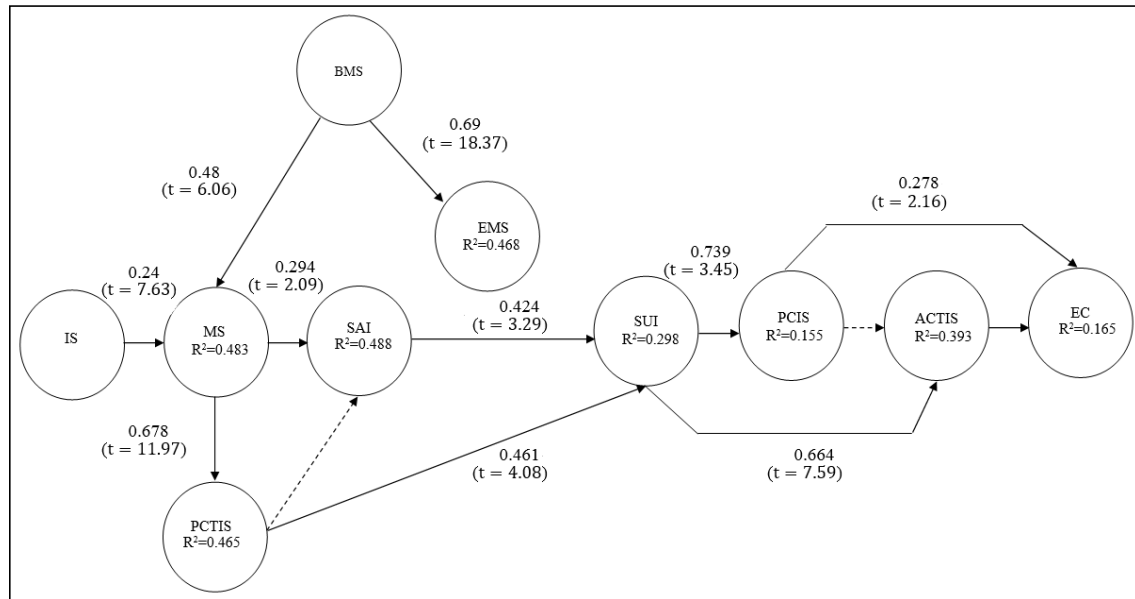


Figure 1 Results of the structural equation model

Appendix Scale properties of measurement model

Construct	Dimension/Items	Loading	t-values	CR	AVE	R ²
IS	The already known	0.931	55.54	0.928	0.812	NA
	The impact of recalled travel experiences on the on-going search	0.893	36.89			
	The experiences of TIS	0.878	31.99			
MS	Surfing & SNS	0.838	24.97	0.808	0.515	0.483
	Browsing & comparison	0.741	12.88			
	Using different search engines & Apps	0.638	7.78			
	Using different search approaches	0.634	7.27			
SAI	To save information as bookmarks	0.833	32.91	0.822	0.494	0.488
	To post information on Facebook	0.709	10.18			
	To save documents on smartphones	0.696	8.98			
	To deliver information through LINE	0.656	8.80			
	To clone web pages	0.547	4.06			
BMS	Website content	0.929	57.64	0.808	0.749	NA
	Mobile Internet/Device problems	0.797	9.75			
PCTIS	Collaboration with travel companions	0.888	44.09	0.858	0.751	0.465
	Seeking opinions from SNS	0.845	17.92			
EMS	A malfunction in the mobile phone	0.939	65.90	0.936	0.747	0.468
	Slow speed of connection to the sites	0.900	51.98			
	The wanted being unavailable	0.889	38.94			
	The failures to link the web pages	0.794	12.05			
	To attend to other personal affairs	0.788	12.67			
SUI	Information filtering	0.956	86.45	0.954	0.912	0.298
	Information compiling and editing	0.954	96.16			
PCIS	To open the saved files for review	0.911	19.87	0.953	0.770	0.155
	Information compiling & editing	0.909	19.22			
	To clone a separate copy for further use	0.908	22.52			
	To generate categories with contexts	0.873	14.34			
	To re-visit earlier result pages by phones	0.841	21.83			
	To store for possible future use	0.818	18.51			
ACTIS	Information filtering with companions	0.846	20.34	0.891	0.620	0.393
	To discuss with companions	0.833	25.48			
	To seek for advices from friends	0.782	12.13			
	Seeking assistance from service providers	0.772	15.47			
	To offer information to companions	0.702	8.49			
EC	To review tour books/magazines	0.931	20.01	0.904	0.824	0.165
	To read advertisements in newspapers	0.885	29.13			