How smart tourism technologies affect tourist destination loyalty

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Abstract
Purpose – The purpose of this study is to investigate how smart tourism technologies and memorable tourism experiences affect tourist satisfaction and tourist destination loyalty.

Design/methodology/approach – A total of 600 questionnaires were distributed, 360 were returned (60% response rate) and a covariance-based structural equation modeling technique was used to test the hypotheses.

Findings – The results of this study explain that smart tourism technologies and memorable tourism experiences play essential roles in enhancing tourist satisfaction and tourist destination loyalty.

Practical implications – This study specifies that tourists have pleasant memories and are satisfied at a tourist destination; as a result, they are more likely to revisit and recommend a tourist destination to their friends, family and other tourists. If a tourist has a negative experience with smart city info-structure facilities, a tourist might reach an overall conclusion to not revisit or recommend the location to other tourists.

Originality/value – This study provides empirical evidence to support the importance of smart tourism technologies and memorable tourism experiences in enhancing tourist satisfaction and tourist destination loyalty.

Keywords Smart tourism technologies, Memorable tourism experiences, Tourist satisfaction, Tourist destination loyalty

Paper type Research paper

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1. Introduction

Information technology plays an essential role in the tourism industry. The effect of information technology on tourism has received attention with the birth of smart tourism (Yoo et al., 2017) and this phenomenon of digital transformations has reached all sectors (Ballina et al., 2019). Therefore, the concept of smart tourism technology has become the most critical element of the tourism industry. It integrates tourist resources and advanced information technologies, and thus it is able to provide meaningful, timely data and interconnectivity among tourism stakeholders (Buhalis, 2019; Gretzel et al., 2015c; Johnson and Samakovlis, 2019). By using advanced information and communication technologies (ICTs) in smart tourism destinations, most industry players are endeavoring to enhance tourist experiences to achieve competitive advantages. For example, by providing smart tourism apps, tourists can use their smartphones to manage their future trip plans and receive reviews and feedback from other travelers on their past experiences before selecting a tourist destination (Lee et al., 2018).

Tourist experiences are critical for the tourism industry, and how smart tourism technologies will affect tourist experiences are challenging. For example, Jeong and Shin (2019) and Lee et al. (2018) conducted a study on smart tourism technologies in different cities and explained that smart tourism technologies had created memorable tourism experiences and tourist happiness. However, both studies are only focused on one destination and the findings cannot be generalized, as different countries with different tourists will have different experiences and familiarity with smart tourism technologies; such differences may lead to individual tourist’s dissatisfaction with smart tourism technologies (Yoo et al., 2017).

Moreover, the intrinsic characteristics of tourists might affect how they perceive and use technology, whereas different experiences are influenced by destination and trip characteristics (Femenia-Serra and Ivars-Baidal, 2018). In addition, memorable tourism experiences are recognized as an essential antecedent of future behaviors. Memorable tourism experiences refer to the ability of tourists to remember and recall the events that have occurred (Kim and Chen, 2019; Kim and Ritchie, 2014; Tung and Ritchie, 2011). In this part, a fundamental outcome of a tourist experience is memorability and it will affect the tourist satisfaction (Vada et al., 2019) and tourist destination loyalty (Jiang et al., 2016). Although the existing studies in the literature have proposed several results related to memorable tourism experiences, novel concepts regarding the degree to which tourists are satisfied and loyal to a tourist destination are gaining more attention in tourism studies. Therefore, other studies are encouraged to reach a better understanding of how smart tourism technologies will improve memorable tourism experiences (Jeong and Shin, 2019; Lee et al., 2018) and investigate the consequences of smart tourism technology (STT) and memorable tourism experience (MTE) as the best predictors of future behaviors. To fill these gaps, this study proposes an integrated model to explore the effects of smart tourism technologies and memorable tourism experiences on enhancing tourist satisfaction and tourist destination loyalty. More specifically, this study intends to address the following research questions:

**RQ1.** How will smart tourism technologies affect memorable tourism experiences?

**RQ2.** Do memorable tourism experiences enhance tourist satisfaction and tourist destination loyalty?
To answer these two research questions, this study is conducted at the individual level by distributing a survey to tourists who visited smart cities in Indonesia. Interestingly, smart city infrastructures are playing an essential role in affecting tourist behavior, as tourists receive benefits from smart city services during their stays (Um and Chung, 2019). Currently, there are 75 cities actively involved in the development of smart cities in Indonesia and it is expected that 70% of the country’s population will live in cities by 2025. There are four elements to becoming a smart city in Indonesia, namely, regional structures, infrastructures, superstructures and six smart city pillars (smart governance, branding, the economy, living, society and the environment) (Mahesa et al., 2019). Although the importance of information technology in the tourism industry has caused many smart cities to upgrade their info-structure to enhance tourists’ experiences, a holistic model that understands tourists’ decision-making process in the Indonesia context is still lacking in the literature. In this study, relevant items from SST constructs (Jeong and Shin, 2019; Lee et al., 2018) and MTE constructs (Jeong and Shin, 2019; Kim, 2018) are adapted. These items emphasize more the technical aspects of SST, where the interaction between SST and information of communication technology is an essential tool to confirm the quality of travel experiences (Koo et al., 2015; Lee et al., 2018). To attract tourists to visit a destination, tourist satisfaction and tourist destination loyalty are incorporated in this study. The tourist satisfaction constructs are adapted from (Jeong and Shin, 2019; Kim, 2018; Wang et al., 2019). The results of this study are expected to provide a significant contribution to the existing literature on the tourism industry to achieve competitive advantages and be able to compete with other tourist smart destinations.

2. Literature review
2.1 Smart tourism technologies
According to Neuhofer et al. (2015), smart tourism refers to particular applications that increase tourists’ experiences and creates added value for customers. More specifically, smart tourism technologies are specific tools, products and services that will generally add value by cultivating higher connectivity, interaction, personalization and co-creation (Buonincontri and Micera, 2016; Neuhofer et al., 2015) and raise overall travel experiences (Femenia-Serra and Ivars-Baidal, 2018; Simeon et al., 2017). Moreover, smart tourism can also be assumed to be an ecosystem established by a smart business network, smart destinations and smart technology infrastructures to maximize the value of the services and experiences for tourists (Femenia-Serra et al., 2019; Gretzel et al., 2015a; Um and Chung, 2019), mediate the tourist experience (Tussyadiah et al., 2018; Wang et al., 2012) and provide the info-structure for value co-creation (Buhalıs, 2019; Buhalıs and Foerste, 2015). Central key elements of STTs and the development of smart tourism are ICTs and the integration of ICTs into physical infrastructures; therefore, smart tourism has become prominent among academics and practitioners. For this reason, tourists will select a destination that provides a better information infrastructure such as faster internet connectivity and networking (Ghaderi et al., 2019; Kelly and Lawlor, 2019; Li et al., 2017). Huang et al. (2017) suggest that STTs have to include all forms of online tourism applications and information sources such as online travel agents, personal blogs, public websites, company websites, social media and smartphones. Other scholars have incorporated smart tourism systems such as decision support systems, ambient intelligence, mobile-connected devices, beacons, virtual reality (VR), augmented reality (AR), mobile apps, integrated payment methods, smart cards, cloud computing and radio-frequency identification (Gretzel et al., 2015b, 2015c; Huang et al., 2017; Jeong and Shin, 2019). In a smart tourism context, the application of these technologies will
play a significant part in providing tourism consumers and service providers with correct information, better decision support, greater mobility and quality tourism experiences (Cimbaljević et al., 2019; Sigala and Chalkiti, 2014).

Most of the scholars have defined smart tourism technology in the literature, and most of them have agreed that STTs are multidimensional constructs and categorized them into four dimensions, namely, accessibility, informativeness, interactivity and personalization (Huang et al., 2017; Jeong and Shin, 2019; Lee et al., 2018; No and Kim, 2015). According to Jeong and Shin (2019), accessibility refers to how an individual can access and use the information offered at the destination by using the different types of SSTs. Accessibility or reachability assumes that travelers and technology have the capability of being connected, reached and accessed by other entities (Kim and Garrison, 2009). Moreover, Domínguez Vila et al. (2019) point out that internet access plays an essential role in promoting destinations and attracting potential visitors. Therefore, accessibility becomes an important factor at tourism destinations and it plays a significant role in influencing tourists’ intentions and behaviors (Shafiee and Es-Haghi, 2017).

Lee et al. (2018) specify informativeness as the volume, frequency, sincerity and accuracy of the information received by travelers from the advanced ICT systems that are available. By using STTs such as AR or VR, tourists will receive the full attractions and range of information for their tourism activities (Jeong and Shin, 2019). Additionally, Pavlou et al. (2007) defined informativeness as the degree to which a website provides travelers with the information they perceived as resourceful and helpful. If the information is believed to be accurate, relevant and credible, it will enrich a traveler’s perception of a seller’s website’s informativeness (Pavlou et al., 2007). Due to the intangible nature of tourism, No and Kim (2015) classified tourism informativeness as consisting of personal or travel blogs, public websites, company websites and social media websites. Furthermore, Jeong and Shin (2019) emphasize that information quality and credibility play a significant role in influencing tourists’ overall experiences and enrich their travel experiences at smart tourism destinations.

According to Jeong and Shin (2019), interactivity promotes bilateral interaction and mutual communication between stakeholders when individuals use STTs. Following this definition, the more reciprocal the communication between a traveler and a website owner is, the more the site can respond to the particular needs of the traveler (Ha and James, 1998; Yoo et al., 2015). This advanced smart system will enhance two-way communication, connect all users, encourage travelers to explore and boost their travel service experiences (Gretzel et al., 2015b; Pavlou et al., 2007). In addition, Jeong and Shin (2019) emphasize that interactivity will allow smart tourism destinations to accumulate dynamic tourist data and offer more attractive tailored services.

Huang et al. (2017) define personalization as the ability of a traveler to obtain specific information to determine his/her personal trip planning needs. Fundamentally, personalization is a process of gathering and using the individual information of the customers’ preferences and needs to provide them with information and proposals that are suitable for the customers’ requirements (Buhalis and Amaranggana, 2015). Other scholars defined personalization as individual attention to a particular product, service and information (No and Kim, 2015; Park and Gretzel, 2007). Moreover, Jeong and Shin (2019) emphasize that personalization will allow STTs to provide the most important and accurate information for tourists to enhance their travel experiences.

### 2.2 Memorable tourism experiences

Most researchers develop their definition of memorable tourism experiences from psychology, anthropology, sociology, tourism and hospitality and marketing perspectives;
therefore, memorable tourism experiences are becoming attractive cross-disciplinary research areas. Memorable tourism experiences and tourist experiences are two concepts interconnected with each other but with dissimilar meanings, connotations and extensions (Seyfi et al., 2019; Zhang et al., 2018). Memorable tourism experiences are selectively created by individual tourists according to how tourists evaluate their tourism experiences (Kim et al., 2012; Tsai, 2016; Tung and Ritchie, 2011). Meanwhile, a tourist experience is defined as the subjective and psychological mental state felt by a tourist during a service encounter and this definition does not explain a memorable tourism experience adequately (Kim et al., 2012; Otto and Ritchie, 1996; Tsai, 2016; Zhang et al., 2018). Therefore, most of the scholars argued that not all tourism experiences would automatically be converted into a memorable tourism experience because a tourist experience is influenced by several aspects that are out of the control of management (Farber and Hall, 2007; Knobloch et al., 2017) and tourists subjectively interpret tourism activities and destinations (Knobloch et al., 2017; Zhang et al., 2018). In addition, memorable tourism experiences are rebuilt by tourists when they are describing a specific travel experience (Kim et al., 2012; Seyfi et al., 2019) based on what they can remember and recall after a trip experience (Sthapit et al., 2018; Zhang et al., 2018). Drawing on this concept, transforming staged experience offerings into personal experiences is the most challenging task for the tourism industry. Therefore, most scholars emphasize the importance of memorable tourism experiences for tourists’ future decision-making (Kim and Chen, 2019; Seyfi et al., 2019), whereas tourists would rely on previous experiences and memories to formulate future trips (Lehto et al., 2004; Zhang et al., 2018) and determine whether to revisit a particular destination.

Interestingly, Tung and Ritchie (2011) and Kim et al. (2012) were pioneers who conducted studies to identify scales for memorable tourism experiences. Tung and Ritchie (2011) identified four dimensions (affect, expectations, consequentiality and recollection) that represent aspects of memorable tourism experiences. Meanwhile, Kim et al. (2012) categorized memorable tourism experiences into seven constructs (hedonism, refreshment, local culture, meaningfulness, knowledge, involvement and novelty) with 24 indicators that are expected to affect a person's memory as it relates to tourism experiences. Subsequently, many researchers have used and further developed these dimensions across industries and countries. For example, several scholars such as Kim and Ritchie (2014) and Tsai (2016) validated the memorable tourism experience constructs developed by Kim et al. (2012) and confirmed the MTE scales. Although Kim et al. (2012) established the foundational concepts of memorable tourism experiences, this notion would affect the memorability of experiences, whereas an experience was created by each person based on the individual’s unique assessment and perception (Sthapit and Coudounaris, 2018). At this point, the varied backgrounds of tourists lead to diverse interpretations of tourist products (Tsai, 2016). Therefore, MTE scales need to be further verified according to the context of the study (Kim and Ritchie, 2014; Zhang et al., 2018).

Additionally, a survey conducted at major tourist sites in Australia by Chandralal and Valenzuela (2015) validated 10 constructs that can be used to measure memorable tourism experiences (authentic local experiences, novel experiences, self-beneficial experiences, significant travel experiences, serendipitous and surprising experiences, local hospitality, social interactions, impressive local guides and tour operators, the fulfillment of personal travel interest and affective emotions). More recently, Seyfi et al. (2019) conducted a qualitative study with 29 tourists at cultural sites in Paris and confirmed five characteristics of a memorable cultural tourism experience including authenticity, quality of service, engagement, cultural exchange and culinary attraction. Although most tourists may participate in similar activities at the same destination, the memorability of their
experiences is different and they may form dissimilar assessments of his or her experience (Kim, 2018). More specifically, the relative importance of these constructs would be different according to the places, destinations and travelers’ demographic characteristics; therefore, there is no consensus on what constitutes MTEs (Zhang et al., 2018). In this study, the concept of memorable tourism experiences is defined and measured as a unidimensional construct based on the memorable tourism experiences scales developed by Kim (2018) and Vada et al. (2019).

### 2.3 Tourist satisfaction

Most scholars have defined customer satisfaction from several perspectives. The most popular customer satisfaction definition is based on the expectancy-disconfirmation paradigm developed by Oliver (1980), which described customer satisfaction as a global evaluation of the differences between customer expectations and performance (Oliver, 2014). The expectancy-disconfirmation framework assumes that consumers postulate a comparison between expectation and performance during the post-consumption stage. In this theory, if the service exceeds the customer’s expectation, the customer would be satisfied; however, if the service does not meet their expectations, the customer would be dissatisfied (Amin and Nasharuddin, 2013; Oliver, 1980; Shahijan et al., 2018). These conceptualizations suggested that customer satisfaction form an overall judgment process of the perceived inconsistency between customer expectations and actual consumption (Meng and Han, 2019). Following this theory, the effects of positive or negative experiences, which arise from the cognitive process of the disconfirmation paradigm, will contribute to satisfaction or dissatisfaction (Homburg et al., 2005; Oliver, 2014; Oliver et al., 1997); therefore, consumers prefer a positive disconfirmation than a negative disconfirmation paradigm.

Although the expectancy-disconfirmation theory is the most extensively used for explaining satisfaction, the problems also exist in the operationalization of the disconfirmation construct (Oliver, 1980). This concept takes place at the individual attribute level; therefore, focusing on an attribute-specific measure would yield better insights (Ali et al., 2016a, 2016b; Churchill and Surprenant, 1982; Oliver, 1980). Another scholar argued that satisfaction reflects the degree to which a consumer believes that the custody and use of a service induce positive sentiment based on the disconfirmation paradigm in process theory (Amin and Nasharuddin, 2013; Amin et al., 2013a, 2013b). Although satisfaction is strongly influenced by customer expectations (Amin et al., 2013a, 2013b; Cooil et al., 2007; Rust and Zahorik, 1993), the disconfirmation paradigm can be minimized, as performance remains within acceptable or tolerable zones (Amin, 2016; Kim et al., 2008; Wirtz and Mattila, 2001).

In the tourism context, satisfaction is referred to as a function of pretravel expectations and post-travel experiences, which is a comparison between pretravel expectations with the actual travel experiences (Chen and Chen, 2010; Chi and Qu, 2008; McDowall, 2010; Sirgy, 2010; Suhartanto et al., 2019). Drawing on this concept, the tourist will compare their experiences to their expectations, which may result in the feeling of fulfillment and then the tourist would be satisfied (Cong, 2016). Conversely, when the result is unhappiness, the tourist would be dissatisfied (Han et al., 2019; McDowall, 2010; Song et al., 2012). Moreover, Shahijan et al. (2018) specify that the tourist’s expectation is important, as it would affect the individual’s satisfaction or dissatisfaction with a specific tourism destination. In this study, tourist satisfaction refers to a cognitive-evaluative process derived from the objective overall assessment of tourists that visit a specific destination (Ali et al., 2016b; Churchill and Surprenant, 1982; Cong, 2016; Hultman et al., 2015; San Martin et al., 2019).
2.4 Tourist destination loyalty

Most of the scholars have defined the concept of tourism destination loyalty following the theory of customer loyalty that was developed by (Amin, 2016; Jacoby and Chestnut, 1978; Jacoby and Kyner, 1973; Tabrani et al., 2018; Zeithaml et al., 1996). In this theory, customer loyalty is measured by behavioral and attitudinal loyalty. According to Zeithaml et al. (1996), behavioral loyalty refers to a customer’s behaviors such as liking a particular product or service and their repurchase intentions. This theory does not provide a clear explanation of the existence of loyalty (Amin, 2016; Host and Knie-Andersen, 2004). Attitudinal loyalty refers to the psychological and emotional state of the customer and their intentions to repurchase and recommend a particular product or service to others. In the tourism context, attitudinal loyalty is most frequently used to interpret and measure tourists’ destination loyalty (Chi and Qu, 2008; Wang et al., 2019; Yoon and Uysal, 2005) and it contains a perspective that reflects tourists’ intentions to revisit a destination based on their previous travel experiences (Chi and Qu, 2008; Oppermann, 2000). Thus, destination loyalty means tourists’ commitment to a destination (Chen and Gursoy, 2001; Lv and McCabe, 2020). Following this concept, Schall (2003) explained that the attitudinal loyalty components consisting of both attitudinal and emotional commitment should be the main focus of hospitality research (Chen et al., 2020).

In addition, Chen et al. (2020) specify destination loyalty as revisit and recommendation intentions. According to Shahijan et al. (2018), revisit intention is a tourist’s willingness to revisit a particular destination in the future. For example, tourists who have higher intentions to visit a destination are expected to recommend it to their friends, relatives and other potential tourists (Chen et al., 2020; Wang et al., 2019). Tourists’ recommendations regarding their previous travel experiences will also significantly affect other tourists’ decision-making processes and choices (Chen et al., 2020) and tourists’ future travel intentions (Chi et al., 2020). According to Lv and McCabe (2020), in the tourism context, the tourist destination choice is typically affected by novelty-seeking together with the complexity of the decision-making process (Chew and Jahari, 2014). At this point, destination loyalty is more difficult to achieve than general customer loyalty; therefore, excellent marketing strategies and effort are required. In this study, a tourist’s intention to revisit and recommend a place to other tourists will be used as the main indicator to measure destination loyalty.

3. Hypothesis development

3.1 Impact of smart tourism technologies and memorable tourism experiences

In tourism research, several studies provide empirical evidence to support the effects of smart tourism technologies on memorable tourism experiences. For example, a bibliometric survey points out that the aim of smart tourism is to describe the integration of various technology components that interact with humans to enhance tourist experiences (Johnson and Samakovlis, 2019). Furthermore, Johnson and Samakovlis (2019) emphasize that a smart city tourism destination has to build advanced technologies to create tourist experiences and interconnected tourist experiences (Chang and Caneday, 2011). Sophisticated technology accessibility such as internet access, cloud services and mobile phone or portable device connectivity will significantly generate automatic real-time desires to explore tourism destinations (Buhalis and Amaranggana, 2015; Jovicic, 2019). At this point, most of the scholars have formed a consensus and similar conclusion that tourist accessibility using advanced technology has become an essential strategy for promoting tourism destinations and attracting the attention of potential tourists (Domínguez Vila et al., 2019; Lee and Gretzel, 2012). For example, Jeong and Shin (2019) describe that when a tourist
has access to relevant information on their travel activities or share local information through smart technology applications, and they able to interact with tourism staff, memorable tourism experiences will be developed. Additionally, Lee et al. (2018) explain that when a tourist is assessing the information received from smart tourism technologies, it will help a tourist to save time in their decision-making process and improve their travel experiences and it would be a significant element to enhance a memorable tourism experience (Tussyadiah et al., 2018). Thus, the following hypothesis is formed:

$$H1. \text{ Smart tourism technologies have significant impacts on memorable tourism experiences.}$$

3.2 Impacts of memorable tourism experiences on tourist satisfaction and tourist destination loyalty

Previous studies have investigated the effects of memorable tourism experiences on tourist satisfaction and tourist destination loyalty across countries. For example, Tung and Ritchie (2011) point out that memorable tourism experiences will develop an indescribable experience that flushes tourists’ emotions with delighted experiences. Other scholars argued that destination loyalty is influenced by other factors including travel motivations and memorable tourism experiences (Chen and Rahman, 2018; Yoon and Uysal, 2005). According to Jeong and Shin (2019), when a tourist has a beautiful memory that they perceive as valuable on their trip, then they tend to feel satisfied and increase their revisit intentions. In addition, past tourists’ experiences associated with novelty and emotional feelings are the most memorable aspects that enhance tourist satisfaction and behavioral intentions (Ali et al., 2016c; Coudounaris and Sthapit, 2017). More specifically, when a tourist describes his/her positive emotions such as joy, love and positive surprise, satisfaction and behavioral intentions will be enhanced (Hosany and Gilbert, 2010; Hosany et al., 2015). Similarly, when a tourist has fun, enjoyment and excitement, it will positively impact experiential tourist satisfaction and cause tourists to stay longer (Dickinson et al., 2011; Jiang et al., 2016). Other studies emphasize the positive effects of memorable tourism experiences on enhancing revisit intentions and positive word-of-mouth (Chen and Rahman, 2018; Woodside et al., 2004). Additionally, Kim and Chen (2019) suggest that tourists’ social interaction, novelty, destination enthusiasm and learning are dimensions of memorable tourism experiences and the most important predictors that enhance tourists’ satisfaction and destination loyalty. Thus, the following hypotheses are formed:

$$H2. \text{ Memorable tourism experiences have a significant impact on tourist satisfaction, and}$$

$$H3. \text{ Memorable tourism experiences have a significant impact on tourist destination loyalty.}$$

3.3 Impact of tourist satisfaction on tourist destination loyalty

In the tourism industry, most of the scholars argued that satisfaction played an essential role in predicting and understanding tourist reactions after a consumption tourist experience. For example, San Martin et al. (2019) conducted a study in Spain and described that tourist satisfaction appears to be the main factor in developing loyalty in terms of tourists’ intentions to revisit and recommend destinations to other friends. Other scholars argued that positive word-of-mouth is created from tourist satisfaction when tourist
experiences exceed expectations and satisfied tourists are more likely to have a deep sense of belonging with a visited destination (Hou et al., 2005; Hultman et al., 2015). Tourists are typically influenced by word-of-mouth when they are judging the quality of any destination and willing to share their own experiences in the dialogue (Eid et al., 2019). For this reason, most scholars have formed a consensus that tourists tend to revisit a tourist destination or recommend the destinations to other tourists when they are satisfied with the tourist activities and destinations (Jeong and Shin, 2019; Kim, 2018; Prayag et al., 2017; Prayag et al., 2013). Tourists are also willing to spread negative word-of-mouth and will not recommend or revisit the tourist destinations if they are dissatisfied (Chen and Chen, 2010; Jeong and Shin, 2019). According to Lee et al. (2018) and Prebensen et al. (2012), tourist satisfaction is established when a product, service or travel experience is simultaneously apparent to a traveler at the destination. Thus, the following hypothesis is formed:

**H4.** Tourist satisfaction has a significant impact on tourist destination loyalty.

4. Methodology

4.1 Questionnaire development

The operational definitions of STTs were developed using the definitions of Huang et al. (2017), Jeong and Shin (2019) and Lee et al. (2018) consisting of four dimensions, namely, accessibility (four items), informativeness (four items), interactivity (four items) and personalization (four items). The MTE construct consisting of four items was adapted by using the unidimensional concept developed by Kim et al. (2018) and Jeong and Shin (2019). Three items on tourist satisfaction and three items on tourist destination loyalty were adapted from Kim et al. (2018) and Jeong and Shin (2019). Appendix shows the measurement scales of this study. The questionnaire was written in both Bahasa Indonesia and English languages. Three Indonesian experts from public universities assessed both the facial and content validity, and minor modifications were made to follow the context of the study. A five-point Likert scale from “strongly disagree” (1) to “strongly agree” (5) was used to measure the smart tourism technologies, memorable tourism experiences and tourist destination loyalty constructs. In addition, the tourist satisfaction construct was measured with a five-point scale ranging from “strongly dissatisfied” (1) to “strongly satisfied” (5).

4.2 Data collection method

The target population in this study is international and domestic tourists who are visiting three tourist cities in Aceh province of Indonesia: Banda Aceh, Sabang and Takengon from April 2019 to August 2019. Aceh province is also well known for tsunami tourism in Indonesia, and the tsunami museum is one of the most visited tourist attractions in Aceh. According to the Aceh Tourism and Culture Agency of Aceh province (ATCA, 2019 Report), 35,000 international tourists visited Aceh in 2018 and that number was expected to increase to 40,000 in 2019, which is a rational target, as Aceh was named as World’s Best Halal Cultural Destination in 2016 by International Travel Week. In addition, the agency has launched 100 tourist attraction events in 2019 and these were allocated into two groups: 10 Aceh Top Events 2019 and 90 Aceh Highlighted Events 2019. According to the Statistics of the Aceh Province Report (2019), 2.5 million domestic tourists and 107,037 international tourists visited Aceh Province in 2019. Most of them are from Malaysia, the UK, the USA, Germany and Taiwan.

The selection of tourist destinations across the different cities was to enhance the generalizability of the findings and representativeness of attractive tourist destinations.
Banda Aceh has several historical museums with Dutch architecture and it has several Tsunami monuments that were dedicated to those who lost their lives when the tsunami hit. Banda Aceh also has a historical cemetery called Kherkhof, which is a large cemetery that is filled with Indonesian and Dutch graves. Sabang is an island destination that attracts numerous tourists from around the world because of its rich, unique natural resources, local lifestyles and beauty, the best beaches in the country and excellent snorkeling areas. Takengon is located at the center of Aceh and is well known as a coffee plantation zone for agro-tourism due to it being cold and pleasant all year long.

A pretest was conducted at Sultan Iskandar Muda Airport, Banda Aceh. Thirty questionnaires were distributed to international tourists and domestic tourists who were arriving and departing at the main building of the airport. A minor change to the questionnaire was made, and the pilot test respondents were not used for further analysis. A real survey using judgment sampling was implemented to distribute the questionnaires to the appropriate respondents in three cities, namely, Banda Aceh, Sabang and Takengon. Judgment sampling involves the selection of subjects who are most advantageously placed or in the best position to provide the required information and it is applied when a limited number of people have the information that is sought (Sekaran and Bougie, 2016). The process of selecting a respondent using judgmental sampling involves the researchers carefully picking and selecting respondents to be a part of the sample. A total of 600 questionnaires were distributed in the three cities at several tourist attractions, namely, cafés and restaurants, museums, beaches and national parks. In total, 500 questionnaires were distributed in Banda Aceh and Sabang, and 100 questionnaires were distributed in the central zone (Takengon).

A total of 15 students from private and public universities were recruited and trained to conduct the survey, and five students were allocated to each city. The respondents were approached politely to participate in the survey. To reduce participation referrals, tourists were informed of the purpose of the research study and the questionnaires were distributed to those tourists who were willing to participate in the survey. A total of 370 respondents participated in the survey and 10 respondents did not complete the survey. A total of 360 respondents met the sample size requirements for structural equation modeling analysis, as suggested by (Hair et al., 2010). Table 1 shows the demographic profiles of the respondents.

5. Data analysis

5.1 Measurement model

A covariance-based structural equation modeling (CB-SEM) using AMOS 25 was used to run the data analysis following the step suggested by Amin (2016) and Amin et al. (2013a, 2013b). Confirmatory factor analysis (CFA) was run to confirm that each item loads to a specific construct. The first-order CFA result shows that the goodness-of-fit was moderately satisfied with 16 items retained from the original to test the model fit. In the next step, second-order CFA was conducted and the results show that the goodness-of-fit was satisfied. Similarly, CFA was used to examine memorable tourism experiences, tourist satisfaction and tourist destination loyalty. Table 2 shows the first-order and second-order CFA results for smart tourism technologies, memorable tourism experiences, tourist satisfaction and tourist destination loyalty.

In addition, to assess the convergent validity of each construct, the standardized factor loadings were calculated to determine the validity of each construct (Hair et al., 2010). Convergent validity is supported if the factor loadings are greater than 0.5, the composite reliabilities are greater than 0.7 and the AVEs are greater than 0.5 (Anderson and Gerbing, 1988; Bagozzi and Yi, 1988, 1991; Fornell and Larcker, 1981; Hair et al., 2010). As shown in Table 3, the factor loadings ranged from 0.501 to 0.932, the AVEs ranged from 0.523 to 0.780
and the CRs was ranged from 0.767 to 0.934. Thus, this provides evidence that construct validity has exceeded the recommended levels. Table 4 shows the discriminant validity of the constructs. As the square root of the AVE between each part of the constructs was higher than the correlation estimated between constructs, discriminant validity is confirmed (Bagozzi and Yi, 1988; Hair et al., 2010). Table 5 shows the comparison of cross-loadings.

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<tr>
<th>Construct</th>
<th>GFI</th>
<th>CFI</th>
<th>$\chi^2$/df</th>
<th>RMSEA</th>
<th>Sig.</th>
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<td>Measurement model:</td>
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<tr>
<td>First-order CFA for smart tourism technologies</td>
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<td>0.934</td>
<td>4.236</td>
<td>0.10</td>
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<td>Second-order CFA for smart tourism technologies</td>
<td>0.880</td>
<td>0.932</td>
<td>4.230</td>
<td>0.09</td>
<td>0.000</td>
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<td>Measurement model:</td>
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<tr>
<td>Memorable tourism experiences</td>
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<td>0.785</td>
<td>11.325</td>
<td>0.11</td>
<td>0.000</td>
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<td>Tourist destination loyalty</td>
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Table 2. Goodness-of-fit statistics for measurement model of STT's
between constructs and demonstrates indicator loadings are higher than other loadings in the same column and row, thus confirming discriminant validity.

5.2 Structural equation modeling
Structural equation modeling was conducted to test the hypotheses. As shown in Figure 1 and Table 6, all hypotheses were supported at the 0.05 significance level. Overall, the results were close to the threshold and represented an acceptable model fit. The relationship between smart tourism technologies and memorable tourism experiences was significant ($p = 0.000, \beta = 0.654$). Memorable tourism experiences were related to tourist satisfaction

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Factor loadings</th>
<th>AVE</th>
<th>CR</th>
</tr>
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<tr>
<td>Accessibility</td>
<td>ACS1</td>
<td>0.872</td>
<td>0.560</td>
<td>0.831</td>
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<tr>
<td></td>
<td>ACS2</td>
<td>0.814</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACS3</td>
<td>0.752</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACS4</td>
<td>0.501</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informativeness</td>
<td>INF1</td>
<td>0.877</td>
<td>0.718</td>
<td>0.911</td>
</tr>
<tr>
<td></td>
<td>INF2</td>
<td>0.839</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INF3</td>
<td>0.892</td>
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<td></td>
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<tr>
<td></td>
<td>INF4</td>
<td>0.778</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactivity</td>
<td>INT1</td>
<td>0.797</td>
<td>0.780</td>
<td>0.934</td>
</tr>
<tr>
<td></td>
<td>INT2</td>
<td>0.879</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INT3</td>
<td>0.919</td>
<td></td>
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<tr>
<td></td>
<td>INT4</td>
<td>0.932</td>
<td></td>
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<tr>
<td>Personalization</td>
<td>PER1</td>
<td>0.844</td>
<td>0.767</td>
<td>0.929</td>
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<tr>
<td></td>
<td>PER2</td>
<td>0.909</td>
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<tr>
<td></td>
<td>PER3</td>
<td>0.882</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>PER4</td>
<td>0.866</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memorable tourism experiences</td>
<td>MTE1</td>
<td>0.666</td>
<td>0.517</td>
<td>0.810</td>
</tr>
<tr>
<td></td>
<td>MTE2</td>
<td>0.670</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MTE3</td>
<td>0.775</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MTE4</td>
<td>0.759</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.
Standardized factor loadings, average variance extracted (AVE) and composite reliability (CR)

Table 4.
Discriminant validity

Notes: Below the diagonal: correlation estimated between the factors; diagonal: square root of AVE; Significant level at 5%.
and tourist destination loyalty ($p = 0.000$, $\beta = 0.653$; and $p = 0.000$, $\beta = 0.268$). Moreover, tourist satisfaction and tourist destination loyalty were significant ($p = 0.000$, $\beta = 0.247$). Thus, $H1$, $H2$, $H3$ and $H4$ were supported.

6. Discussion and conclusions

6.1 Conclusions

The objective of this study is to investigate how smart tourism technologies and memorable tourism experiences will enhance tourist satisfaction and tourist destination loyalty in a
developing country. The results indicated that the smart tourism technology construct consisting of four variables has appropriate reliability to measure smart tourism technologies. More specifically, accessibility and informativeness played important roles as critical drivers of smart tourism technologies, followed by interactivity and personalization. The results show that tourists prefer to visit a tourism destination if accessibility and informativeness are well developed. The results indicated that tourists had used several smart tourism technology devices in selecting attractive tourist destinations. The most important factors of tourists’ use of STTs at the smart tourism destinations are city guide apps, mobile payments, Google maps and tourist attractions’ map locations. The findings also suggest that the more tourists engage with smart tourism technologies, the more they search for a deeper understanding of smart city destinations.

H1 indicated that smart tourism technologies are related to memorable tourism experiences. The results support that a high level of smart tourism technology infrastructures will significantly affect memorable tourism experiences. Tourists’ technology-based experiences might increase the level of memorable tourism experiences. Most of the tourists have used STTs and they have motivated tourists to participate in tourism activities to exploit their memorable travel experiences. For example, Jeong and Shin (2019) specify that is fully equipped with a high bandwidth capacity will significantly influence the memorable tourism experiences in advanced smart cities. H2 and H3 indicated that memorable tourism experiences are related to tourist satisfaction and tourist destination loyalty. This means that tourists who have excellent tourist experiences will experience significantly enhanced tourist satisfaction and tourist destination loyalty. For example, Kim (2018) describes that tourists prefer to revisit tourist destinations of which they have positive memories. H4 identified the relationship between tourist satisfaction and tourist destination loyalty. When a tourist receives a high level of satisfaction at a tourist destination, they will have higher revisit intentions and are more likely to recommend the destination to other tourists. The findings are supported by previous studies (Ali et al., 2016c; Chen and Rahman, 2018; Jeong and Shin, 2019).

6.2 Theoretical implications
This study provides several theoretical implications. First, this study will contribute to the literature by providing a comprehensive concept of smart tourism technologies in a developing country. The dimensions of smart tourism technologies have been explored. Although previous studies have used this construct across countries, these constructs must be replicated within a specific context. As suggested by Jeong and Shin (2019), the operationalization of this construct has to fit one particular context. This study provides a
significant contribution to the literature that STTs is a multidimensional construct consisting of accessibility, informativeness, interactivity and personalization. Second, minimal empirical research has focused on smart tourism technologies in a developing country such as Indonesia. To fill this gap, this study focused on the roles of smart tourism technologies and memorable tourism experiences in enhancing tourist satisfaction and tourist destination loyalty. This finding is in line with other previous studies conducted in developed countries (Domínguez Vila et al., 2019; Jeong and Shin, 2019; Lee et al., 2018; Vada et al., 2019). Third, this study also identifies how smart tourism technologies and memorable tourism experiences will develop and improve tourist satisfaction and tourist destination loyalty. The results highlight the importance of memorable tourism experiences in establishing tourist satisfaction and tourist destination loyalty. The previous studies that supported this notion indicated that when a tourist receives excellent memorable tourism experiences, tourist satisfaction and tourist destination loyalty will be established (Chen and Rahman, 2018; Eid et al., 2019; Seyfi et al., 2019).

6.3 Managerial implications
The results and findings of this study provide several managerial implications. First, STTs and MTEs form a strong foundation for enhancing tourist satisfaction and tourist destination loyalty. To this point, the implementation of smart tourism technologies has provided several benefits for tourists including the more efficient use of resources, the effective management of city tourism and reduced decision-making time and effort, which will consequently improve travel experiences. Using STTs when visiting a tourist destination provides an opportunity to explore more alternates for planning trip decisions that are more efficient and smoother processes than traditional methods. Furthermore, tourist experiences using STTs have allowed them to use several social media platforms including Trip Advisory, Facebook, Twitter and Instagram to interact or engage with tourism authorities, travel agencies, hotels, restaurants and airline industries. Second, most tourists had pleasant memories and were satisfied at a tourist destination; as a result, they are more likely to revisit and recommend a tourist destination to their friends, family and other tourists. For this reason, tourism authorities and industry players have to make sure that tourists’ expectations are met accordingly. For example, if a tourist has a negative experience with smart city info-structure facilities, a tourist might reach an overall conclusion not to revisit and recommend the location to other tourists. In fact, the tourism city info-structure is the main item affecting tourists’ experience and consequently enhancing tourist satisfaction and tourist destination loyalty. Third, Indonesia is a tropical country with a beautiful and exotic culture and a plethora of beauty, tourist activities and destinations. This unique tourist destination has built memorable tourism experiences, tourist satisfaction and tourist destination loyalty. Although Indonesia is an attractive tourist destination, tourism authorities should upgrade the smart tourism technology infrastructures by providing high-speed internet accessibility, improve their tourism information systems and support the local government in upgrading their tourist facilities. Tourists have experience using several STTs and developed memorable tourism experiences at Indonesia’s smart tourism destinations. In addition, tourists’ interactions with local authorities and tourism industry players are important factors in creating memorable tourism experiences. Therefore, local tourist authorities, tourism industry players and tourist stakeholders have to work together to upgrade and improve their tourist facilities and train their staff to have a more customer-oriented focus. In addition, tourist authorities, travel agents, hotels, restaurants and media have to develop attractive tourist activities and be aggressive at promoting tourist destinations such as the Aceh international
diving festival in Sabang, the Saman (traditional dance) festival in Takengon and the culinary and traditional food festival in Banda Aceh.

6.4 Limitations and future research
The research findings and implications of this study are based on tourists who visited three cities in the Aceh province of Indonesia; thereby, the results cannot be generalized to represent all smart city destinations in Indonesia. Therefore, expanding the research to cover more regions, cities and sample sizes might form different results and conclusions. This study is a quantitative approach, and thus using mixed methods for a future research study with different samples of the population will enhance the validity of the findings. The data were collected from attractive tourism areas, and using other platforms such as TripAdvisor might provide more diverse tourist backgrounds and verify the appropriate conclusions (Lv and McCabe, 2020). Another limitation is that the STT measurement items are very general statements and specific to websites and app usage at a destination. Therefore, incorporating other factors of smart tourism technologies will provide more details of the operational definition of STTs. In addition, MTEs were measured as unidimensional constructs, and thus the results cannot be generalized for the holistic concept of MTEs. Therefore, measuring MTEs as multidimensional constructs and their mediating role should be studied in future research. Considering other variables such as tourist engagement and the destination image as dependent variables and tourist familiarity with technologies as a moderating variable should be considered in future research.

References


### Appendix

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart tourism technologies:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td>I can use tourism websites and apps anytime and anywhere</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>I can easily use tourism websites and apps</td>
<td>Lee et al. (2018)</td>
</tr>
<tr>
<td></td>
<td>I can easily find tourism websites and apps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I can search without a complicated sign-up process at tourism</td>
<td></td>
</tr>
<tr>
<td>Informativeness</td>
<td>Tourism websites and apps provide me with useful information about the</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>travel destination(s) and the trip</td>
<td>Lee et al. (2018)</td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps are helpful for evaluating the destination(s) and the trip</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps enable me to complete my trip with the trip</td>
<td></td>
</tr>
<tr>
<td></td>
<td>detailed information provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps enable me to minimize my worries about my trip</td>
<td></td>
</tr>
<tr>
<td>Interactivity</td>
<td>I can find many other travelers’ questions and answers on tourism websites and apps</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps that I use are highly responsive to me</td>
<td>Lee et al. (2018)</td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps that I use are interactive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is easy to share tourism information content on tourism websites and apps</td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>Tourism websites and apps allow me to receive tailored information</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>Tourism websites and apps provide me with easy-to-follow paths and links</td>
<td>Lee et al. (2018)</td>
</tr>
<tr>
<td></td>
<td>I can interact with tourism websites and apps to get personalized information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The tourism information provided by tourism websites and apps meets my needs</td>
<td></td>
</tr>
<tr>
<td>Memorable tourism experiences</td>
<td>I really enjoyed this tourism experience</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>I revitalized through this tourism experience</td>
<td>Kim (2018)</td>
</tr>
<tr>
<td></td>
<td>I learned something about myself from this tourism experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I had a chance to closely experience the local culture of a destination area</td>
<td>Kim (2018)</td>
</tr>
<tr>
<td>Tourist satisfaction</td>
<td>I am satisfied with this travel experience</td>
<td>Kim (2018)</td>
</tr>
<tr>
<td></td>
<td>I feel enjoyable about this travel experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I feel pleased about this travel experience</td>
<td></td>
</tr>
<tr>
<td>Tourist destination loyalty</td>
<td>I want to visit the selected city again</td>
<td>Jeong and Shin (2019)</td>
</tr>
<tr>
<td></td>
<td>I would recommend the selected city to family and friends</td>
<td>Kim (2018)</td>
</tr>
<tr>
<td></td>
<td>I would say positive things about the selected city to other people</td>
<td></td>
</tr>
</tbody>
</table>

**Table A1. Measurement scales**

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