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Mobile social tourism shopping: A dual-stage analysis of a multi-mediation model

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HIGHLIGHTS

- SOR framework was adapted to investigate mobile social tourism shopping.
- Data was collected from a UNESCO World Cultural Heritage Site in Penang, Malaysia.
- A dual-stage analysis was performed with PLS-SEM and Artificial Neural Network.
- A multiple mediation analysis was conducted.
- Tourists might have social network fatigue under mobile social tourism platforms.

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ABSTRACT:

This study investigates mobile social tourism (MST) shopping, which refers to the use of MST platforms in shopping for tourism products and services, among Malaysian domestic tourists who have visited George Town, which is a UNESCO World Cultural Heritage Site located in Penang. Drawing upon the Stimulus-Organism-Response (SOR) framework, a multi-mediation model is proposed to address this relatively new research avenue. Through the use of Partial Least Squares Structural Equation Modelling and Artificial Neural Network analyses, it was discovered that the environmental stimuli (i.e., perceived mobility, social presence, and system and service quality) directly and indirectly influence tourists' MST shopping intention through their inner organism changes (i.e., perceived usefulness and perceived enjoyment). The results support the application of the SOR framework in MST shopping, as most of the developed hypotheses are supported. Practical and theoretical implications are subsequently discussed in light of the results.

1. Introduction

The rise of low-cost carriers in recent years has promoted the tourism industry to greater heights (Escobar-Rodríguez & Carvajal-Trujillo, 2014). Thus, it is unsurprising to see that the economic growth and development of some countries are now greatly dependent on tourism (Webster & Ivanov, 2014). Without exception, Malaysia, a country in Southeast Asia, has experienced the benefits offered by tourism in recent years. By 2020, it is forecasted that the tourism industry will contribute RM 3 billion weekly towards the Malaysian economy (Hew, Lee, Leong, Hew, & Ooi, 2016). Given its significant contribution, Malaysian government emphasised tourism as a key economic area under the Tenth Malaysia Plan (Prime Minister's Department, 2010), and further prioritised it as one of the key initiatives for the regional economic corridors under the Eleventh Malaysia Plan (Prime Minister's Department, 2015). As opined by Kozak and Kozak (2013), the prosperity of the Malaysian tourism industry is mainly attributed to the wide range of tourism products and services (TPS) that it offers.

TPS, as defined by several researchers (Cosma, Bota, & Tutunea, 2012; Kim, Chung, & Lee, 2011; Kim, Chung, Lee, & Preis, 2016; Tan, Lee, Lin, & Ooi, 2017), mainly include accommodations, entertainment (such as festivals, events, and theme parks), transport, and rental services. The purchasing of TPS online is a new phenomenon in the tourism industry (Kim et al., 2011), and it allows tourists to

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enjoy the benefit of lower costs (Jensen, 2012; Kim, Lee, Chung, & Kim, 2014). This phenomenon has been referred to as "online tourism shopping" by some researchers (Kim, Chung, Lee, & Kim, 2012; Kim, Lee, & Chung, 2013). Afterward, tourists started adopting smart mobile devices, such as smartphones, as a tourism travel tool in purchasing TPS (Dickinson et al., 2014; No & Kim, 2014), which has been termed "mobile tourism shopping" by Kim, Chung, Lee, and Preis (2015). Lately, given the explosion of online social networks, tourists are embracing online social networks and smart mobile devices for tourism-related purposes (French, Luo, & Bose, 2017; Kim, Chung, et al., 2016; Kim, Lee, & Bonn, 2016).

There are two main types of online social networks that serve as platforms for tourists to conduct their tourism-related tasks, including the purchase of TPS. Networks of the first type are specifically designed for tourism-related purposes, such as AirBnB and TripAdvisor. French et al. (2017) referred to online social networks of this type as social networking tourism sites, and opined that they could allow tourists to share TPS among themselves without going through traditional travel agencies. In contrast, networks of the second type are not designed specifically for tourism-related purposes. For instance, Tourism Malaysia, a promotion board under the Ministry of Tourism and Culture, has been leveraging YouTube and Facebook as platforms for promoting tourism activities and products (Musa & Thirumoorthi, 2016). Hence, tourists are utilising online social networks that are not mainly designed for tourism purposes to purchase TPS as well. Accordingly, purchasing TPS via online social networks follows the latest trend among tourists. Malaysian tourists are also heavily relying on online social networks to facilitate their decision making in the purchase of TPS (Zainal, Harun, & Lily, 2017).

Considering the proliferation of smart mobile devices and the current popularity of mobile applications (Hew, 2017; Hew, Lee, Ooi, & Wei, 2015), it is rather common to see social networking tourism sites and online social networks go mobile by developing and offering their own mobile applications. In this study, these mobile social networking tourism sites (such as AirBnB and TripAdvisor) and mobile online social networks (particularly those that can facilitate the purchase of TPS, such as Facebook) are referred to as mobile social tourism (MST) platforms. Furthermore, the use of these platforms to shop for TPS is termed MST shopping in this study. Noting the importance of mobile applications, Ismail, Kadir, Aziz, Mokshin, and Lokman (2016) proposed a mobile application with a social element to help tourists search for tourism spots and TPS in Malaysia, which has subsequently assisted Tourism Malaysia in promoting Malaysia at the national and international levels. Tan et al. (2017) also agreed on the importance of mobile applications (especially those with a social element) in the Malaysian tourism industry, and they observed that Malaysians are currently adopting mobile applications for purchasing TPS. Given the current literature and status quo in the Malaysian tourism industry, MST shopping remains an emerging avenue that urgently needs attention.

Although numerous past studies have focused on online tourism shopping (Hsu, Chang, & Chen, 2012; Jensen, 2012; Kim et al., 2012, 2011; Kim, Lee, et al., 2013), mobile tourism shopping (Kim et al., 2015), and the use of online social networks in tourism (French et al., 2017; Kim, Chung, et al., 2016; Kim, Lee, et al., 2016), these studies have mostly been conducted with a single stage of analysis, mainly by means of Covariance-Based Structural Equation Modelling or Variance-Based Structural Equation Modelling, and have omitted a proper mediation analysis of the mediator(s) in their models. Contemplating these research gaps, this study aims to present more refreshing insights into the current state of tourism research by performing a dual-stage analysis and evaluating the roles of multiple mediators via multiple mediation analysis.

Based upon the notion of the Stimulus-Organism-Response (SOR) framework (Mehrabian & Russell, 1974), this study attempts to shed light on MST shopping through a multi-mediation model, which considers perceived mobility, social presence, and system and service quality as the environmental stimuli; perceived usefulness, perceived ease of use, and perceived enjoyment as the inner organism changes; and MST shopping intention as the response. With this multi-mediation model, we are confident that MST shopping can be adequately explained in this study.

It is hoped that the fresh insights of this study will eventually benefit Malaysian practitioners and policy makers in the tourism industry. Government policy makers, and perhaps mobile app developers in the tourism industry, could make more informed decisions and derive better strategic plans for fostering MST shopping among tourists, which eventually encourages spending by tourists. The tourism industry carries significant weight for a country, as it represents one of the main and most important revenue sources, particularly for Malaysia (Hew, Lee, Leong, et al., 2016). With the enormous spending power of tourists, countless business opportunities are available for practitioners such as hoteliers. This, in turn, benefits the government in terms of tax revenues and creates more job opportunities. Hence, advocating MST shopping among tourists could have huge implications for the society, nation, and economy.

2. Literature review

2.1. MST shopping

According to a review conducted by Xiang, Magnini, and Fesenmaier (2015), tourists once relied on intermediaries, such as tour operators and travel agencies, to purchase TPS during their travels. Hence, their choices of TPS were rather limited during the pre-Internet era (prior to 1990). Similarly, practitioners had limited ability to reach tourists. Due to the advancement of Internet technology, online social networks, and smartphones in recent years, tourists have more control over their choices of TPS. Further, practitioners have acquired wider access to tourists. Utilising online social networks to market TPS has been validated as an effective strategy (Zeng & Gerritsen, 2014). Owing to the incredible speed at which posts spread on online social networks, which eventually influences buying decisions in a significant manner, purchasing TPS through online social networks is quite different from purchasing through traditional channels (Kim, Lee, et al., 2016). According to Shankar et al. (2016), who discovered that the use of mobile online social networks in shopping activities has been accelerating among shoppers lately, tourists are heavily relying on mobile online social networks to facilitate their TPS shopping.

2.2. Applying the SOR framework

The SOR framework (Mehrabian & Russell, 1974) has been applied by researchers in different retailing contexts to explain the decision-making process of consumers (Kim & Lennon, 2013). In addition to being utilised widely in the online environment, the SOR framework has been employed to explain purchase intention in online social networks (Zhang & Benyoucef, 2016). Nonetheless, this framework has yet to be applied in the setting of tourism shopping. Hence, it would be interesting to explore the suitability of this framework in the context of MST shopping. Based upon the SOR paradigm, the environmental stimuli could arouse individuals, hence affecting the internal organismic states that mediate their approach or avoidance responses in the online shopping environment (Eroglu, Machleit, & Davis, 2001).

The stimuli in the SOR framework are a set of attributes that

influence consumers' perceptions and serve as the starting point of the decision-making process (Koo & Ju, 2010). Li, Dong, and Chen (2012) expressed that this set of attributes, which influences consumers' organismic states, varies according to the type of consumption environment. Therefore, this study has discovered some relevant stimuli by referring to the characteristics of MST platforms in later discussions. As illustrated by Chan, Cheung, and Lee (2017), there are two main types of internal reactions: cognitive and affective reactions. According to their explanations, cognitive reactions denote the mental processes that occur when online shoppers are interacting with environmental stimuli; a positive cognitive reaction stimulates, while a negative cognitive reaction discourages the buying responses of shoppers. Affective reactions describe the emotional responses that arise within online shoppers when they are interacting with the stimuli. Lastly, the responses are defined as the behavioural reactions of consumers (Pantano & Viassone, 2015).

As argued by Hong, Thong, Moon, and Tam (2008), perceived mobility is a unique factor in the mobile data service environment. Indeed, mobility is the key to mobile commerce services (Li et al., 2012; Liu & Cheng, 2015), and it is considered an essential element of any mobile network service (Park & Kim, 2013, 2014). Based on this notion, this study opines that perceived mobility, which has been defined as "the degree to which users are aware of the mobility value of mobile services and systems" (Park & Kim, 2014, p. 379), is an essential attribute of MST platforms. In comparison to traditional e-commerce, smart mobile devices allow users to access information and services anytime and anywhere (Mallat, Rossi, Tuunainen, & Öörni, 2009). Unlike online tourism shopping, tourists can use smart mobile devices in MST shopping to shop for their TPS. As described by Xiang et al. (2015), tourists are now engaging in some decision making and itinerary planning during their journeys; these tasks were previously completed prior to their holidays. Given the mobility attribute of MST platforms, tourists can now access these platforms for TPS shopping anytime and anywhere throughout their journeys, and make decisions and plan their itineraries on the move. Hence, following several past studies (Li et al., 2012; Wang & Lee, 2014), perceived mobility serves as one of the environmental stimuli in this study.

In addition, social presence, which has been defined as the "extent to which a medium is perceived as sociable, warm, sensitive, personal, or intimate when it is used to interact with other people" (Qiu & Li, 2008, p. 268), matters in the context of online shopping. Social presence measures one's feeling of being online (Tu & Mcisaac, 2010), and captures "the effectiveness of online sellers to recreate the notion of human touch" (Pavlou, Liang, & Xue, 2007, p. 107). As cited in Kaplan and Haenlein (2010), the notion of social presence originates from the Social Presence Theory by Short, Williams, and Christie (1976), and it serves as a key element in online social networks. In the words of Wei, Seedorf, Lowry, Thum, and Schulze (2017), Social Presence Theory states that if a communication medium has the appropriate social presence level for a task, the communication interaction shall be more efficient. In a recent study, Lu, Fan, and Zhou (2016) demonstrated that an appropriate level of social presence could be a reason for social commerce purchase intention. Therefore, social presence appears as a facilitating stimulus in the context of social commerce. Owing to the ability of social elements (such as recommendations and reviews) in helping tourists make their decisions in purchasing TPS (Nusair, Bilgihan, Okumus, & Cobanoglu, 2013), social presence is a relevant attribute for MST platforms. Given these arguments and following Fan, Liu, and Zhang (2013) and Shen and Khalifa (2012), this study operationalises it as a stimulus under the MST shopping environment.

Consistent with Hsu et al. (2012) and Kim and Lennon (2013), this study finds that website quality is another important stimulus in the MST shopping environment. This study follows the DeLone and McLean Model of Information Systems Success (DeLone & McLean, 2003) to measure website quality through system and service quality, which has been defined as "the degree to which users believe that the overall service and system performance meets their expectations" (Kwon et al., 2014, p. 537). In addition to these qualities, information quality is an important dimension of quality (Hew, Lee, Leong, et al., 2016). From a mobile online social network perspective, information quality "reflects the accuracy, comprehensiveness and timeliness of information provided by mobile social network service providers" (Zhou, Li, & Liu, 2010, p. 933). Nevertheless, information quality has been excluded from the model. Although contents generated by other tourists, such as comments and reviews, are influencing tourists' decision making, they are not created by the MST platforms and, therefore, are beyond their control. Moreover, as mentioned earlier, user-generated contents, such as recommendations and reviews, are social elements in the online shopping context (Kumar & Benbasat, 2006; Shen, 2012). Therefore, the perceptions of these social elements could be adequately captured by the construct of social presence (Fan et al., 2013). Hence, information quality is excluded from the context of this study.

In this study, tourists' cognitive reactions are represented by perceived usefulness and perceived ease of use, and their affective reactions are manifested as perceived enjoyment (Chan et al., 2017; Koufaris, 2002; Parboteeah, Valacich, & Wells, 2009). These cognitive and affective reactions are supposed to intervene into the responses of tourists (called MST shopping intention) after they have interacted with the environmental stimuli. In accordance with Chan et al. (2017), and for the purpose of this study, perceived usefulness refers to the degree to which the tourists believe that the MST platforms are enhancing their MST shopping productivity; perceived ease of use refers to the extent to which the tourists believe that using MST platforms for TPS shopping will require less effort; and perceived enjoyment refers to the pleasure experienced by tourists during the use of MST platforms for TPS shopping.

Both perceived usefulness and perceived ease of use are derived from the well-known Technology Acceptance Model (Davis, 1989). According to Hong et al. (2008), these two constructs are prominent in explaining consumer behaviour among technology adoption studies. Recently, Kucukusta, Law, Besbes, and Legohérel (2015) employed these constructs in the context of online tourism shopping to explain the intention to book tourism products, and they posited that these fundamental constructs of TAM could predict user intention. Owing to the prominence of perceived usefulness and perceived ease of use in predicting consumer behaviour and their relevancies in online tourism shopping context, they are expected to be a good surrogate for tourists' cognitive reactions in this study.

Perceived enjoyment, in contrast, is included based on the Motivation Theory. As cited in Lin and Lu (2011), Deci (1975) asserted that the motivations underlying human behavior could be divided into extrinsic motivation and intrinsic motivation. Davis, Bagozzi, and Warshaw (1992) then successfully applied this theory in the context of information technology. According to them, humans are extrinsically motivated to commit an action when the performance of such action could achieve valued outcomes (e.g., improving job performance), whereas they are intrinsically motivated to commit an action when they are interested in the performance of the said action, rather than the outcomes. From their study, they conceptualised perceived usefulness as a form of extrinsic motivation and perceived enjoyment as a form of intrinsic motivation. Ayeh, Au, and Law (2013) adopted these conceptualisations of Motivation Theory and employed them in

investigating the use of consumer-generated media (or user-generated content) on online social networks for travel planning. They clarified that in addition to perceived usefulness and perceived ease of use, perceived enjoyment is a main reason for tourists to use consumer-generated media for travel planning, as tourists enjoy the process of searching for travel information, as well as reading the comments and reviews on TPS. Following this notion, it is expected that this intrinsic motivation of tourists could be a relevant construct that functions as the proxy for their affective reactions.

After interacting with all environmental stimuli and experiencing inner organism changes, tourists provide a response at the final stage. In this study, their response is conceptualised as MST shopping intention, which is a term that describes the behavioural intention to use MST platforms for TPS shopping. Given that behavioural intention is an ideal proxy for actual usage behaviour (Hew et al., 2015), MST shopping intention is sufficient for capturing the response by tourists.

3. Hypotheses development

3.1. Perceived mobility

Under the environment of mobile communications and services, mobility is regarded as a crucial element that allows users to access services and communicate with one another ubiquitously through wireless networks (Park & Kim, 2013). In accordance with several past studies, perceived mobility is posited to be an antecedent of perceived usefulness and perceived ease of use in mobile technology studies (Liu & Cheng, 2015; Park & Kim, 2014; Yang, Lu, Gupta, & Cao, 2012). Moreover, Kwak, Choi, and Lee (2014) learned that the mobility characteristic of mobile online social networks affects the flow experience (such as enjoyment) of users during their usage. In another mobile data service study, Wang, Yang, and Yang (2014) obtained a similar finding, and they confirmed that perceived mobility influences users' perceived enjoyment. Moreover, some studies on mobile technologies have also shown that perceived mobility is one of the most important drivers of usage intention (Hong et al., 2008; Wang et al., 2014).

Based on these notions, it is hypothesised that if tourists were aware of the mobility value offered by MST platforms, they would recognise these platforms as useful and easy-to-use tools for shopping for TPS. In addition, they would find the use of these platforms for TPS shopping enjoyable and would hence possess higher intention to shop for more TPS. Accordingly, the following hypotheses are developed:

H1. Perceived mobility has a positive impact on perceived usefulness.

H2. Perceived mobility has a positive impact on perceived ease of use.

H3. Perceived mobility has a positive impact on perceived enjoyment.

H4. Perceived mobility has a positive impact on MST shopping intention.

3.2. Social presence

Social presence has been a noteworthy construct in the context of mobile technology and online social networking services in recent years (Han, Min, & Lee, 2015; Ogara, Koh, & Prybutok, 2014). Other than boosting usage intention in the context of online social networks (Lee, Park, Kim, Kim, & Moon, 2011; Park & Lee, 2010; Xu, Ryan, Prybutok, & Wen, 2012), an elevated social presence has positive effects on the perceived ease of use, perceived usefulness, and perceived enjoyment under electronic environments, such as online shopping and electronic services (Cyr, Hassanein, Head, & Ivanov, 2007; Hassanein & Head, 2006, 2007; Shen, 2012; Smith & Sivo, 2012).

In this study, it is expected that the tourists' perception of the social presence within an MST platform influences their cognitive and affective reactions, which are represented by perceived usefulness, perceived ease of use, and perceived enjoyment. That is, as well as inducing tourists to perceive MST platforms as useful, easy-to-use, and enjoyable tools in TPS shopping, this particular environmental stimulus also fosters MST shopping intention among tourists. As such, the following hypotheses are offered:

H5. Social presence has a positive impact on perceived usefulness.

H6. Social presence has a positive impact on perceived ease of use.

H7. Social presence has a positive impact on perceived enjoyment.

H8. Social presence has a positive impact on MST shopping intention.

3.3. System and service quality

As concluded by Kwon et al. (2014), system and service quality is strongly associated with users' perceptions about a technology. Since MST platforms deliver services to tourists through their systems, system and service quality serves as an important environmental stimulus that influences tourists' cognitive and affective reactions. In online shopping (Ahn, Ryu, & Han, 2007) and mobile technology (Cheong & Park, 2005; Zhou, 2013) studies, system and service quality acts as the antecedent for perceived ease of use, perceived usefulness, and perceived enjoyment. Furthermore, the influence of system and service quality on usage intention has been well-documented under the environments of mobile technologies and online social networks (Hew, Lee, Leong, et al., 2016; Kwon et al., 2014; Park & Pobil, 2013).

In this vein, it is believed that a positive perception of system and service quality of MST platforms will lead to favourable cognitive and affective reactions by the tourists, in addition to driving their intention to use the platforms for TPS shopping. Hence, the following hypotheses are formed:

H9. System and service quality has a positive impact on perceived usefulness.

H10. System and service quality has a positive impact on perceived ease of use.

H11. System and service quality has a positive impact on perceived enjoyment.

H12. System and service quality has a positive impact on MST shopping intention.

3.4. Perceived usefulness and perceived ease of use

Both perceived usefulness and perceived ease of use have been widely adapted in a number of mobile technology (Choi & Totten, 2012; Dutot, 2015; Sim, Tan, Wong, Ooi, & Hew, 2014) and online social network (Chang, Hung, Cheng, & Wu, 2015; Liébana-Cabanillas, Sánchez-Fernández, & Noz-Leiva, 2014; Nikou & Bouwman, 2014; Rauniar, Rawski, Yang, & Johnson, 2014) studies to explain usage intention. Hence, it can be well concluded that both function as the drivers of usage intention. Similarly, it is anticipated

that these cognitive reactions of tourists could subsequently affect their MST shopping intention (i.e., their response). Accordingly, the next two hypotheses are developed:

H13. Perceived usefulness has a positive impact on MST shopping intention.

H14. Perceived ease of use has a positive impact on MST shopping intention.

3.5. Perceived enjoyment

Perceived enjoyment has great relevancy in affecting the intention to use pleasure-oriented information systems and hedonic platforms, such as online social networks (Heijden, 2004; Lin & Lu, 2011; Sun, Wang, Shen, & Zhang, 2015; Wong, Tan, Tan, & Ooi, 2015). Since MST platforms are essentially mobile online social networks, tourists' perceived enjoyment (an affective reaction) pertaining to the use of these platforms will influence their MST shopping intention (i.e., their response) positively. Additionally, the linkage between perceived enjoyment and usage intention has been verified by several studies in the areas of mobile technologies and online social networks (Hsiao, Chang, & Tang, 2016; Kim, Ahn, & Chung, 2013; Zhou, Li, & Liu, 2015). The next hypothesis is constructed accordingly:

H15. Perceived enjoyment has a positive impact on MST shopping intention.

3.6. The mediating roles of cognitive and affective reactions

Through the theoretical lens of the SOR paradigm (Kawaf & Tagg, 2012), both cognitive (perceived usefulness and perceived ease of use) and affective (perceived enjoyment) reactions are supposed to mediate the linkages between environmental stimuli (perceived mobility, social presence, system and service quality) and tourists' response (MST shopping intention) in this study. It has been suggested in the literature that perceived usefulness, perceived ease of use, and perceived enjoyment can mediate the relationships between usage or purchase intention and their antecedents (Guriting & Ndubisi, 2006; Hsu et al., 2012; Ramayah & Lo, 2007; Wu, Wang, & Lin, 2007) in the contexts of online TPS shopping, mobile technologies, and ICTs.

Other than exerting a direct impact on tourists' MST shopping intention, the environmental stimuli of MST platforms, namely, perceived mobility, social presence, system and service quality, indirectly influence MST shopping intention through both cognitive and affective reactions. Accordingly, the following hypotheses pertaining to the multiple mediating roles of perceived usefulness, perceived ease of use, and perceive enjoyment are established:

H16. Perceived usefulness mediates the impacts of (a) perceived mobility, (b) social presence, and (c) system and service quality on MST shopping intention.

H17. Perceived ease of use mediates the impacts of (a) perceived mobility, (b) social presence, and (c) system and service quality on MST shopping intention.

H18. Perceived enjoyment mediates the impacts of (a) perceived mobility, (b) social presence, and (c) system and service quality on MST shopping intention.

3.7. The multi-mediation model

Based on the SOR paradigm, a multi-mediation model is proposed and illustrated in Fig. 1. The environmental stimuli of MST platforms, which are operationalised as perceived mobility, social presence, and system and service quality, are expected to influence the two main types of organism (cognitive and affective reactions) and the response of tourists. Cognitive reaction is represented by perceived usefulness and perceived ease of use, while affective reaction is represented by perceived enjoyment. Finally, the response is conceptualised as MST shopping intention. In addition, after considering the confounding effects of personal characteristics, this study further controls for age, educational level, gender, and income level (Chong, Chan, & Ooi, 2012; Leong, Ooi, Chong, & Lin, 2013; Whitacre, 2017).

4. Methodology

Given the subject of MST shopping, this study targets domestic tourists who have experience in using MST platforms to shop for TPS in Malaysia. Non-probability judgemental sampling was utilised to select the sample in this study, due to the unavailability of a sampling frame. To draw a representative sample, this study has chosen George Town, Penang, as the sampling location, given its great popularity among domestic tourists. Penang has played a significant role in promoting and expanding the tourism industry in Malaysia (Yousefi & Marzuki, 2015), and it has attracted numerous international and domestic tourists (Safri, Ismail, Alias, & Hashim, 2013). As noted by Ranjanthran and Mohammed (2011), the number of domestic tourists is considerably higher than the number of international tourists in Penang. Moreover, since Penang has many well-preserved heritage buildings, its capital city, George Town, has been inscribed as a UNESCO World Cultural Heritage Site (Maghsoodi Tilaki, Hedayati Marzbali, Abdullah, & Bahauddin, 2016). Ever since the inscription, Penang has been transforming its focus from traditional business towards tourism and hospitality (Rasoolimanesh, Jaafar, Kock, & Ahmad, 2017). Therefore, George Town in Penang is an ideal sampling location for this study.

For a period of one month, 450 survey questionnaires were distributed to domestic tourists at different tourist attractions during different timeslots. The tourists were politely asked if they have experience with MST shopping and, subsequently, were

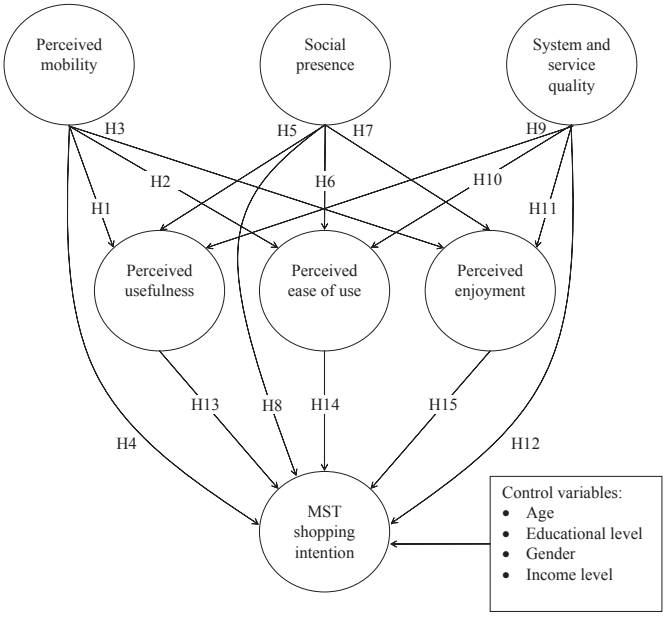


Fig. 1. The multi-mediation model.

invited to participate in the survey if they gave a positive response. Overall, 407 completed questionnaires were received at the end. However, seven of the respondents were under 15 years of age. Given that the labour force (part time and full time) in Malaysia is 15 years old and above (Department of Statistics Malaysia, 2016), these respondents were removed from the data set, as they do not have income earning ability. Eventually, 400 domestic tourists, whose demographic profile is detailed in Table 1, made up the final sample. A sample of this size should adequately represent a population that exceeds 1,000,000 (Krejcie & Morgan, 1970).

All indicators for constructs in the questionnaire were carefully adapted from the sources listed in Table 2. A seven-point Likert scale was used to measure these indicators, which ranged from "1 - Strongly Disagree" to "7 – Strongly Agree".

5. Data analyses

Given the small sample size in this study, Partial Least Squares Structural Equation Modelling (PLS-SEM), which is a type of Variance-Based Structural Equation Modelling, is deemed the ideal data analysis method, as it can achieve a higher level of statistical power under this situation, in comparison to Covariance-Based Structural Equation Modelling (Hair, Sarstedt, Ringle, & Mena, 2012). Although the sample size is relatively small, it still satisfies the minimum requirement. Following the method developed by Hew, Lee, Ooi, and Lin (2016) for calculating the minimum sample size for PLS-SEM through a calculator provided by Soper (2015), it was found that the recommended sample size is 170. Moreover, PLS-SEM can predict a relatively complex model without requiring the fulfilment of distribution assumptions and, therefore, is able to handle data of non-normal distribution, which is a phenomenon that is commonly encountered by business and social sciences researchers (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014; Sarstedt, Ringle, Smith, Reams, & Hair, 2014). As suggested by Lee, Foo, Leong, and Ooi (2016), a one-sample Kolmogorov-Smirnov normality test was employed to examine the data distribution. The result clearly indicates that the data have a non-normal distribution; hence, PLS-SEM is again considered to be suitable for this study. In PLS-SEM analysis, a two-step approach, in which the measurement model is inspected prior to the examination of the structural model (Hew, Badaruddin, & Moorthy, 2017), is strictly followed. In addition, the common method bias, predictive power of the model, and mediation are evaluated and reported (Lowry & Gaskin, 2014).

Table 1
Demographic profile of respondents.

Demographic profile		Frequency	Percentage
Gender	Male	175	43.75
	Female	225	56.25
Educational level[a]	High school	148	37.00
	Pre-U/Foundation studies/Matriculation	38	9.50
	Diploma/Advanced diploma	60	15.00
	Bachelor degree/Professional qualification	125	31.25
	Postgraduate degree	24	6.00
	Others	5	1.25
Age	15–19	75	18.75
	20–24	148	37.00
	25–29	56	14.00
	30–34	35	8.75
	35–39	17	4.25
	40–44	12	3.00
	45–49	13	3.25
	50 and above	44	11.00
Occupation	Unemployed	21	5.25
	Self-employed	54	13.50
	Privately employed	112	28.00
	Public servant	24	6.00
	Student	125	31.25
	Housewife	12	3.00
	Retiree	7	1.75
	Others	45	11.25
Income level[b]	Less than RM1000	154	38.50
	RM1000 - RM3000	137	34.25
	RM3001 - RM5000	63	15.75
	RM5001 - RM7000	20	5.00
	RM7001 - RM9000	14	3.50
	More than RM9000	12	3.00
Experience in using MST platforms	Less than 3 years	140	35.00
	3 - 5 years	131	32.75
	More than 5 years	129	32.25
Frequency in using MST platforms to purchase TPS (in a year)	1 - 3 times	229	57.25
	4 - 6 times	91	22.75
	More than 6 times	80	20.00
TPS purchased[c]	Accommodation	170	42.50
	Entertainment	159	39.75
	Transport	161	40.25
	Rental services	129	32.25
	Others	13	3.25

Note.
[a] High school in Malaysia refers to the PMR/SPM/STPM levels.
[b] RM represents the Malaysian Ringgit, a currency of Malaysia.
[c] Respondents are allowed to opt for more than one options.

Table 2
Indicators for constructs.

Constructs	Indicators	Sources
Perceived enjoyment	PE1 - I had fun in using mobile social tourism platforms. PE2 - I found my visit to mobile social tourism platforms interesting. PE3 - I feel that the use of mobile social tourism platforms is enjoyable. PE4 - I feel that the use of mobile social tourism platforms is exciting.	Shen (2012) and Zhou et al. (2015).
Perceived ease of use	PEU1 - Mobile social tourism platforms are easy to use. PEU2 - My interaction with mobile social tourism platforms is clear and understandable. PEU3 - Learning to use mobile social tourism platforms is easy. PEU4 - It is easy to use mobile social tourism platforms to shop for tourism products and services wanted by me.	Shen (2012)
Perceived mobility	PM1 - It is convenient to use mobile social tourism platforms anytime and anywhere. PM2 - Mobility is an outstanding advantage of mobile social tourism platforms that offer tourism products and services. PM3 - I can access mobile social tourism platforms at any time to shop for tourism products and services. PM4 - I can access the mobile social tourism platforms anywhere to shop for tourism products and services.	Liu and Cheng (2015) and Park and Kim (2014).
Perceived usefulness	PU1 - Mobile social tourism platforms enable me to discover new tourism products and services more quickly. PU2 - Mobile social tourism platforms increase my productivity in discovering tourism products and services. PU3 - I think mobile social tourism platforms provide useful service and information to me, when I am looking for tourism products and services. PU4 - Using mobile social tourism platforms help me to get better decision in shopping for tourism products and services.	Ahn et al. (2007), Kwon et al. (2014), and Shen (2012).
MST shopping intention	SI1 - I am very likely to use mobile social tourism platforms in the future to discover new tourism products and services. SI2 - I am likely to actually purchase tourism products and services I found on mobile social tourism platforms. SI3 - I intend to use mobile social tourism platforms to shop for tourism products and services as much as possible. SI4 - I will continue to use mobile social tourism platforms to shop for tourism products if I have access to the platforms.	Kwon et al. (2014), Park and Kim (2014), and Shen (2012).
Social presence	SP1 - There is a sense of human contact in mobile social tourism platforms. SP2 - There is a sense of personalness in mobile social tourism platforms. SP3 - There is a sense of sociability in mobile social tourism platforms. SP4 - There is a sense of human warmth in mobile social tourism platforms. SP5 - There is a sense of human sensitivity in mobile social tourism platforms.	Han et al. (2015) and Shen (2012).
System and service quality	SSQ1 - I have not had any limitations or problems with using mobile social tourism platforms in shopping for tourism products and services. SSQ2 - Mobile social tourism platforms that offer tourism products and services fully meet my needs. SSQ3 - Mobile social tourism platforms provide precise services that are aligned with the main purpose of the service.	Kwon et al. (2014) and Park and Kim (2014)

However, as noted earlier, a single stage of data analysis by using PLS-SEM is insufficient. As described by Ooi and Tan (2016), PLS-SEM can detect the linear relationships between the constructs, but not the non-linear relationships. According to Hair, Celsi, Money, Samouel, and Page (2016), a linear relationship refers to a straight-line association between two variables, whereas a non-linear relationship (also known as a curvilinear relationship) refers to a relationship between two variables that is described by a curve rather than a straight line. They further opined that in a linear relationship, the strength of the relationship between the variables remains the same over a certain range. This indicates that a unit of change in the exogenous variables always produces a corresponding and constant change in the endogenous variable. Furthermore, Jaiswal and Niraj (2011) added that a non-linear relationship occurs when the "change in the quantum of independent variables may not uniformly affect the dependent variables at all levels and for all magnitude of changes" (p.166); that is to say, a unit of change in the exogenous variables might have a smaller or greater impact on the endogenous variable. Consequently, a complex real-world decision-making process might be conducted in a simplified manner if researchers only consider linear relationships among the constructs (Sim et al., 2014). Henceforth, in agreement with Teo, Tan, Ooi, Hew, and Yew (2015), this study performs a second stage of analysis, namely, Artificial Neural Network (ANN) analysis, to capture both linear and non-linear relationships among the constructs. In addition to its ability to capture both linear and non-linear relationships, ANN is a type of analysis approach that is inspired by the human neurological system; hence, it resembles a human brain and has the ability to acquire knowledge through a learning process (Chong, 2013). However, ANN has been criticised for its inability to test hypotheses of causal relationships (Tan, Ooi, Leong, & Lin, 2014). To enjoy the advantages of both PLS-SEM and ANN analyses, this study performs a dual-stage analysis, in which PLS-SEM is performed prior to ANN analysis. PLS-SEM is performed first to statistically identify the significant exogenous variables that have direct and indirect impacts on an endogenous variable, and ANN is performed subsequently to confirm the degrees of influence exerted by these exogenous variables. To confirm the suitability of ANN in this study, an ANOVA test of linearity was conducted (Ooi & Tan, 2016). It was found that nine relationships (out of 15) are non-linear in the multi-mediation model; this supports the necessity of ANN analysis.

5.1. Assessing common method bias

Common method bias is a potential problem when the responses for both exogenous and endogenous variables are collected from the same respondent (Chang, Van Witteloostuijn, Eden, & Eden, 2010). As such, this study has included some measures to control for such bias (Hew, Lee, Ooi, et al., 2016). Simple language

was used, and during the questionnaire design stage, it was ensured that the items in the questionnaire were sufficiently concise. Moreover, during the questionnaire administration stage, respondents were guaranteed anonymity and informed that there is neither a correct nor incorrect response to each of the items. To ensure that common method bias is not a serious concern in this study, two statistical analyses were performed. First, Harman's single-factor test reported that the common variance explained by the single factor is 45.79%; hence, this type of bias is not a serious concern, as the percentage is below the threshold of 50% (Teo, Tan, Ooi, & Lin, 2015). Second, as shown in Table 3, the alternative method proposed by Liang, Saraf, Hu, and Xue (2007) for assessing common method bias confirms that it is not a serious concern, as the ratio of the average substantive variance (0.7660) to the average method variance (0.0039) is relatively small at 196:1. Moreover, most of the method factor loadings are negative and insignificant.

5.2. Inspecting the measurement model

During the inspection of measurement model, both reliability and validity have to be fulfilled (Hair, Sarstedt, et al., 2014). Reliability can be established by means of composite reliability, which has to be more than 0.70 (Hair et al., 2012). As shown in Table 4, reliability is fulfilled by all constructs.

In accordance with Sarstedt et al. (2014), there are two types of validity that need to be established: convergent and discriminant validity. From their description, convergent validity can be confirmed if the indicator loadings are higher than 0.70 and the average variance extracted for each construct is greater than 0.50. Both Tables 4 and 5 indicate that convergent validity is fulfilled. In contrast, discriminant validity is demonstrated through the Fornell and Larcker (1981) criterion and cross-loadings of the indicators (Sarstedt et al., 2014). In the Fornell and Larcker (1981) criterion, the square root of the average variance extracted for each construct must be greater than the inter-construct correlations. Table 6 indicates that this criterion is satisfied. Moreover, according to Table 5, the indicators of each construct have higher loading values on their own construct than on other constructs. Hence, discriminant validity is once again established. In a more recent context, Henseler, Hubona, and Ray (2016) asserted that the discriminant validity needs to be verified through another criterion: the heterotrait-monotrait ratio of correlations must be significantly less than one. Table 7 indicates that this criterion is satisfied as well.

5.3. Examining the structural model

Given the sound measurement model, the next step was to examine the structural model to statistically verify the theoretically established paths and confirm the developed hypotheses. A bootstrapping procedure with 5000 sub-samples was performed through SmartPLS 3 (Ringle, Wende, & Becker, 2015) with the "no sign change" option, which delivers the most conservative outcomes (Hair, Hult, Ringle, & Sarstedt, 2014). The outcome of the examination is listed in Table 8 and displayed in Fig. 2 for better illustration.

In terms of the influences of environmental stimuli under MST platforms, perceived mobility influences tourists' perceived usefulness ($\beta = 0.4724$, $p < 0.001$), perceived ease of use ($\beta = 0.4469$, $p < 0.001$), and perceived enjoyment ($\beta = 0.1607$, $p < 0.01$), but not their MST shopping intention ($\beta = 0.0070$, $p > 0.10$). Moreover, social presence influences perceived usefulness ($\beta = 0.0866$, $p < 0.10$) and perceived enjoyment ($\beta = 0.2529$, $p < 0.001$), but not perceived ease of use ($\beta = 0.0230$, $p > 0.10$) or MST shopping intention ($\beta = -0.0018$, $p > 0.10$). In contrast, system and service quality impacts perceived usefulness ($\beta = 0.2831$, $p < 0.001$), perceived ease of use ($\beta = 0.3722$, $p < 0.001$), perceived enjoyment ($\beta = 0.3742$, $p < 0.001$), and MST shopping intention ($\beta = 0.2159$, $p < 0.001$). Therefore, H1 to H12 are all supported, except for H4,

Table 3
An alternative test for common method bias.

Constructs	Indicators	Substantive factor loading (Ra)	Substantive variance (Ra^2)	Method factor loading (Rb)	Method variance (Rb^2)
Perceived enjoyment	PE1	0.8290 ***	0.6872	0.0304 NS	0.0009
	PE2	0.8665 ***	0.7508	0.0367 NS	0.0013
	PE3	0.9766 ***	0.9537	−0.0680 *	0.0046
	PE4	0.8855 ***	0.7841	0.0040 NS	0.0000
Perceived ease of use	PEU1	0.8693 ***	0.7557	0.0302 NS	0.0009
	PEU2	0.9261 ***	0.8577	−0.0514 NS	0.0026
	PEU3	0.9687 ***	0.9384	−0.0747 (*)	0.0056
	PEU4	0.8064 ***	0.6503	0.0952 *	0.0091
Perceived mobility	PM1	0.8343 ***	0.6961	0.0440 NS	0.0019
	PM2	0.9060 ***	0.8208	−0.0218 NS	0.0005
	PM3	0.9223 ***	0.8506	−0.0442 NS	0.0020
	PM4	0.8849 ***	0.7830	0.0216 NS	0.0005
Perceived usefulness	PU1	0.8982 ***	0.8068	−0.0466 NS	0.0022
	PU2	0.9232 ***	0.8523	−0.0390 NS	0.0015
	PU3	0.8938 ***	0.7989	−0.0045 NS	0.0000
	PU4	0.7783 ***	0.6058	0.0915 *	0.0084
MST shopping intention	SI1	0.7211 ***	0.5200	0.1287 (*)	0.0166
	SI2	0.9721 ***	0.9450	−0.0721 *	0.0052
	SI3	0.8990 ***	0.8082	−0.0043 NS	0.0000
	SI4	0.9243 ***	0.8543	−0.0429 NS	0.0018
Social presence	SP1	0.8440 ***	0.7123	0.0279 NS	0.0008
	SP2	0.8039 ***	0.6463	0.0192 NS	0.0004
	SP3	0.7670 ***	0.5883	0.0716 (*)	0.0051
	SP4	0.8899 ***	0.7919	−0.0991 **	0.0098
	SP5	0.8197 ***	0.6719	−0.0229 NS	0.0005
System and service quality	SSQ1	0.9181 ***	0.8429	−0.1059 *	0.0112
	SSQ2	0.9216 ***	0.8493	−0.0264 NS	0.0007
	SSQ3	0.7910 ***	0.6257	0.1213 **	0.0147
Average		***0.8729***	***0.7660***	***−0.0001***	***0.0039***

Notes: ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, (*) $p < 0.10$, NS insignificant.

Table 4
Reliability and convergent validity.

Constructs	Mean	Std. Deviation	Composite Reliability	Average Variance Extracted
Perceived enjoyment	4.8369	1.0829	0.9386	0.7926
Perceived ease of use	5.0819	1.1383	0.9399	0.7964
Perceived mobility	5.3538	1.1147	0.9364	0.7864
Perceived usefulness	5.0575	1.0720	0.9281	0.7636
MST shopping intention	4.9300	1.1077	0.9330	0.7772
Social presence	4.2230	1.1032	0.9138	0.6797
System and service quality	4.6592	1.1017	0.9066	0.7642

Table 5
Indicator loadings and cross-loadings.

	Perceived enjoyment	Perceived ease of use	Perceived mobility	Perceived usefulness	MST shopping intention	Social presence	System and service quality
PE1	***0.8490***	0.4680	0.4248	0.5667	0.5046	0.4319	0.4345
PE2	***0.8972***	0.4557	0.4385	0.5635	0.6079	0.4009	0.5347
PE3	***0.9218***	0.4637	0.3904	0.5184	0.5762	0.4290	0.5025
PE4	***0.8916***	0.4334	0.3704	0.5317	0.6224	0.4477	0.5147
PEU1	0.4408	***0.8937***	0.6038	0.6053	0.4639	0.3542	0.5451
PEU2	0.4291	***0.8820***	0.5767	0.5294	0.4321	0.3416	0.5265
PEU3	0.4554	***0.9061***	0.5595	0.5557	0.4779	0.3176	0.4802
PEU4	0.4925	***0.8877***	0.5478	0.5964	0.5603	0.3179	0.5921
PM1	0.3911	0.5904	***0.8715***	0.5979	0.4477	0.3966	0.4144
PM2	0.4176	0.5794	***0.8892***	0.5747	0.4135	0.3736	0.4043
PM3	0.3706	0.5747	***0.8850***	0.5277	0.4210	0.3791	0.4607
PM4	0.4333	0.5289	***0.9012***	0.6012	0.4871	0.3879	0.4734
PU1	0.4914	0.5291	0.6142	***0.8582***	0.5534	0.3363	0.4409
PU2	0.5059	0.5343	0.5811	***0.8898***	0.5920	0.3992	0.4914
PU3	0.5600	0.5863	0.5616	***0.8894***	0.5962	0.3352	0.5037
PU4	0.5790	0.5941	0.5150	***0.8573***	0.6193	0.3623	0.4951
SI1	0.5556	0.5127	0.4931	0.6499	***0.8321***	0.2958	0.4760
SI2	0.5767	0.4828	0.4287	0.5906	***0.9119***	0.3331	0.5201
SI3	0.6008	0.4562	0.4098	0.5787	***0.8941***	0.4018	0.5731
SI4	0.5614	0.4653	0.4282	0.5607	***0.8862***	0.3662	0.5379
SP1	0.3936	0.3515	0.4141	0.4021	0.3498	***0.8682***	0.3056
SP2	0.3959	0.3257	0.3594	0.3264	0.3325	***0.8191***	0.3636
SP3	0.3918	0.3726	0.4360	0.3424	0.3543	***0.8222***	0.3481
SP4	0.4160	0.1979	0.2475	0.2790	0.2823	***0.8140***	0.3545
SP5	0.3842	0.2669	0.3054	0.3291	0.3069	***0.7969***	0.3653
SSQ1	0.4180	0.4885	0.4009	0.4138	0.4375	0.3039	***0.8282***
SSQ2	0.5336	0.4979	0.3930	0.4949	0.5467	0.3764	***0.9020***
SSQ3	0.5078	0.5880	0.4960	0.5310	0.5720	0.4105	***0.8906***

Note: PE = perceived enjoyment, PEU = perceived ease of use, PM = perceived mobility, PU = perceived usefulness, SI = MST shopping intention, SP = social presence, SSQ = system and service quality.

Table 6
Fornell and Larcker (1981) criterion.

	Perceived enjoyment	Perceived ease of use	Perceived mobility	Perceived usefulness	MST shopping intention	Social presence	System and service quality
Perceived enjoyment	***0.8903***						
Perceived ease of use	0.5103	***0.8924***					
Perceived mobility	0.4552	0.6407	***0.8868***				
Perceived usefulness	0.6113	0.6420	0.6498	***0.8738***			
MST shopping intention	0.6513	0.5441	0.4994	0.6756	***0.8816***		
Social presence	0.4796	0.3729	0.4335	0.4102	0.3965	***0.8244***	
System and service quality	0.5597	0.6026	0.4939	0.5528	0.5980	0.4196	***0.8742***

Notes: The square root of the average variance extracted for each construct is denoted in bold and italic, while the inter-construct correlations are shown off-diagonally.

H6, and H8. These environmental stimuli together explain 49.90%, 51.92%, and 40.39% of the variances in perceived usefulness ($R^2 = 0.4990$), perceived ease of use ($R^2 = 0.5192$), and perceived enjoyment ($R^2 = 0.4039$), respectively. Pertaining to the impact of tourists' internal organismic states on their response, only perceived usefulness ($\beta = 0.3544$, $p < 0.001$) and perceived enjoyment ($\beta = 0.2903$, $p < 0.001$) affect MST shopping intention; this result provides support for H13 and H15, respectively. Perceived ease of use ($\beta = 0.0395$, $p > 0.10$), however, does not significantly influence MST shopping intention; hence, this renders H14 unsupported. Overall, the multi-mediation model could account for 58.31% of the variance in MST shopping intention ($R^2 = 0.5831$). Regarding the control variables, none of them could provide a significant explanation of MST shopping intention, which indicates that these personal characteristics possess no confounding effect on the result.

Table 7
The heterotrait-monotrait ratio of correlations criterion.

	Perceived enjoyment	Perceived ease of use	Perceived mobility	Perceived usefulness	MST shopping intention	Social presence	System and service quality
Perceived enjoyment							
Perceived ease of use	0.5585						
Perceived mobility	0.5002	0.7028					
Perceived usefulness	0.6770	0.7073	0.7189				
MST shopping intention	0.7144	0.5957	0.5500	0.7500			
Social presence	0.5363	0.4090	0.4771	0.4577	0.4414		
System and service quality	0.6313	0.6801	0.5609	0.6300	0.6783	0.4835	

Table 8
Outcome of structural model examination.

Hypotheses	Paths	Path coefficients	T statistics	*P*-values	Bias corrected confidence intervals	Remarks
H1	Perceived mobility → Perceived usefulness ***	0.4724	9.5250	0.0000	[0.3883, 0.5537]	**Supported**
H2	Perceived mobility → Perceived ease of use ***	0.4469	11.2095	0.0000	[0.3788, 0.5123]	**Supported**
H3	Perceived mobility → Perceived enjoyment **	0.1607	2.9811	0.0029	[0.0709, 0.2492]	**Supported**
H4	Perceived mobility → MST shopping intention NS	0.0070	0.1324	0.8947	[-0.0829, 0.0906]	*Unsupported*
H5	Social presence → Perceived usefulness (*)	0.0866	1.7804	0.0751	[0.0077, 0.1663]	**Supported**
H6	Social presence → Perceived ease of use NS	0.0230	0.4898	0.6243	[-0.0564, 0.0983]	*Unsupported*
H7	Social presence → Perceived enjoyment ***	0.2529	5.2511	0.0000	[0.1719, 0.3314]	**Supported**
H8	Social presence → MST shopping intention NS	−0.0018	0.0404	0.9677	[-0.0824, 0.0683]	*Unsupported*
H9	System and service quality → Perceived usefulness ***	0.2831	5.4580	0.0000	[0.1950, 0.3675]	**Supported**
H10	System and service quality → Perceived ease of use ***	0.3722	7.7244	0.0000	[0.2884, 0.4502]	**Supported**
H11	System and service quality → Perceived enjoyment ***	0.3742	6.9383	0.0000	[0.2796, 0.4573]	**Supported**
H12	System and service quality → MST shopping intention ***	0.2159	3.4087	0.0007	[0.1130, 0.3182]	**Supported**
H13	Perceived usefulness → MST shopping intention ***	0.3544	4.9809	0.0000	[0.2339, 0.4733]	**Supported**
H14	Perceived ease of use → MST shopping intention NS	0.0395	0.6875	0.4918	[-0.0579, 0.1342]	*Unsupported*
H15	Perceived enjoyment → MST shopping intention ***	0.2903	4.9018	0.0000	[0.1934, 0.3927]	**Supported**
Control variables						
	Age → MST shopping intention NS	−0.0211	0.5278	0.5977	[-0.0880, 0.0441]	*Unsupported*
	Educational level → MST shopping intention NS	−0.0527	1.5200	0.1286	[-0.1111, 0.0029]	*Unsupported*
	Gender → MST shopping intention NS	0.0268	0.7673	0.4429	[-0.0306, 0.0841]	*Unsupported*
	Income level → MST shopping intention NS	0.0184	0.4185	0.6756	[-0.0511, 0.0937]	*Unsupported*

Notes: ***$p < 0.001$, **$p < 0.01$, (*) $p < 0.10$, NS insignificant.

5.4. The predictive relevance and effect size

In addition to using the coefficient of determination (R^2) to assess the predictive accuracy of a model, Hair, Hult, et al. (2014) and Hair, Sarstedt, et al. (2014) suggested using the cross-validated redundancy (Q^2) to ascertain the predictive relevance of the model. If the Q^2 value of an endogenous variable is greater than zero, one can conclude that the model has predictive relevance for it (Hair, Hult, Ringle, & Sarstedt, 2017). From Table 9, it is verified that the multi-mediation model has predictive relevance for perceived usefulness, perceived ease of use, perceived enjoyment, and MST shopping intention.

In addition, the effect size f^2 for each of the exogenous variables is calculated in Table 9. According to Hair, Hult, et al. (2014) and Hair, Sarstedt, et al. (2014), effect size f^2 indicates the contribution made by an exogenous variable towards the R^2 value of an endogenous variable, and the values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively. Perceived mobility has medium effects on perceived ease of use and perceived usefulness, but a small effect on perceived enjoyment. In contrast, system and service quality has medium effects on perceived enjoyment and perceived ease of use, but a small effect on perceived usefulness. Lastly, all significant predictors of MST shopping intention have small effects on MST shopping intention.

5.5. Analysing the multiple mediating effects

Instead of using the method proposed by Baron and Kenny (1986) in testing for multiple mediating effects, this study follows an approach advocated by Hair et al. (2017), and Zhao, Lynch, and Chen (2010). According to their descriptions, there are two types of non-mediation and three categories of mediation. If both direct and indirect effects between an independent variable and a dependent variable via a mediator are insignificant, the path has no-effect non-mediation. However, if only the direct effect is significant, the path has direct-only non-mediation; if only the indirect effect is significant, researchers need to further assess the significance of the direct effect to further distinguish between complementary partial mediation, competitive partial mediation, and full mediation. Complementary partial mediation occurs when the direct effect is significant and moves in the same direction as the indirect effect, while competitive partial mediation occurs when the direct effect is significant but moves in the opposite direction of the indirect effect. Lastly, full mediation only occurs when the direct effect is insignificant. In addition, researchers should check whether the total effect is significant for each path to establish mediation.

From Table 10, it is ascertained that perceived usefulness and perceived enjoyment function act as the perfect mediators between perceived mobility and MST shopping intention; they both also fully mediate the effect of social presence on MST shopping intention. This outcome supports H16a, H16b, H18a, and H18b. Although these two stimuli do not fully mediate the path from system and service quality to MST shopping intention, they partially mediate the path in a complementary manner. Hence, H16c and H18c are partially supported. Surprisingly, perceived ease

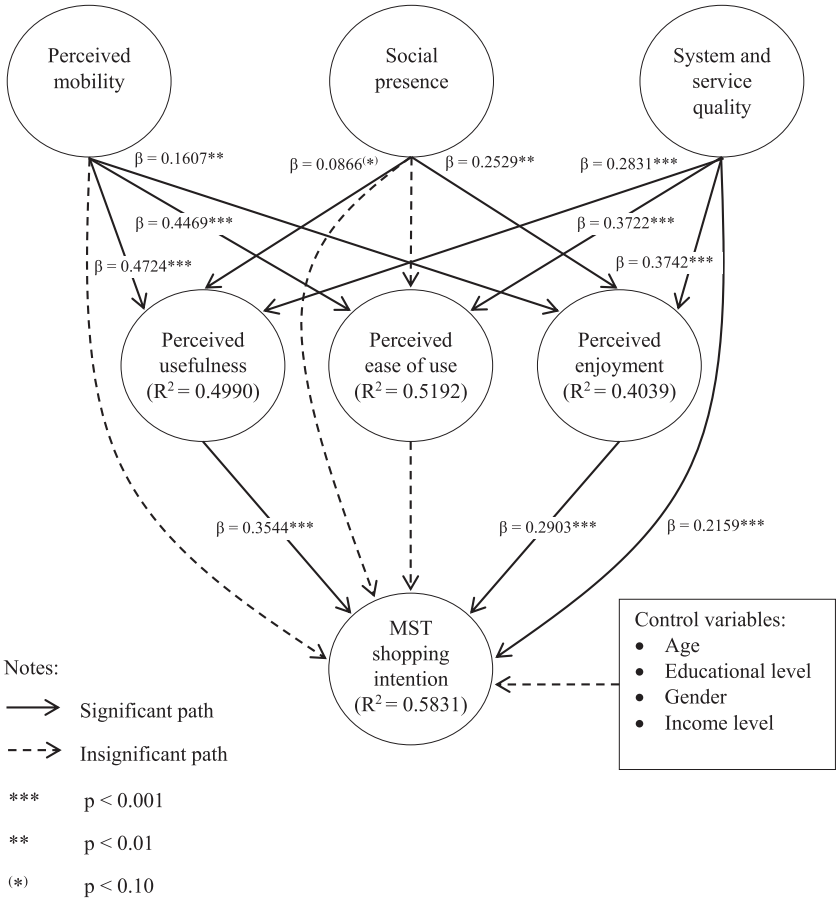


Fig. 2. Outcome of the structural model examination.

Table 9
Predictive relevance and effect size.

Endogenous variables	R^2	Q^2	Exogenous variables	Effect size f^2
Perceived enjoyment	0.4039	0.2987	Perceived mobility	0.0301
			Social presence	0.0811
			System and service quality	0.1654
Perceived ease of use	0.5192	0.3841	Perceived mobility	0.2882
			Social presence	0.0008
			System and service quality	0.2028
Perceived usefulness	0.4990	0.3565	Perceived mobility	0.3090
			Social presence	0.0113
			System and service quality	0.1126
MST shopping intention	0.5831	0.4190	Perceived enjoyment	0.1012
			Perceived ease of use	0.0016
			Perceived mobility	0.0001
			Perceived usefulness	0.1224
			Social presence	0.0000
			System and service quality	0.0591

of use does not play any mediating role between the stimuli (i.e., perceived mobility, social presence, system and service quality) and response (i.e., MST shopping intention); thus, H17a, H17b, and H17c are unsupported. Moreover, the total effects are significant for the supported hypotheses, which again indicates that perceived usefulness and perceived enjoyment play multiple mediating roles.

5.6. ANN analysis

This study employs a multi-layer perceptron ANN with the feed-forward back-propagation algorithm, since this type of algorithm can minimise the error during ANN analysis (Sim et al., 2014). To avoid over-fitting, a ten-fold cross-validation procedure was performed, with 90% of the data being used in the training process and the remaining 10% being used for testing purposes (Ooi & Tan, 2016). A sigmoid function was selected as the non-linear activation function for the hidden and output layers, while the number of hidden neurons was generated by SPSS v22 automatically (Leong, Hew, Tan, & Ooi, 2013).

To measure the predictive accuracy and predictive relevance, researchers should calculate the root-mean-square error values and observe the number of non-zero synaptic weights that are

Table 10
Multiple mediation analysis.

Hypotheses and paths	Specific indirect effects	Direct effect	Total effect	Types of Mediation	Remarks
H16a: Perceived mobility to MST shopping intention via perceived usefulness	0.1674^{***}	0.0070^{NS}	0.2387^{***}	Full mediation	**Supported**
H16b: Social presence to MST shopping intention via perceived usefulness	$0.0307^{(*)}$	-0.0018^{NS}	0.1032^{*}	Full mediation	**Supported**
H16c: System and service quality to MST shopping intention via perceived usefulness	0.1003^{**}	0.2159^{***}	0.4395^{***}	Complementary partial mediation	**Partially supported**
H17a: Perceived mobility to MST shopping intention via perceived ease of use	0.0177^{NS}	0.0070^{NS}	0.2387^{***}	No-effect non-mediation	*Unsupported*
H17b: Social presence to MST shopping intention via perceived ease of use	0.0009^{NS}	-0.0018^{NS}	0.1032^{*}	No-effect non-mediation	*Unsupported*
H17c: System and service quality to MST shopping intention via perceived ease of use	0.0147^{NS}	0.2159^{***}	0.4395^{***}	Direct-only non-mediation	*Unsupported*
H18a: Perceived mobility to MST shopping intention via perceived enjoyment	0.0467^{*}	0.0070^{NS}	0.2387^{***}	Full mediation	**Supported**
H18b: Social presence to MST shopping intention via perceived enjoyment	0.0734^{***}	-0.0018^{NS}	0.1032^{*}	Full mediation	**Supported**
H18c: System and service quality to MST shopping intention via perceived enjoyment	0.1086^{***}	0.2159^{***}	0.4395^{***}	Complementary partial mediation	**Partially supported**

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{(*)}p < 0.10$, ^{NS} insignificant.

linked to hidden neurons (Teo, Tan, Ooi, Hew, et al., 2015). A lower root-mean-square error value implies a higher level of predictive accuracy and represents a great fit and forecast of the data (Hew et al., 2017). After ascertaining both predictive accuracy and predictive relevance, a sensitivity analysis was performed to rank the exogenous variables in terms of their relative importance with respect to the endogenous variable (Hew & Kadir, 2016).

During the first stage of PLS-SEM analysis, it was confirmed that perceived usefulness and perceived enjoyment (i.e., the cognitive and affective reactions of tourists) could mediate the relationships between environmental stimuli and tourists' MST shopping intention (i.e., their response). To obtain further insights pertaining to the tourists' response, three ANN models were built in the second stage of analysis, with the statistically significant exogenous variables used as input neurons. The first and second ANN models attempt to model the relationships between environmental stimuli and tourists' inner organism changes (i.e., perceived usefulness and perceived enjoyment), and the third model seeks to understand the influences exerted by environmental stimuli and tourists' inner organism changes on MST shopping intention. Fig. 3 displays the three developed ANN models.

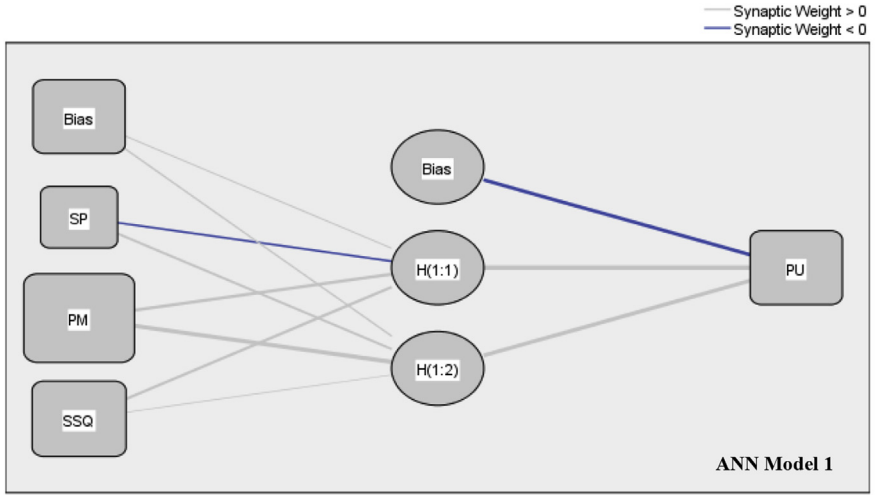
The relationships between stimuli and perceived ease of use were excluded from the second stage of ANN analysis, as perceived ease of use has no significant direct influence on MST shopping intention and does not significantly mediate the relationships between stimuli and response. For the same reasons, perceived ease of use was also dropped in ANN Model 3. Nevertheless, as shown in Table 10, since perceived mobility and social presence have significant indirect effects, and system and service quality has a significant direct effect on MST shopping intention, they were included in ANN Model 3 as the input neurons. Such inclusion is in accordance with Mostafavi et al. (2015) and Yuce et al. (2014), who ruled that the input neurons should consist of both direct and indirect predictors of the output neuron.

From Fig. 3, it is observed that in each ANN model, the non-zero synaptic weights are connected to at least one hidden neuron, which implies the achievement of predictive relevance of these ANN models. Moreover, in Table 11, it is also confirmed that these models have high levels of predictive accuracy, as the root-mean-square error values are close to zero.

Considering the high levels of predictive accuracy and predictive relevance of ANN models, Table 12 shows the sensitivity analysis that ranks the relative importance of input neurons (i.e., the exogenous variables) in each ANN model. In ANN Model 1, perceived mobility shows the greatest level of importance for perceived usefulness, followed by system and service quality and social presence. Interestingly, in ANN Model 2, perceived mobility is the least important reason for tourists to feel joy in using MST platforms for shopping. Instead, system and service quality, together with social presence, has a higher impact on tourists' perceived enjoyment. On another hand, in terms of MST shopping intention, perceived usefulness, perceived enjoyment, and system and service quality are the top three in terms of their influence, whereas perceived mobility and social presence have negligible influence. This outcome is expected, as the influences of perceived mobility and social presence on MST shopping intention are fully mediated by perceived usefulness and perceived enjoyment. This result also echoes that obtained in the multiple mediation analysis.

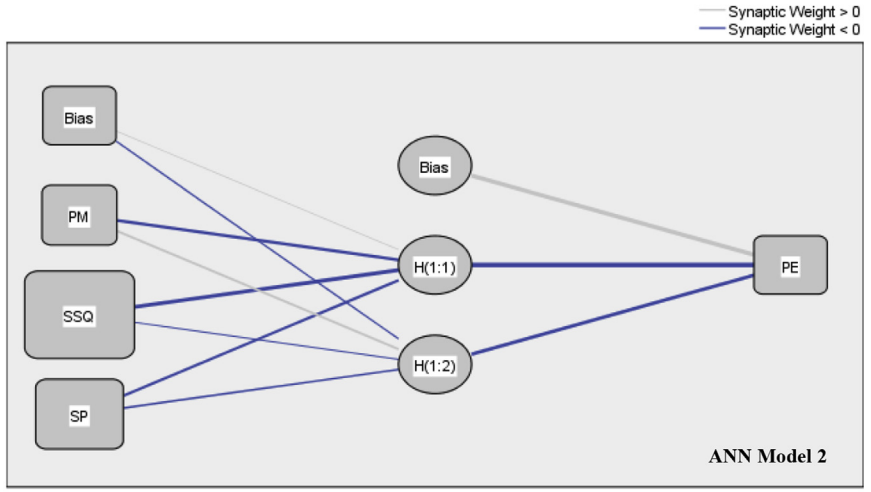
6. Discussions

The PLS-SEM analysis confirmed most of the theoretical paths that were established, except for three paths that are associated with MST shopping intention and one path that is related to perceived ease of use. Two of the key environmental stimuli under



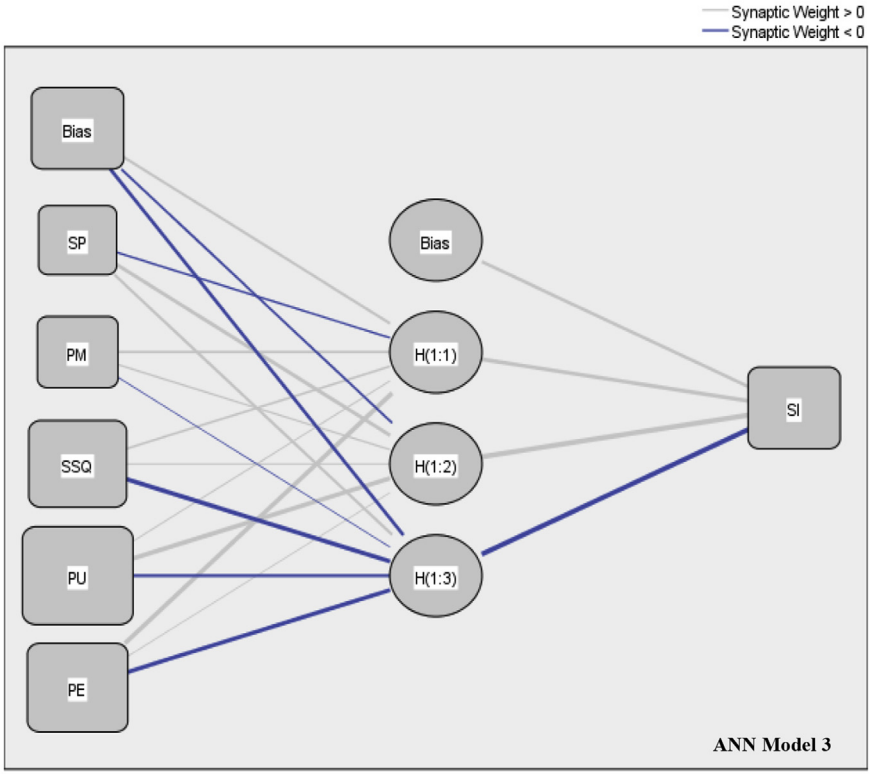
Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid



Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid



Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid

Note: PE = perceived enjoyment, PEU = perceived ease of use, PM = perceived mobility, PU = perceived usefulness, SI = MST shopping intention, SP = social presence, SSQ = system and service quality.

Fig. 3. The ANN models developed.

Table 11
Root-mean-square error values incurred during training and testing stages.

Neural networks	ANN Model 1 *Input neurons: Perceived mobility, social presence, and system and service quality Output neuron: Perceived usefulness*		ANN Model 2 *Input neurons: Perceived mobility, social presence, and system and service quality Output neuron: Perceived enjoyment*		ANN Model 3 *Input neurons: Perceived enjoyment, perceived mobility, perceived usefulness, social presence, and system and service quality Output neuron: MST shopping intention*	
	Training	Testing	Training	Testing	Training	Testing
ANN1	0.0948	0.0695	0.1034	0.0867	0.0866	0.0671
ANN2	0.0904	0.0808	0.0949	0.0914	0.0813	0.0873
ANN3	0.0920	0.0742	0.1007	0.0901	0.0898	0.0770
ANN4	0.0893	0.0943	0.1018	0.0869	0.0944	0.0834
ANN5	0.1036	0.1329	0.1085	0.1229	0.1017	0.0899
ANN6	0.0966	0.0904	0.0990	0.0910	0.0829	0.0886
ANN7	0.0990	0.0860	0.0987	0.1067	0.0872	0.0860
ANN8	0.0925	0.0996	0.0994	0.1059	0.0951	0.0757
ANN9	0.0890	0.0866	0.0967	0.1002	0.0910	0.0917
ANN10	0.0937	0.0812	0.0990	0.0985	0.0826	0.0919
Mean	***0.0941***	***0.0896***	***0.1002***	***0.0980***	***0.0893***	***0.0838***
Std. deviation	***0.0046***	***0.0177***	***0.0038***	***0.0114***	***0.0065***	***0.0081***

the environment of MST shopping, namely, perceived mobility and social presence, were found to have no direct influence on MST shopping intention. Nonetheless, the multiple mediation analysis offers further insights into and explanation for such interesting findings. Despite that neither of the key environmental stimuli directly influences tourists' MST shopping intention, they indirectly transmit their influence through perceived usefulness and perceived enjoyment. Such outcomes are in agreement with the SOR paradigm (Chan et al., 2017; Eroglu et al., 2001; Mehrabian & Russell, 1974), which posits that inner organism changes intervene between environmental stimuli and response. Such results also support the mediating roles of perceived usefulness and perceived enjoyment in this study, which are consistent with those of other researchers (Heijden, 2003; Henderson & Divett, 2003; Wu et al., 2007) who have noticed that perceived usefulness and perceived enjoyment serve as the mediators of behavioural intention.

Another notable finding is that social presence has no direct influence over perceived ease of use, which implies that this social element of MST platforms does not cause tourists to perceive MST platforms as easy tools to use in TPS shopping. It is believed that when too many social elements are made available, such as the reviews submitted by other tourists pertaining to TPS (Kumar & Benbasat, 2006; Shen, 2012), tourists will find them to be overwhelming and difficult to absorb when making an informed decision (Schindler & Bickart, 2012). Subsequently, they will lose faith in the ease of use of MST platforms in regard to TPS shopping. This finding might be explained by a recent phenomenon named online social network fatigue (Lee, Son, & Kim, 2016; Zhang, Zhao, Lu, & Yang, 2016), which will be further discussed in a later section.

In addition, it is astonishing to learn that the perceived ease of use, which is a cognitive reaction of tourists after interacting with environmental stimuli, neither directly affects MST shopping intention nor mediates the influences of environmental stimuli. This outcome is similar to that of a study of mobile shopping by Agrebi and Jallais (2015), who learnt that perceived ease of use has no significant influence over usage intention. They argued that this outcome is attributable to the vast amount of experience with smartphones among the users, which allows them to handle the device easily in mobile shopping. Thus, perceived ease of use of mobile shopping loses its influence in this case. As observed by Castañeda, Muñoz-Leiva, and Luque (2007) and Lin (2011), experienced users are less influenced by the effect of perceived ease of use in deciding whether to revisit a website and using an e-learning service. Since 65% of the respondents in this study had more than three years of experience in using MST platforms, they might have developed a high degree of familiarity with these platforms and, subsequently, became impervious to the ease of use of these platforms. In another study of online tourism shopping, Nunkoo and Ramkissoon (2013) also discovered that when tourists have extensive experience in online tourism shopping, they tend to focus more on the usefulness of online tourism shopping than on its ease of use. In addition, their study also supports the significant role of perceived usefulness in this study. As such, owing to the respondents' extensive experience in using MST platforms, it is logical that the perceived usefulness exerts significant influence on MST shopping intention instead of perceived ease of use in this study. Furthermore, the insignificant mediating roles of perceived ease of use might be explained by its insignificant direct influence on MST shopping intention. As noted by Loeys, Moerkerke, and Vansteelandt (2014), when a mediator has no effect on the dependent variable, there is no indirect effect from the independent variable via the mediator. This statement supports the results shown in Table 10, which indicate that all the specific indirect effects from perceived mobility, social presence, and system and service quality on MST shopping intention

Table 12
Sensitivity analysis.

Neural networks	ANN Model 1 *Output neuron: Perceived usefulness*			ANN Model 2 *Output neuron: Perceived enjoyment*			ANN Model 3 *Output neuron: MST shopping intention*				
	Perceived mobility	System and services quality	Social presence	System and services quality	Social presence	Perceived mobility	Perceived usefulness	Perceived enjoyment	System and services quality	Perceived mobility	Social presence
ANN1	0.612	0.335	0.053	0.303	0.359	0.338	0.374	0.270	0.244	0.069	0.043
ANN2	0.588	0.312	0.100	0.447	0.285	0.268	0.251	0.328	0.296	0.040	0.085
ANN3	0.533	0.375	0.092	0.506	0.220	0.274	0.393	0.198	0.211	0.125	0.073
ANN4	0.551	0.346	0.103	0.349	0.353	0.298	0.458	0.164	0.167	0.091	0.120
ANN5	0.445	0.382	0.173	0.409	0.387	0.204	0.396	0.226	0.248	0.035	0.094
ANN6	0.367	0.350	0.283	0.468	0.311	0.220	0.389	0.283	0.258	0.037	0.033
ANN7	0.307	0.354	0.339	0.365	0.362	0.274	0.378	0.277	0.284	0.012	0.049
ANN8	0.405	0.428	0.167	0.397	0.307	0.296	0.145	0.329	0.231	0.131	0.165
ANN9	0.497	0.347	0.156	0.469	0.402	0.129	0.305	0.209	0.260	0.161	0.066
ANN10	0.517	0.404	0.079	0.450	0.314	0.236	0.378	0.291	0.214	0.082	0.033
Avg. relative importance	*0.482*	*0.363*	*0.155*	*0.416*	*0.330*	*0.254*	*0.347*	*0.258*	*0.241*	*0.078*	*0.076*
Normalised relative importance (%)	**100**	**75**	**32**	**100**	**79**	**61**	**100**	**74**	**70**	**23**	**22**

via perceived ease of use are insignificant. Given the significance of the specific indirect effect in constituting the first requirement in establishing mediations (Zhao et al., 2010), it is sensible to argue that the insignificant direct influence of perceived ease of use on MST shopping intention suppresses the meditating roles of perceived ease of use in this study.

Overall, the applicability of the SOR framework has been established in the context of MST shopping. All environmental stimuli (perceived mobility, social presence, and system and service quality) can influence tourists' cognitive (perceived usefulness) and affective (perceived enjoyment) reactions, which consequently mediate between the stimuli and response (MST shopping intention). Although perceived mobility and system and service quality affect the perceived ease of use, this particular cognitive reaction does not influence MST shopping intention or mediate the effects of stimuli. Moreover, system and service quality can directly and indirectly motivate MST shopping intention.

Through the ANN analysis, perceived mobility emerges as the strongest driver of perceived usefulness, which serves as a main motivation for tourists to engage in MST shopping. This outcome is identical to that reported by Kim et al. (2015), who found that mobility is a key element that tourism marketers should emphasise to attract mobile shoppers. In addition, this outcome supports the claim made by Xiang et al. (2015) that tourists are now making decisions and planning their itineraries during their journeys. Henceforth, it is logical that the mobility feature of MST platforms is causing tourists to award higher usefulness ratings to MST platforms. Moreover, concurring with Hsu et al. (2012) and Kim, Ahn et al. (2013), this study discovers that system and service quality serves as the most important element for the enjoyment of tourists when using MST platforms for shopping.

In addition, social presence, which is an essential element under MST platforms, did not exert the strongest influence on either perceived usefulness or perceived enjoyment. This result implies that this social element of MST platforms needs to be enhanced, as tourists are focusing on other non-social elements when forming their MST shopping intention. Some recent studies have suggested that too much information and social interaction on online social networks could result in online social network fatigue, which subsequently causes users to discontinue their use of online social networks (Lee et al., 2016; Zhang et al., 2016). As elaborated earlier, the presence of too many social elements might overwhelm the tourists, who consequently find that the MST platforms are difficult to use for TPS shopping. Hence, it is sensible that tourists are focusing more on other non-social stimuli (i.e., perceived mobility and system and service quality) in forming their cognitive and affective reactions. Perhaps, this might also explain the lowermost total effect and the bottommost ranking of social presence in terms of its influence towards MST shopping intention in Table 10 and the ANN Model 3 in Table 12.

7. Implications

7.1. Managerial implications

According to the results, practitioners should consider all the environmental stimuli that were identified in this study, especially social presence, to trigger tourists' inner cognitive and affective reactions (i.e., perceived usefulness and perceived enjoyment), which could greatly influence the MST shopping intention of tourists. Since practitioners have control over the environmental stimuli only, the following discussion of the implications is focused on suggestions for improving these stimuli.

To improve perceived mobility, practitioners are urged to consider the current style of tourists in making their decisions. A recent study has found that tourists are making decisions and planning itineraries during their trips (Xiang et al., 2015); thus, practitioners should contemplate this current trend and design several useful features to support tourists in making real-time decisions while on the move. Identical to the radar concept, practitioners could collect the location information from tourists and make suggestions and recommendations for nearby TPS, to facilitate their decision making. Most importantly, these suggestions must be tailored to their preferences, which can be captured and predicted from their past searches and transactions. Although most practitioners have developed their own mobile applications for users to use on the move, there are still some users who are unsatisfied with the available mobile applications. For instance, approximately 7% of AirBnB users have left a one-star rating for the mobile application in the Google Play Store (Google Play, 2017). Practitioners are therefore encouraged to review the feedback left by users and improve their mobile applications accordingly.

Second, practitioners are strongly encouraged to enhance their system and service quality, as this particular factor is of great importance for the perceived enjoyment of tourists in using MST platforms for TPS shopping. Given that tourists are getting used to making decisions on the move, practitioners should ensure that their systems provide fast responses, perform transactions safely and timely, provide real-time customer service or live chat, and resolve disputes between buyers and sellers in a fast and easy manner. Tracking the preferences of individual tourists is another way to improve the service quality.

Finally, although social presence does not strongly influence perceived usefulness and perceived enjoyment, practitioners still have to take care of this social element in their platforms. This phenomenon might be attributable to the information overload that fatigues tourists when making fast decisions on the move (Lee et al., 2016; Zhang et al., 2016). As such, for tourists to make faster decisions while travelling, practitioners must devote intense efforts in resolving the information overload. For instance, practitioners could consider allowing tourists to rate the helpfulness of comments and feedback for a particular TPS and could then display them in descending order based on their ratings in the search result. This could help filter out comments that were posted by the sellers. In addition, practitioners should only allow people who have purchased the TPS to leave comments and make continued efforts in banning users who post fake comments on a frequent basis. These actions and efforts are also believed to be relevant for improving the service quality.

Moreover, practitioners should consider the roles of artificial intelligence in tourism. The simplest way to achieve this is to design and integrate a voice command function into the mobile applications. With the fusion of artificial intelligence and voice command functionality, tourists could ask any questions that are related to TPS while they are travelling, without the hassle of thorough searching and reading. This could help tourists develop positive opinions pertaining to the perceived mobility, social presence, and system and service quality. Additionally, the problem of information overload is relieved with such a solution.

7.2. Theoretical implications

This study attempted to explain the MST shopping intention with a multi-mediation model that was built using the SOR framework. To understand the complicated relationships among constructs, a dual-stage analysis was performed with a multiple mediation analysis. Through the theoretical lens of the SOR framework, the multi-mediation model successfully united the Social Presence Theory (Short et al., 1976), DeLone and McLean Model of Information Systems Success (DeLone & McLean, 2003), Technology Acceptance Model (Davis, 1989), and Motivation Theory (Deci, 1975). In addition, perceived mobility, which is a unique

factor in mobile technology studies (Hong et al., 2008; Li et al., 2012; Liu & Cheng, 2015), is incorporated into the model. Thus far, tourism researchers have yet to investigate these models and theories as a single model under the paradigm of the SOR framework. Overall, the multi-mediation model provides a moderate level of predictive accuracy ($R^2 = 0.5831$) and a high level of predictive relevance ($Q^2 = 0.4190$) for MST shopping intention (Hair, Sarstedt, et al., 2014). These results support the use of the proposed multi-mediation model; hence, the proposed model is believed to reveal some fresh insights and potential implications to tourism researchers.

First, although the first stage of PLS-SEM analysis revealed the insignificant direct influences of perceived mobility and social presence on MST shopping intention, the multiple mediation analysis suggested that these environmental stimuli exert significant indirect influences on MST shopping intention via perceived usefulness and perceived enjoyment. In this study, it is argued that without a proper mediation analysis, the true roles of perceived mobility and social presence and the mediating roles of perceived usefulness and perceived enjoyment would be buried and neglected. Thus far, researchers who have studied online tourism shopping (e.g., Jensen, 2012), mobile tourism shopping (e.g., Kim et al., 2015), and the use of online social networks in tourism (e.g., French et al., 2017) usually do not move on to make further discoveries pertaining to the indirect influence played by an exogenous variable after they have discovered that the exogenous variable has insignificant direct effects. Based on the findings obtained in this study, tourism researchers are urged to conduct a mediation analysis to properly assess the indirect effects of exogenous variables and the mediating roles of mediators in their research models.

Second, given the insignificant direct roles of an exogenous variable, some tourism researchers (e.g., Dedeke, 2016; Kim, Lee, Shin, & Yang, 2017) tended to ignore its indirect influences and subsequently omitted the relevant discussions pertaining to its indirect roles. As reported in this study, the indirect effects of exogenous variables (i.e., perceived mobility and social presence) could also be material to the endogenous variable (i.e., MST shopping intention); hence, it is necessary to consider these exogenous variables and rank their influences on the endogenous variable. However, in practice, it is rather difficult to rank the exogenous variables according to their influences when both direct and indirect effects are involved in PLS-SEM analysis. The ranking of influences is made more difficult by solely relying on a single stage of PLS-SEM analysis, if researchers need to consider the non-linear relationships among constructs. In this study, it is argued that the ignorance of indirect effects and non-linear relationships could render impossible the description of the real-world decision-making process in a simplified manner. As such, a second stage of ANN analysis, which accounts for both indirect effects (Mostafavi et al., 2015; Yuce et al., 2014) and non-linear relationships (Hew et al., 2017; Ooi & Tan, 2016), needs to be seriously considered by tourism researchers when ranking the influences of exogenous variables. Tourism researchers are advised to employ a dual-stage analysis approach in their studies to obtain further insights from their data and contribute new knowledge to the literature.

Third, given the insignificant role of social presence on perceived ease of use, in addition to its tiny role in shaping the MST shopping intention, this study has revealed another significant finding: tourists might have a certain degree of online social network fatigue when they are using MST platforms for TPS shopping. Therefore, a detailed investigation into this recent research avenue seems to be a promising direction for tourism researchers, since research on the use of online social networks in tourism is currently in its infancy. Researchers should also unearth other social-related environmental stimuli, which might play noteworthy roles in developing the MST shopping intention. All these research directions will enrich the current state of tourism research.

8. Limitations and future suggestions

First, given the use of the non-probability judgemental sampling technique, generalisation should be practised with caution. As argued by Tansey (2007), generalisation can only be realised with probability sampling techniques, which are simply unrealisable in this study owing to the missing sampling frame. Nonetheless, future studies could consider a non-probability quota sampling technique, as such techniques are preferred methods for enhancing the representativeness of the sample, in comparison to other non-probability sampling methods (Cooper & Schindler, 2014). Second, since it is argued that the insignificant influence of perceived ease of use on MST shopping intention is due to the ample experience of respondents in using MST platforms, researchers could recruit inexperienced respondents to verify this claim. A multi-group comparison between experienced and inexperienced users seems to be promising, too. Third, as this study targeted only domestic tourists, researchers could perform a comparative study with a sample that consists of both foreign and domestic tourists to see if the multi-mediation model holds in a cross-national context.

9. Conclusion

MST shopping is regarded as the next revolution in the tourism industry and a trendy way to purchase TPS among tourists. With the aim of offering new knowledge, this study ventures into this relatively new research area. It is hoped that this study will encourage researchers to further investigate this emerging discipline while inspiring practitioners to incorporate more advanced features into their MST platforms to benefit tourists and eventually make their travels easier.

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Appendix A. Abbreviations used and their full forms

Abbreviations	Full forms
ANN	Artificial Neural Network
MST	Mobile social tourism
PLS-SEM	Partial Least Squares Structural Equation Modelling
Q^2	Cross-validated redundancy
R^2	Coefficient of determination
SOR	Stimulus-Organism-Response
TPS	Tourism products and services
UNESCO	The United Nations Educational, Scientific and Cultural Organization

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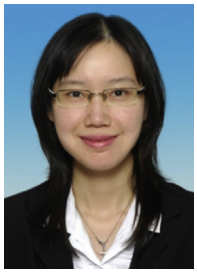

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