A comprehensive review of mobile technology use in hospitality and tourism

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Rob Law[a], Irene Cheng Chu Chan[b], and Liang Wang[c]

[a]School of Hotel and Tourism Management,
The Hong Kong Polytechnic University, 17 Science Museum Road, TST East,
Kowloon, Hong Kong SAR, China
E-mail: rob.law@polyu.edu.hk
Phone: (852) 3400 2181; Fax: (852) 2362 9362

[b]School of Hotel and Tourism Management,
The Hong Kong Polytechnic University, 17 Science Museum Road, TST East,
Kowloon, Hong Kong SAR, China
E-mail: irene.cc.chan@connect.polyu.hk
Phone: (852) 3400 2337; Fax: (852) 2362 9362

[c]Department of Tourism and Hotel Management, School of Management
Zhejiang University, Xihu District, Hangzhou City
Zhejiang Province, China
E-mail: lydlx0909@gmail.com
Phone: (86571) 8820 6872; Fax: (86571) 8820 6872

Corresponding Author: Rob Law

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A comprehensive review of mobile technology use in hospitality and tourism

Abstract:

Mobile technology has become a necessity for tourists, both in their daily lives and during their travels. Considering the growing significance of mobile technologies, this study collected and analyzed 92 related articles published in hospitality and tourism journals to examine the state-of-the-art research in this field. The comprehensive review shows that most studies focus on the context of tourism experience and the hotel industry. These studies tend to adopt quantitative research methods and use theories from the field of information system as theoretical foundation. A few research themes are identified from the perspectives of both the suppliers and consumers. An overall disproportionate focus has been given by researchers, with more studies concentrating on consumers than on suppliers. In accordance with the findings of the literature review, a research agenda is proposed to guide future research on mobile technology use in the hospitality and tourism industry.

Keywords: mobile technology, literature review, mobile device, m-tourism, smartphones, smart tourism

1. Background

Information and communication technologies (ICTs) have substantially affected the hospitality and tourism industry since their emergence in the early 90s (Buhalis and Law, 2008). The impacts of ICTs have mainly resulted from websites, social media, and mobile technologies, which are important channels allowing industry practitioners to reach their customers (Leung, Law, van Hoof, & Buhalis, 2013; Sotiriadis, 2017). Combining the virtues of mobility and ICTs, mobile technologies, such as smartphones, tablets, and mobile applications (apps), have become the primary device for users to access the Internet and have thus become an indispensable part of consumers' daily lives (Wang, Park, & Fesenmaier, 2012). According to the forecast of Statista (2017), the number of smartphone users will exceed 2.8 billion worldwide by 2020, a number representing more than one-third of the global population. An average adult spends over four hours per day using his or her smartphone, along with the related apps for social networking and communications. This finding represents a massive cultural shift in technology usage (Hacker Noon, 2017). Furthermore, this mobile "superstorm" has dramatically changed tourist behaviors and business processes in the field of hospitality and tourism, thus ascribing a revolutionized meaning to the latter (Wang, Park, & Fesenmaier, 2016). The instantaneous feature of mobile technologies empowers tourists to access and share information without spatial and temporal limits (Wang, Xiang, & Fesenmaier, 2014). Consumers' widespread adoption of mobile technologies for travel-related purposes has resulted in the development of relevant mobile information services, such as mobile electronic tourist guides (METG) or app-based mobile tour guides (AMTG), and mobile payment using near-field communication (NFC) technologies. Practitioners also leverage the advantage of global positioning systems (GPS) to carry out location-based marketing (Beldona, Lin, & Yoo, 2012; Mak, Nickerson, & Sim, 2015; Yoon, Kim, & Connolly, 2017).

The rapid advancement of mobile technologies and their applications has defined the scope of the relevant literature and the subsequent need for further scrutiny. Two review studies have been conducted by Kim and Law (2015) as well as Liang, Schuckert, Law, and Masiero (2017). Kim and Law (2015) reviewed 104 smartphone-related articles published from 2000 to 2013. However, the scope of their study is limited to mobile marketing in the fields of hospitality and tourism. Their study offers an in-depth review of mobile marketing and relevant practices from the perspectives of both marketers and consumers. However, the narrow focus does not provide a comprehensive picture of mobile technology research pertinent to hospitality and tourism. The more recent study by Liang and his colleagues (2017) reviewed 92 mobile technology articles published between 2002 and 2015. They categorized the studies into three main topical clusters, including industry and business applications, technological innovation, and consumers and demand. They also adopted the "paradigm funnel" to present a methodological review of existing mobile technology studies in hospitality and tourism. Despite the valuable contributions of previous review studies, several gaps are observed in the extant literature. First, existing review studies tend to include studies published both within and beyond hospitality and tourism journals, and the discussion from the mixed sources creates difficulties for scholars to understand and evaluate the state-of-the-art knowledge specific to the field of hospitality and tourism. Second, the characteristics of mobile technology research in terms of the industry applications and theoretical underpinning are not fully known. Third, the existing review studies adopted a deductive approach that allocated reviewed articles into pre-determined themes, which somehow limits the variety of topical clusters identified. In relation to this, an inductive approach will be useful in drawing further insights. Fourth, the relevant papers that have been published in recent years (2016 and 2017), during which mobile technologies have rapidly advanced, need to be reviewed.

The present study attempts to fill the identified gaps by presenting an extensive review of the mobile technology literature published in hospitality and tourism journals from its emergence up to 2017. The main objective is to understand the state-of-the-art of knowledge by characterizing mobile technology research based on specific dimensions (e.g., research context, theories adopted, etc.), and synthesizing the existing knowledge from the perspectives of both suppliers and consumers using an inductive approach.

Findings of the current review should make both theoretical and practical contributions. From a theoretical perspective, this study takes stock of our existing knowledge on mobile technology research in hospitality and tourism, which will guide future research. From a practical perspective, the findings should be of interest for practitioners, who are looking for suggestions on how to re-engineer their business practices in order to leverage the potential of mobile technologies.

2. Methodology

Following previous studies (Kim & Law, 2015; Liang et al., 2017), all mobile-technology related articles focused on hospitality and tourism were identified and collected from four databases, namely, EBSCOhost, Google Scholar, Science Direct, and Scopus, from September to November 2017. The article selection process followed the procedure described here. First, in order to identify the relevant articles in the four databases, the researchers used several keywords, including “mobile technology,” “mobile device,” “mobile service,” “mobile application,” “apps,” and “smartphone,” which appeared in the “titles, keywords, or abstracts.” Only the articles published in hospitality and tourism journals were included for analysis. Within the list of articles returned, two main conditions, which determined the final inclusion of each article, needed to be

met. First, only full-length papers in English were retrieved. Other publications, such as book chapters, research notes, and conference papers, were excluded from the analysis. Second, the direct relevance to the focus of this study was considered. To achieve this, the authors first read the title, abstract, and keywords of each article. The short-listed articles were read in detail to further filter out the irrelevant papers. For example, papers that investigated the role of mobile technology on facilitating learning efficiency of tourism and hospitality students were excluded in the final stage of article selection, in order to maintain strong coherence to the research topic. To minimize possible bias in the article selection process, a consensus among all authors needed to be achieved before an article was excluded. The above process resulted in the identification of 92 relevant articles published between 2002 and 2017.

To satisfy the objective of this comprehensive review, the selected articles were classified into two main categories: supplier-focused (25 papers) and consumer-focused (67 papers). These papers were then read and content-analyzed based on the following sub-topics: (1) different subject themes, (2) year, (3) journal publication, (4) methodological nature of the research, (5) industry applications, and (6) theories and frameworks applied. The results of the analysis are presented in the next section.

3. Characterizing mobile technology research in hospitality and tourism

3.1 Distribution of articles by year

Similar to the results of Liang et al.'s (2017) study, the first article of mobile technologies in hospitality and tourism appeared in 2002. Only eight articles (9%) were written in the first decade of mobile technology research (i.e., from 2002 to 2011), and majority (91%) were

published in recent years from 2012 to 2017. As illustrated in Figure 1, a clear upward trend is observed over the entire period of mobile technology research from 2002 to 2017, with a steady growth from 2002 to 2013, and a significant surge from five articles in 2013 to 16 articles in 2014. These findings reflect the substantial growth of interest among hospitality and tourism scholars in mobile technology research. Note that the figure for year 2017 is a tentative number.

Insert Figure 1 here

3.2 Distribution of articles by journal publications

Table 1 presents the distribution of mobile technology articles published in 24 different hospitality and tourism journals. *Journal of Hospitality and Tourism Technology* contributed the largest number (18 articles), followed by *International Journal of Contemporary Hospitality Management* (10 articles) and *Tourism Management* (9 articles). These three journals represent 41% of all mobile technology research in hospitality and tourism. *International Journal of Hospitality Management* produced six articles, whereas *Journal of Hospitality Marketing and Management*, *Journal of Sustainable Tourism*, and *Journal of Travel Research* each contributed five articles. These four journals contribute 22% of all mobile technology research, and the remaining 37% were distributed among 16 other journals.

Insert Table 1 here

3.3 Industry applications of mobile technology research

Referring to Table 2, tourism experience/trip in general (39%) and hotel industry (33%) were the two most frequently examined industry settings in the mobile technology literature, followed by other industries, such as restaurants (7%) and travel trade, encompassing both (online) travel agencies and tour operators (7%). Other major players in the tourism industry, including airlines (3%), destination (2%), attractions (1%), and convention or events (1%), are under-researched and are thus under-represented in mobile technology research.

Insert Table 2 here

3.4 Methodological nature of mobile technology research

As shown in Table 3, out of 92 reviewed articles, 68 articles (74%) used quantitative methods, outnumbering qualitative approaches, which are only used in a total of 11 articles (12%). Seven papers are conceptual (8%), whereas six papers adopted mixed-method approaches (7%). Quantitative studies are mainly based on surveys, with a small proportion of studies adopting experimental design and secondary data. Meanwhile, articles using qualitative methods primarily collected data through in-depth or focus group interviews. Mixed methods mostly combined interviews or content analysis of websites with questionnaire surveys.

Insert Table 3 here

3.5 Theories and frameworks applied in mobile technologies research

Taking stock of the theories and frameworks that have been used in the existing literature helps us understand the theoretical foundations of mobile technology research, which in turn, serves as a critical point of departure to further advance knowledge. Table 4 shows that 47 out of 92 articles (51%) used one theory to study mobile technologies, whereas 26 articles (28%) did not base their study on any theories or frameworks. Furthermore, 12 studies (13%) adopted two theories, and 7 articles (7%) integrated three to five theories in one study.

As listed in Table 4, the technology acceptance model (TAM) is the most cited theory, which has been applied or tested by 26 articles (27%) in total. TAM was first introduced by Davis (1989) as a framework to explain an individual's intention to accept or adopt new information technologies and applications. Since its introduction, the theory has been applied to predict the adoption of various types of mobile technologies, including mobile devices (e.g., Kim, Kim, Kim, & Kim, 2016), travel mobile applications (e.g., Im & Hancer, 2014), and mobile tour guides (Peres, Correira, & Moital, 2011). Seven articles (7%) applied the unified theory of acceptance and use of technology (UTAUT) model (Venkatesh, Morris, Davis, & Davis, 2003), which is a younger theoretical model in the field of information system compared with TAM. Five articles (5%) used

innovation diffusion theory (IDT) (Rogers, 2003) and theory of planned behavior (TPB) (Ajzen, 1991). Although a total of 46 theories or frameworks have been applied in mobile technology research, 35 have only been applied once, even though these theories, such as the task-technology fit theory (Goodhue & Thompson, 1995) and technology-based service adoption model (Heidenreich & Handrich, 2015) are rather relevant to mobile technologies. Nevertheless, mobile research is largely grounded on theories from information systems (e.g., TAM, UTAUT, IDT, and TPB), which focus on identifying users' adoption intention of the relevant technologies.

Insert Table 4 here

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4. Thematic synthesis of mobile technology research

Mobile technologies are changing the way tourists experience a destination, consume travel-related products, and share their travel experiences with others. Practitioners and marketers respond by adjusting their strategies and plans to accommodate changing consumer needs. Identifying the key themes that constitute mobile technology research in hospitality and tourism allows us to understand the research focus of scholars and identify the under-researched topics that demand further attention. Using content analysis, the relevant literature was reviewed and first categorized into two major themes that originated from the perspectives of both the suppliers and the consumers. Studies from the suppliers' perspective focus on identifying the impact of mobile technologies on the business practices and operations of hospitality and tourism firms, whereas those from the consumers' perspective examine the effects of mobile technologies on consumers,

including their motivations, perceptions, and behaviors (Sotiriadis, 2017). Afterwards, an inductive approach was adopted in this study to identify the recurring topics under the two main streams of research.

4.1 Suppliers' perspective

Articles focused on the suppliers' perspective represent only 27% (25 papers) of all mobile technology papers in hospitality and tourism, demonstrating a significant lack of scholarly attention. As summarized in Table 5, publications from the suppliers' perspective fall into three main categories: "effects of mobile technologies on business functions" (19 papers), "evaluation and improvement of mobile technologies" (5 papers), and "influential factors on successful mobile adoption" (1 paper). The following sub-section discusses the representative studies of each category.

Insert Table 5 here

4.1.1 Effects of mobile technologies on businesses functions

This category of mobile technology research includes 19 articles that focused on exploring the effects of mobile technology adoption on business functions and practices. While some studies examined the possible applications of innovative mobile technologies, such as NFC, to the tourism industry in general (Egger, 2013; Katsura & Sheldon, 2008; Pesonen and Horster, 2012), others

focused on either one of the following functional aspects, ranging from strategic development, human resource management, and performance management, to marketing and distributions.

Strategic development: Mobile technologies allow managers to stay connected with their existing and potential customers, thus expediting the entire service delivery process, and as such, mobile technologies are considered an important source of competitive advantage (Bertan, Bayram, Ozturk, & Benzergil, 2016). A hotel's strategic decision to adopt a mobile reservation system is affected by the system's degree of compatibility with the existing values and needs of the hotel, the hotel's technological resources, and whether the hotel believes that most customers are using mobile reservation systems (Wang, Li, Li, & Zhang, 2016c).

Human resource management: Mobile technologies affect the management of human resources at hospitality and tourism firms in a number of ways. Kim and Kizildag (2011) investigated the potential of adopting mobile devices to conduct employee training at various customer-service departments of a hotel, such as housekeeping, room services, and restaurants. They suggested that mobile learning (m-learning) may overcome the limitations of traditional training methods and increase the effectiveness of employee training. Drawing on the insights from hotel managers, Kim, Connolly, and Blum (2014) explored the opportunity to deploy mobile technologies to improve staff productivity and collaboration. They concluded that the engineering department is perceived as the most appropriate functional area to adopt mobile technologies to enhance efficiency and cost control, because mobile technologies can transmit instantaneous requests from other departments and assist in a wide range of multi-tasking abilities. Jeong, Lee, and Nagesvaran (2016) partially confirmed this suggestion by identifying hotel employees' perceptions of using mobile technologies at work. Mainly, they found that employees believe that

the use of mobile technologies increase their self-efficacy and job performance, which then leads to their higher job satisfaction and commitment to the organization.

Performance management: Mobile technologies also significantly influence the services offered by hospitality and tourism firms to their customers, which result in higher revenue (Jung, Kim, & Farrish, 2014; Lee, Hwang, & Hyun, 2010). Using secondary data, Makki, Singh, and Ozturk (2016) echoed this view by showing that hotels adopting mobile technologies achieve higher occupancy rates and operating incomes. The adoption of mobile technologies may even stimulate higher stock prices of airlines and hotels (Qin, Tang, Jang, & Lehto, 2017).

Marketing and distribution: Mobile technologies may facilitate the delivery of products and services (Car, Pilepić, & Šimunić, 2014). The findings of Law, Leung, Lo, Leung, and Fong (2015) showed that mobile technology is still growing as a technology-based travel intermediary for both travel agencies and hotels in Hong Kong. Mainly, the adoption of technologies is only limited to websites and social media platforms. Meanwhile, mobile technologies have been shown to affect customer segmentation. Eriksson (2014) identified and profiled five groups of customers based on the level of mobile travel services. Okazaki, Campo, Andreu, and Romero (2015) also performed a segmentation of Spanish travelers according to their mobile applications usage before, during, and after travel. Each segment exhibit different patterns of mobile technology usage and are also motivated by different benefits of mobile technologies.

The effect of mobile technologies has frequently been examined in the hotel context, such as HR functions and services provided to consumers in hotels. Through a literature review, Tan and Law (2016) suggested that mobile learning may be used as a visitor management tool for a destination. Other than that, empirical studies on the potential effect on other tourism-related

business functions, such destination and visitor management and attraction management have been limited, thus representing significant gaps for future research.

4.1.2 Evaluation and improvement of mobile technologies

The second research theme from the suppliers' perspective is related to the evaluation and improvement of mobile technologies. This category contains five articles. Chen, Murphy, and Knecht (2016) summarized five functional features of hotel mobile applications, including hotel information, hotel functions, reservation information, social media links, and additional features. They investigated consumers' perceived importance and the performance of each category, wherein performance gaps can be identified. In their evaluation, Wang, Xiang, Law, and Ki (2016b) found that hotel mobile apps are lagging behind OTA apps in terms of hotel information provision and booking services, to name a few. Rivera, Croes, and Zhong (2016) found that the most important attributes for destination mobile application include information content and coupons, whereas the location-aware feature is rated as the least important. Nevertheless, personalization appears to be a paramount feature of mobile applications that tourists expect but are not currently satisfied with (Dickinson et al., 2014). Meehan, Lunney, Curran, and McCaughey (2016) developed an intelligent context-aware recommender system to improve the accuracy of suggestions and mitigate the problem of information overload.

4.1.3 Influential factors on successful mobile adoption

Aside from the aforementioned two categories, a non-recurring yet important theme from the suppliers' perspective has been identified in the existing mobile technologies literature in

hospitality and tourism: the factors influencing successful mobile technology adoption. This category contains only the study of Lin (2017). Using the hybrid multiple criteria decision-making (MCDM) methods, Lin found that the critical success factors for mobile technology implementation comprise top management support and consumer needs.

4.2 Consumers' perspective

Articles focused on the consumers' perspective represent 73% (67 papers) of all mobile technology papers on hospitality and tourism. As shown in Table 6, these papers fall into four categories: motivators/inhibitors of tourists to use/reuse mobile technologies for travel (41 papers), the impact of mobile technologies on consumer travel patterns and behaviors (17 papers), perceptions toward using mobile technologies for travel (9 papers), and preference and usage behavior of mobile technologies for travel (3 papers). Three studies covering more than one topic are categorized into more than one category (Mang, Piper, & Brown, 2016; Murphy, Chen, & Cossutta, 2016; Wang et al., 2014). The following sub-section discusses the representative studies of each category.

Insert Table 6 here

4.2.1 Motivators/inhibitors of tourists to use/reuse mobile technologies for travel

For the purpose of this study, "adoption" refers to consumers' use of both personal and firm-initiated mobile technologies, such as mobile devices, apps and payment systems, for travel-

related purposes. The motives for consumers to adopt various mobile technologies for travel-related purposes before, during, or after a trip have been extensively studied, thus representing the most popular research topic in the mobile technology literature pertinent to hospitality and tourism. Drawing on the results of these studies, five factors affecting consumers' adoption of mobile technologies for travel are synthesized: (1) utilitarian, (2) hedonic, (3) dispositional, (4) behavioral, and (5) environmental factors. They are discussed as follows.

Utilitarian factors: These factors are related to consumers' evaluation of the quality of the mobile technologies. Some studies refer to this dimension as "extrinsic motivators" (e.g., Kim et al., 2016). Consumers tend to adopt mobile technologies because they find these technologies useful and convenient when accomplishing travel-related tasks, such as information search (Kim, Ahn, & Chung, 2013; No & Kim, 2014), reservation and payment for services (Fong, Lam, & Law, 2017; Morosan, 2014; Ozturk, Nusair, Okumus, & Hua, 2016), ordering food (Okumus & Bilgihan, 2014), and moving around a destination (Lu, Mao, Wang, & Hu, 2015). Ease of use affects consumers' perceived usefulness of mobile technologies in performing tasks (Kwon, Bae, & Blum, 2013; O'Regan & Chang, 2015). However, a mobile technology that is easy to use may not necessarily prompt consumers to adopt mobile technologies for their travel (Kim et al., 2016; Oh, Lehto, & Park, 2009; Okumus, Bilgihan, & Ozturk, 2016), as some consumers actually adopt mobile technologies that demonstrate usefulness to achieve specific tasks, regardless of the level of complexity involved in their usage (Morosan & DeFranco, 2016b). Aside from perceived usefulness and ease of use, other utilitarian factors that determine consumers' usage of mobile technologies include perceived personalization (Jung, Chung, & Leue, 2015; Morosan & DeFranco, 2014b; Nyheim, Xu, Zhang, & Mattila, 2015), perceived risk and security of the mobile

technology (Fong et al., 2017; Ozturk et al., 2016), and perceived behavioral control (Park & Huang, 2017).

Hedonic factors: These factors represent the "intrinsic motivations" within the consumers (see Kim et al., 2016) affecting their adoption intention. Existing studies show that consumers who enjoy using mobile technologies in their daily lives have a higher tendency to adopt technology for travel purposes (de Oliveira Nunes & Mayer, 2014; Okumus & Bilgihan, 2014). Consumers' travel preferences and the image of a specific destination may also affect their adoption intention regardless of whether they consider using mobile technologies compatible with their lifestyle (Lu et al., 2015; Ozturk, Bilgihan, Salehi-Esfahani, & Hua, 2017). Additionally, consumers may use mobile technologies for travel in order to be socially accepted (Fong et al., 2017; Lai, 2015; Okumus & Bilgihan, 2014; Okumus et al., 2016). Other hedonic factors include consumers' emotional attachment to the mobile technology during travel (O'Regan & Chang, 2015; Ozturk et al., 2017) and their need for social interactions with the service staff (Sarmah, Kamboj, & Rahman, 2017).

Dispositional factors: These factors are related to consumers' own personal traits. Consumers' self-confidence on their ability to use the mobile technologies (Park & Huang, 2017; Okumus & Bilgihan, 2014), personal innovativeness (Meng, Kim, & Hwang, 2015; Morosan & DeFranco, 2016b; Okumus et al., 2016), trust in the service provider (Morosan, 2014), privacy concern, and their involvement with the services (Morosan & DeFranco, 2016b) predict their intention to adopt mobile technologies for travel. More innovative consumers tend to see mobile technologies as more useful, fun, and enjoyable (Ozturk et al., 2016); thus, they are more prepared to adopt these technologies when they travel. Consumer demographic characteristics, such as age, also determine their adoption (Morosan & DeFranco, 2014a). Although mobile technologies are

more popular among the younger generation, some studies have attempted to identify the motivating factors for senior users (e.g., Kim, Bonn, & Lee, 2017).

Behavioral factors: Consumer behaviors also affect their intention to adopt mobile technologies for travel. For instance, high spenders are more likely to adopt mobile technologies than low spenders (Morosan & DeFranco, 2014a). However, scholars have yet to come to a consensus on the prescribed "spill-over effects" from the daily usage of mobile technologies to travel-related settings. Wang et al. (2014), for example, showed that consumers using smartphones everyday are more likely to use smartphones for travel. This is because smartphone usage, which creates a sense of attachment to their social lives, has already become a habit for them. However, Meng et al. (2015) opposed this view and showed that using a smartphone for daily routines may not imply usage for travel. Nevertheless, consumers' experiences in technology usage and in traveling affect their intention to use mobile technologies (Kim, Park, & Morrison, 2008). Frequent travelers feel more positive toward using mobile devices and tend to believe that mobile technologies are useful, and thus have stronger adoption intention (Oh et al., 2009; Wang et al., 2014). Furthermore, the use of mobile technologies is negatively affected by the use of traditional media, such as personal computers (Okazaki and Hirose, 2009).

Environmental factors: Although not a main motivator, environmental factors like service environment can facilitate technology adoption (Gupta & Dogra, 2017). The service environment should encourage customers to use mobile technologies to consume travel-related products by making bookings, socializing, and seeking help from the service staff (Morosan & DeFranco, 2014b; Wang et al., 2014).

Among the identified motivational factors, scholars have attempted to identify the more prominent factors determining the adoption of mobile technologies for travel, but they did not

come to an agreement. One group of scholars supported utilitarian motivations, such as perceived usefulness and performance expectancy, as the most important predictors of mobile technologies among the factors they have investigated (Fong et al., 2017; Kim, 2016 Morosan & DeFranco, 2014b; Morosan & DeFranco, 2016c; No & Kim, 2014). Others opposed this view and suggested that hedonic motivations are the strongest predictors (Morosan & DeFranco, 2016a; Zhu & Morosan, 2014). Morosan and DeFranco (2016b), however, demonstrated that consumers' involvement with the service is the major determinant of adoption, followed by other utilitarian factors like privacy concerns and perceived personalization. Instead of identifying the more important factor, Im and Hancer (2014) suggested that hedonic motivations and utilitarian motivations are interrelated in affecting consumers' adoption of mobile travel applications.

4.2.2 Impact of mobile technologies on consumer travel patterns and behaviors

Another research theme from the consumers' perspective is the impact of mobile technologies on consumer travel patterns and behaviors. However, this topic has received less scholarly attention, with only a total of 17 articles investigating this topic. As suggested in these studies, the use of mobile technologies changes travel activities from the pre-trip planning stage, to experiences and consumption on site, to post-trip sharing and even the feedback stage. The instantaneous nature of mobile technologies integrates consumer efforts in the pre- and post-trip stages together during the trip (Wang et al., 2014).

Pre-trip planning stage: Tourists may plan less before the trips as they know that information is readily accessible with mobile devices as long as they have Internet access (Wang

et al., 2014). Thus, consumers rely more on tablets and smartphones than other devices in the search process (Murphy et al., 2016).

During-trip experience stage: Mobile technologies empower tourists to efficiently adjust their itinerary and plans in response to unexpected circumstances that occur during their trips (Lamsfus, Wang, Alzua-Sorzabal, & Xiang, 2015; Wang et al., 2012; Wang, Xiang, & Fesenmaier, 2016a). Tourists are also equipped to experience a destination in more innovative ways and explore unusual attractions instead of the frequently accessed "hermeneutic circle" (Wang et al., 2012). During the consumption of services, tourists become more willing to engage in the value co-creation process with the service providers if they frequently use the mobile technologies to access services or perform tasks (Morosan & DeFranco, 2016a). Tourists are also likely to find such service experience more valuable, as mobile technologies reduce the demand on consumers' time and effort for traveling to information centers (Lyu & Hwang, 2015).

Consumers use mobile technologies mainly for communication, social media, entertainment, and information acquisition (Wang et al., 2016a). Depending on the purpose of usage, mobile technologies affect tourist experiences in diverse ways. On the one hand, using mobile technologies for communication purposes makes tourists feel more secure, as they are instantly connected with their family and friends back home (Wang et al., 2016a). On the other hand, using mobile technologies for entertainment allows consumers to enjoy more and be themselves during their trip. Sometimes, mobile devices are used for work-related purposes during a trip. However, Kirillova and Wang (2016) asserted that frequent communication via smartphone for work-related purposes is likely to compromise the restorative functions of traveling, unless the communicator is perceived as caring and emotional. Dickinson et al. (2017) showed that mobile technologies are effective in enhancing social support among campsite tourists, who can easily ask

for or offer travel assistance in various ways. The rise of mobile technologies has turned backpackers into "flashpackers" who frequently adopt mobile devices and internet connections during travel (Paris, 2012). Compared with backpackers, the so-called "flashpackers" are more independent and enjoy the increased freedom and choices offered by mobile technologies.

Post-trip sharing stage: Instead of sharing their experiences or providing feedback to the service providers upon return, tourists are more likely to share their experiences on-site, to ensure that their social circle is updated in real time (Wang et al., 2014; Zhang, Omran, & Cobanoglu, 2017). Additionally, storing and retrieving their memories have become more convenient when consumers use mobile technologies in their travel.

4.2.3 Perceptions toward using mobile technologies for travel

Aside from the adoption and impact of mobile technologies, a few articles focus on studying consumers' perceptions toward mobile technologies. Risk and benefit perceptions are common topics under this category. Morosan and DeFranco (2015) investigated how consumers' perceived risks and benefits affect their willingness to disclose their personal information through hotel apps in order to receive more personalized services. In a follow-up study, DeFranco and Morosan (2017) examined the calculative process between risk and benefits in consumers when they connect their mobile devices to a hotel's network. Park and Tussyadiah (2017) aimed to understand the different dimensions constituting risk perceptions in mobile travel booking. They showed that consumer innovativeness and trust toward smartphones mitigate the perceived risk associated with mobile travel booking. However, the request of information by the travel app tend to increase perceived risk.

Two studies focused on consumers' perceptions toward marketers' effort through mobile technologies. Erawan (2016) revealed that tourists consider advertisements delivered through mobile devices as sources of information. Tussyadiah and Wang (2016) found that tourists perceive their mobile devices as a travel companion or guide, which enhance their travel experiences. Although they tend to follow the push recommendations in their smartphones during their trips, they also worry that their over-reliance on such recommendations can affect their control over their own travel experiences.

Other studies that focus on consumers' perceptions toward mobile technologies seek to understand consumers' social attribution to mobile devices (Tussyadiah, 2014), attitude toward location-based services (Mak et al., 2015) and travel mobile applications (Im & Hancer, 2017), and perceived benefits of purchasing air travel ancillary services through mobile devices (Morosan, 2015b).

4.2.4 Preference and usage behavior of mobile technologies for travel

This category of research occupies the smallest proportion in mobile technology studies from the consumers' perspective, with only three studies investigating this topic. Murphy et al. (2016) studied the usage behaviors of different technological devices, and found that consumers tend to switch to their personal computers in the final booking process, although they use mobile devices during the search process. Smartphone users are also more likely to consult their family and friends for information but are less likely to use OTA websites. Tussyadiah (2016) investigated the role of travelers' innovativeness traits on the usage patterns of mobile technologies during travel. She found that more innovative travelers tend to use smartphones more frequently for on-

site trip management, reading online reviews, searching for promotional offers, receiving push recommendations, and social networking. Dickinson, Hibbert, and Filimonau (2016) studied tourists' desire to stay connected or disconnected using mobile technologies in camping tourism. They found that tourists face a dilemma on the value of being connected and the desire to stay away from mobile technologies.

5. Discussion and implications

This comprehensive review aimed to characterize and synthesize the existing literature on mobile technology usage in the field of hospitality and tourism. As indicated by the increasing number of articles in each year, mobile technology has become an important research topic among scholars in this field. Most studies investigated the adoption and effects of mobile technologies in the context of tourism experience and the hotel industry. Future research can explore the above identified topics in other sectors of tourism, including airlines, destinations, and attractions. A few sectors may be integrated in one study to enhance the generalizability of the findings and our understanding of this rising phenomenon.

In terms of the methodological nature, quantitative methods, such as questionnaire survey, are the most commonly adopted methods. Scholars may thus develop and test multi-level models, which incorporate views from both the individual (e.g., employee) and the firm (e.g., destinations and hotels) levels. For example, employee perceptions toward mobile technology usage for work-related purposes may be aggregated to a firm-level perception, which influences the firm's overall mobile technology strategies. Moreover, more innovative data collection methods, such as the netnographic approach in the online platforms and big data analysis, should be utilized to draw

more insights on this topic through different lenses. The analyses on the theories and frameworks adopted show that mobile technology research has solid theoretical ground given that a large proportion of studies are based on one or more theories or frameworks. As expected, such theories as TAM, UTAUT, IDT, and TPB from the field of technology and information systems are the most frequently cited and applied in the literature. Given the multi-disciplinary nature of the hospitality and tourism field, theories and frameworks from other disciplines investigating the social and psychological aspects of mobile technologies, such as social exchange and social presence theories, should be more frequently explored. This should be done in order to supplement the existing knowledge gained from information system theories and further advance the research avenue.

Consistent with previous studies (Kim & Law, 2015), the number of articles from consumers' perspective is much larger than that from suppliers' perspective, clearly demonstrating an asymmetry in scholarly interest and attention. Research from suppliers' viewpoint is heavily tilted towards illustrating the effects of mobile technologies on business functions, including strategic development, human resource management, performance management, and marketing and distributions. More research is need to understand the strategic decisions of practitioners to adopt innovative mobile technologies. In particular, the motivators and inhibitors are less understood. Theoretical models that have been explored from the consumers' perspective, such as the TAM (e.g., Kim et al., 2008; Wang et al., 2014) and the benefit-risk calculus model (Morosan, 2015; Morosan & DeFranco, 2015), can be applied to understand what factors motivate or constrain the adoption of mobile technologies for business purposes. Additionally, theories related to the strategic use of resources, such as resource-based view theory (Wernerfelt, 1984), may be deployed to understand how mobile technology—as a valuable resource—may be utilized and

transformed into distinctive capabilities that can help create competitive advantages. As mobile technology gains increasing popularity among hospitality and tourism practitioners, future studies may investigate whether and how its prominent role in enhancing the competitive position of a firm diminishes or increases.

Aside from being effective in enhancing employee trainings and productivity, the role of mobile technologies on other functions related to HR management, such as internal marketing and communication, employee engagement, and employee relationship management, should also be explored in future studies. Moreover, an objective measure of employee productivity, such as the evaluation by customers or supervisors instead of employees' subjective evaluation, should be developed to better understand the role of mobile technologies on HR management. Practitioners are more concerned with whether the exploitation and participation in mobile technologies can positively influence organizational performance. The existing literature is not sufficient to answer this question, partly because the causality effect is not well-demonstrated in existing studies despite an overall positive association (Jung et al., 2014; Makki et al., 2016). Thus, future studies are suggested to perform pre- and post-adoption comparison or longitudinal research to confidently attribute the effect of performance improvement to mobile technology usage. Moreover, a multi-factor performance indicator integrating various aspects, such as customer satisfaction, relationship quality, and customer loyalty, should be developed to gain more comprehensive insights into how mobile technologies improve organizational performance. Instead of mobile adoption as a broad company strategy, the effect of the specific attributes of mobile technologies (e.g., personalization) on organization performance can also be linked and investigated. Mobile technologies represent a powerful marketing tool to reach current and potential customers, yet the existing literature is limited to identifying the novel ways of segmenting customers according to

their mobile usage behaviors (Eriksson, 2014; Okazaki et al, 2015). Although segmentation is important for practitioners and marketers to learn about the target segments that appreciate the efforts of mobile technological implementation, the role of mobile technologies on other marketing processes, especially the advertising and service delivery process, remains under-explored. This finding is consistent with that of Kim and Law (2015). Specifically, the existing literature is not capable of answering such questions as "What are the most effective mobile advertising strategies?" and "How does mobile technology help deliver services to tourists or hotel guests?" These questions represent paramount research questions that can be researched individually or holistically to assist practitioners in devising appropriate mobile marketing tactics. Hospitality and tourism marketers have increasingly adopted innovative mobile marketing tools, such as location-based push recommendations, to effectively reach their customers. However, diversified strategies of using such push messages, ranging from content design, to time and frequency of recommendation, are not well researched.

In addition, the role of mobile technologies on other business functions in the tourism context, such as customer services, customer relationship management, and visitor management and control, have not been explored. To fill this gap, future studies may investigate how mobile technologies complicate or simplify the process of service delivery. Mobile technologies may also be used to conduct visitor management (Tan & Law, 2016), but its effectiveness remains unknown.

Two other research themes related to suppliers' perspectives are the evaluation and improvement of mobile technologies and the factors that influence successful mobile technology adoption. Both topics warrant more research attention. Aside from constantly updating customer needs and requirements, more advanced methods from computer science and programming may be necessary to enhance the existing mobile payment and recommender systems in the hospitality

and tourism field. At the same time, future research may also extend the work of Lin (2017) to further investigate the critical success factors of successful mobile applications in various sectors in the tourism industry, or acquire information from a different group of informants. While a number of studies have investigated consumers' expectations on mobile technologies, expectations from suppliers on what mobile technologies can offer for the organization are less understood.

Studies from consumers' perspectives largely focus on the motivators and/or inhibitors of tourists to use and/or reuse mobile technologies for travel. Five factors affecting consumers' adoption have been synthesized to represent the literature. These factors are utilitarian, hedonic, dispositional, behavioral, and environmental factors. Motivational studies are very popular among scholars. This is because innovative technologies constantly emerge in the market, and researchers are interested in understanding what drives the adoption of these new technologies. When these motivational studies are conducted, researchers tend to focus on the utilitarian and hedonic characteristics of mobile technologies (i.e., usefulness, ease of use, enjoyable usage experience, and compatibility) as the primary determinants of the successful adoption of mobile technologies for travel. Dispositional factors are also limited to consumers' demographic characteristics, privacy concerns, and personal innovativeness. These studies provide insights into technology adoption from a macro-level perspective. Future studies may consider investigating a deeper level of consumer characteristics, such as self-image, novelty-seeking, personality, and need for status, which can generate further interesting insights on personal differences. Moreover, most of these studies focus on identifying the motivators rather than inhibitors. However, the reasons why tourists are reluctant to use mobile technologies for travel are equally important. The inhibitors being identified from existing studies are limited to perceived risk and privacy concerns (Fong et al., 2017; Ozturk et al., 2016; Ozturk et al., 2017). A more comprehensive study that involves

focus group discussions or interviews, followed by questionnaire surveys with specific travelers who are reluctant to use mobile technologies in their trips, is an interesting area worthy of further exploration. The results can be compared with the five factors identified in the current study, so that motivators and inhibitors can be more accurately determined.

This comprehensive review shows that mobile technologies influence travel patterns and tourists behavior before, during, and after a trip, by providing convenient and instant access to information, social connections, support, and an interactive sharing platform. Tourists are empowered to make impromptu decisions anytime and anywhere, so they can plan less before their trips and easily adjust their itineraries during their trips. Although tourists can experience a destination in more innovative ways (Wang et al., 2012), whether they enjoy their trip more with the intervention of mobile technologies is unclear. Thus, future studies should examine the changes in consumer emotional states created by the use of mobile technologies. While Dickinson et al. (2017) showed that mobile technologies enhance communication among campsite tourists, scholars may extend this view to explore how the use of mobile technologies affects social interactions and communications among travel companions. In fact, the direct and indirect roles of mobile technologies in mediating "memorable travel experiences" have yet to be fully explored.

Finally, the perceptions toward using mobile technologies for travel, and tourists' preference and usage behavior of mobile technologies for travel are two areas of research that have been overlooked. Perceptions regarding mobile technologies mainly focus on identifying the antecedents and consequences of perceived risks and benefits (DeFranco & Morosan, 2017; Park & Tussyadiah, 2017), and the perceptions of mobile marketing efforts (Erawan, 2016; Tussyadiah & Wang, 2016). Future studies should thus explore the antecedents and consequences of the perceived personalization of mobile technologies, which is one of the most important features of

mobile technologies driving usage and expectations (Dickinson et al., 2014). In addition, studies on other topics from the consumers' perspective, such as the antecedents and consequences of perceptions and attitudes toward innovative mobile technologies (e.g., LBS and mobile payments, the effect of mobile technologies usage on destination image, and satisfaction to mobile information services) should be deployed.

6. Conclusions

This study is not without limitations. First, this study identified and reviewed articles related to mobile technologies published only in hospitality and tourism academic journals. Articles published in non-hospitality and tourism journals, and other research outputs, such as conference proceedings, research notes, and reports, are excluded from the review. Additionally, relevant studies not containing the keywords used for data collection were left out. Thus, some valuable information might have been unintentionally excluded.

Nevertheless, this study represents one of the first few attempts to review this important research area from the perspectives of suppliers and consumers. By taking stock of all mobile technology studies in hospitality and tourism, this study characterizes and synthesizes our current knowledge on this topic, thus providing a useful roadmap to guide future research. Moreover, this study offers practitioners, who are interested in adopting mobile technologies, an overview of consumers' motives, usage behavior, and preferences on using mobile technologies for travel-related purposes. This review can be replicated a few years later to identify the change in research focus and methodological nature. Moreover, quantitative methods may be used to compare the differences between articles in hospitality and tourism journals.

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Table 1. Distribution of articles by journal publications.

Journal publication	*Count*	*%*
Journal of Hospitality and Tourism Technology	18	20%
International Journal of Contemporary Hospitality Management	10	11%
Tourism Management	9	10%
International Journal of Hospitality Management	6	7%
Journal of Hospitality Marketing & Management	5	5%
Journal of Sustainable Tourism	5	5%
Journal of Travel Research	5	5%
International Journal of Tourism Research	4	4%
International Journal of Hospitality & Tourism Administration	3	3%
Asia Pacific Journal of Tourism Research	3	3%
Annals of Tourism Research	3	3%
Tourism Management Perspectives	2	2%
Tourism and Hospitality Management	2	2%
Journal of Travel and Tourism Marketing	2	2%
Journal of Information Technology and Tourism	2	2%
Journal of Hospitality and Tourism Research	2	2%
Journal of Hospitality and Tourism Management	2	2%
Current Issues in Tourism	2	2%
Cornell Hospitality Quarterly	2	2%
Tourism and Management Studies	1	1%
Journal of Quality Assurance in Hospitality & Tourism	1	1%
Journal of Convention and Event Tourism	1	1%
Journal of China Tourism Research	1	1%
Asia-Pacific Journal of Innovation in Hospitality and Tourism	1	1%
Total	*92*	*100%*

Table 2. Industry applications of mobile technology research

Industry applications	***Count***	***%***
Travel experience/trip in general	37	39%
Hotel industry (hotels, accommodation, lodges)	32	33%
Restaurants	7	7%
Travel trade (Online/travel agencies and tour operators)	7	7%
Airlines	3	3%
Campgrounds	2	2%
Clubs	2	2%
Destination	2	2%
Tourism industry	2	2%
Attractions	1	1%
Convention/Event	1	1%
Total	*96*[a]	*100%*

[a] *The total number of industries exceeds the number of articles reviewed (N=92) as some articles have investigated more than one service providers.*

Table 3. Methodological nature of mobile technologies research

Methodological nature	*Count*	*%*
Conceptual	**7**	**8%**
Secondary	7	8%
Mixed methods	**6**	**7%**
Hybrid	2	2%
Primary	4	4%
Qualitative	**11**	**12%**
Primary	9	10%
Secondary	2	2%
Quantitative	**68**	**74%**
Primary	65	71%
Secondary	3	3%
Total	*92*	*100%*

Table 4. Theories and frameworks

Theories and frameworks	*Count*	*%*
Number of theories applied		
1 theory	47	51%
No theory	26	28%
2 theories	12	13%
3 theories	4	4%
4 theories	2	2%
5 theories	1	1%
Total	*92*	*100%*
Theories/frameworks studied more than once		
Technology acceptance model	26	27%
Unified theory of acceptance and use of technology model (UTAUT)	7	7%
Innovation diffusion theory	5	5%
Theory of planned behavior	5	5%
Social cognitive theory	4	4%
Theory of reasoned action	4	4%
Motivation theory	3	3%
Service-dominant logic paradigm	3	3%
Technology-organization-environment (TOE) framework	2	2%
Theory of perceived risk	2	2%
Uses and gratifications (U&G) theory	2	2%

Table 5. Research topics from suppliers' perspective

Categories	***Citations***
Effects of mobile technologies on business functions (N=19)	Bertan et al. (2016); Boys, While, and Groover (2017); Buhalis and Licata (2002); Car et al. (2014); Egger (2013); Eriksson (2014); Jeong et al., (2016); Jung et al. (2014); Katsura and Sheldon (2008); Kim et al. (2014); Kim and Kizildag (2011); Law et al. (2015); Lee et al. (2010); Makki et al. (2016); Pesonen and Horster (2012); Qin et al. (2017); Okazaki et al. (2015); Tan and Law (2016); Wang et al. (2016c)
Evaluation and improvement of mobile technologies (N=5)	Chen et al. (2016); Dickinson et al. (2014); Meehan, et al. (2016); Rivera et al. (2016); Wang et al.(2016b)
Influential factors on successful mobile adoption (N=1)	Lin (2017)

Table 6. Research topics from consumers' perspective

Categories	***Citations***
Motivators/inhibitors of tourists to use/reuse mobile technologies for travel (N=41[b])	Aluri (2017); Beldona et al. (2012); de Oliveira Nunes and Mayer (2014); Fong et al. (2017); Gupta & Dogra (2017); Im and Hancer (2014); Jung et al. (2015); Kim (2016); Kim et al. (2013); Kim et al. (2008); Kwon et al. (2013); Kim et al. (2016); Kim, Mejia, and Connolly (2017); Lai (2015); Lee and Lee (2014); Lu et al. (2015); Mang et al. (2016); Meng et al. (2015); Morosan (2014); Morosan (2015a); Morosan and DeFranco (2014a); Morosan and DeFranco (2014b); Morosan and DeFranco (2016b); Morosan and DeFranco (2016c); No and Kim (2014); Nyheim, et al. (2015); Oh et al. (2009); Okazaki and Hirose (2009); Okumus and Bilgihan (2014); Okumus et al. (2016); O'Regan and Chang (2015); Ozturk et al. (2017); Ozturk et al. (2016); Park and Huang (2017); Peres et al. (2011); Rivera, Gregoary, and Cobos (2015); Sarmah et al. (2017); Wang et al. (2014); Yoon et al. (2017); Zhu and Morosan (2014)
Impact of mobile technologies on consumer travel patterns and behaviors (N=17[b])	Coussement and Teague (2013); Dickinson et al. (2013); Dickinson et al. (2017); Kirillova and Wang (2016); Lamsfus et al. (2015); Lee, Chen, & Su (2017); Lyu and Hwang (2015); Mang et al. (2016); Morosan and DeFranco (2016a); Murphy et al. (2016); Paris (2012); Wang et al. (2012); Wang et al. (2014); Wheaton et al. (2016); Yepes (2015); Wang et al. (2016a); Zhang et al. (2017)
Perceptions toward using mobile technologies for travel (N=9[b])	DeFranco and Morosan (2017); Erawan (2016); Im and Hancer (2017); Mak et al. (2015); Morosan (2015b); Morosan and DeFranco (2015); Park and Tussyadiah (2017); Tussyadiah and Wang (2016); Tussyadiah (2014)
Preference and usage behavior of mobile technologies for travel (N=3[b])	Dickinson et al. (2016); Murphy et al. (2016); Tussyadiah (2016)

[b] *The total exceeds the number of articles categorized under consumers' perspective (N=67) as three studies have more than one research focus.*

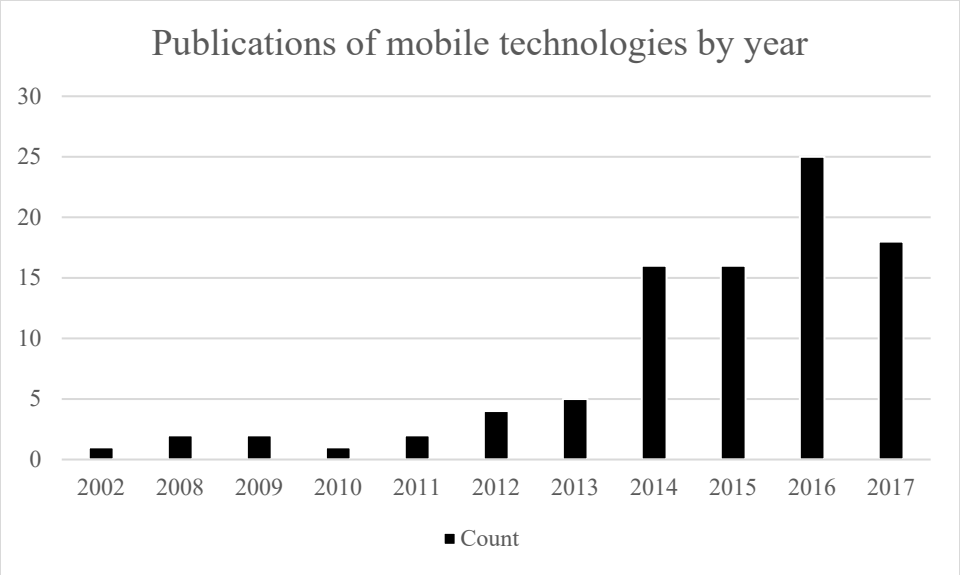

Figure 1. Publications of mobile technologies by year