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Assessing Hotel-Related Smartphone Apps Using Online Reviews

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The fast adoption of the smartphone and its associated applications (apps) is changing the landscape of the hospitality industry in terms of marketing and distribution. Within this context, understanding the current capabilities of smartphone apps and user experience of these apps can help the hospitality industry develop more user-friendly apps and effective distribution strategies via mobile channels. This study investigates the functional features of two types of smartphone apps in facilitating hotel reservations—one by online travel agencies and the other by hotel brands. Based on the content analysis of online user reviews, this study comparatively assesses consumers' experiences and their evaluation involving these two types of hotel apps. This study provides a timely analysis of the state-of-the-art mobile technology for hotel distribution, and its findings offer useful insights into mobile distribution and smartphone app design for the hospitality industry.

KEYWORDS *smartphone, apps, hotel booking, online distribution, mobile marketing, user reviews*

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INTRODUCTION

As a combination of the mobile phone and the computer, and for its capability of Internet access, location-awareness, and mobile operation systems, the smartphone has been capturing a large and increasing share of the mobile market in recent years. Along with smartphone penetration growth, mobile applications (apps) are also enjoying increasing popularity and usage, and more and more smartphone owners use these apps for travel-planning purposes (Wang & Xiang, 2012). Research has shown that the hospitality industry experienced a tremendous increase in mobile channel booking revenue from \$753 million to \$1,368 million from 2011 to 2012 (PhoCusWright, 2012). Several hotel groups have announced impressive amounts of mobile bookings and optimistic views on the future of the mobile-booking channel, and they have predicted that travelers will turn to their mobile devices to research travel and accommodation options, book, and communicate room preferences with hotels directly. The mobile travel market value in United States was estimated to reach US\$23 billion in 2013 with 16% of growth over the past year (Tnooz, 2014).

Many hotels and online travel agencies (OTAs) wish to be at the forefront of this trend in the adoption of smartphones for travel planning and hospitality services. Some hotel groups, such as Choice Hotels, Starwood Hotels & Resorts, Intercontinental Hotel Group, Marriott, and Hyatt, have developed their own mobile applications, while the major OTAs, such as Expedia, Travelocity, Tripadvisor, and Hotwire, have also launched mobile applications to increase the use of their platforms for hotel booking. However, there are reports showing that at the current stage the mobile channel is mainly perceived as an information source instead of a transaction tool by both travelers and hospitality suppliers. For instance, comScore (2012) reported that top hotel-related mobile activities are looking up hotel addresses (29%), searching for attractions/things to do at destination/near hotel (23%), reading hotel reviews (22%), comparing hotel price and availability (21%), and booking hotel room (18%). As such, the hospitality industry has yet taken full advantage of this potentially powerful distribution and marketing channel for their products.

It is expected that the smartphone along with the mobile platform will play an important role not only in the distribution of products but also in establishing and strengthening customer relationships and brand loyalty (Anuar, Musa, & Khalid, 2014). While there is growing literature aimed at understanding the impact of mobile technology on hospitality and travel (e.g., Lee, Hwang, & Hyun, 2010; S. Oh, Lehto, & Park, 2009; Wang, Xiang, & Fesenmaier, 2014), little is known about how consumers actually use and evaluate their experiences with the use of smartphone apps, specifically in the hospitality industry. With this in mind, the overall goal of this study is to assess the current capabilities of hotel-related smartphone apps in order

to gain an understanding of factors that would contribute to a positive or negative experience perceived by consumers. Specifically, this study aims to answer two research questions:

- RQ1:* What are the functional features of hotel-related smartphone apps that support travelers' information, communication, and transaction needs?
- RQ2:* To what extent are existing hotel-related apps effective in satisfying users' needs?

By analyzing a collection of customer reviews on hotel-related apps, this study comparatively evaluates two types of hotel-related apps: one by OTAs and the other by hotel brands. The customers' needs and perceptions for the mobile applications of OTAs and hotel groups are identified and differentiated. Then, the implications for research and practice are discussed.

RESEARCH BACKGROUND

While mobile technology has been identified as an important agent of change in hospitality and tourism industry (Buhalis & Law, 2008), its role in supporting travel is a relatively recent phenomenon. From the early prototype of mobile tour guides and hand-held PDAs, to GPS-supported systems and camera phones, to today's smartphones with enhanced information and communication capabilities, the capacity of mobile technology in assisting travel-related decisions has been substantially improved (Wang & Xiang, 2012). Today's mobile technologies are known to possess the capabilities to satisfy users' entertainment and spontaneous needs, help fulfill one's efficiency desires, assist in making time-critical arrangements, and cater to mobility-related situational needs. Thus, a review of the major roles of mobile technology in supporting travelers will provide a foundation for the exploration of the functional features of hotel-related smartphone apps, facilitating the understanding and evaluation of the status quo of these apps. Also, in order to systematically understand the app users' experience, this study identifies the core dimensions of the user experience of hotel-related smartphone apps from the extant literature. The following sections provide research background from the two aforementioned aspects.

With power-efficient processors, modern operating systems, broadband Internet access, large viewing screen, user-friendly interfaces, pervasive computing capabilities, and productivity-enhancing apps, the smartphone offers a wide range of possibilities to support travelers in their use of information and communications home and away (Gretzel, 2011; White & White, 2007). Particularly, compared to previous generations of consumer mobile technologies, the smartphone offers substantially higher capacity for

connectivity, communication, content consumption, and content creativity (Want, 2009). Studies identified that different from the traditionally conceived tour guides, smartphone apps not only provide information about destinations and attractions, they also play various roles in travel, such as travel agencies, translators, entertainment devices, and social tools (Wang, Park, & Fesenmaier, 2012; Wang & Xiang, 2012).

To help travelers make informed decisions at a reduced cognitive cost, one of the important goals for mobile technology development is system intelligence. A viable approach to system intelligence is the delivery of context-aware information. Particularly, position-aware context is increasingly applied to mobile services. For instance, Dickinson et al. (2012) reviewed 164 top visitor attraction apps and demonstrated a range of technical functionalities varying from basic systems delivering web content to mobile devices with more sophisticated context-awareness tools. Another approach to improving system intelligence is through personalized recommendations based upon contextual factors, such as tourist types, activities, experiences, visiting phases, technology capabilities, and limitations, to inform the user of the time of day and weather conditions, to recommend means of transportation, as well as to propose sites to visit (Kenteris, Gavalas, & Mpitzopoulos, 2010; Tintarev, Flores, & Amatriain, 2010). Morell (2013) empirically demonstrated how smartphone apps could improve the quality of customer service in theme or amusement parks through showing the exact location of rides, checking on wait times at different attractions, and reserving a place in line at a ride among other ways.

In addition, since interaction with others is found to be a source for tourists to seek information and to make decisions before, during, and after the visit, the potential for integrating social computing into the mobile platform is huge. For example, “mashup” technology, based upon open web APIs (application programming interfaces), has shown the power of integrating applications and data sources to create novel and situational services, such as mapping (Meng & Xu, 2010). Mobile community services for tourists have been developed to allow users to seek travel-related information through social interaction and share experiences with each other anytime and anywhere. Social computing, combined with location-based technology, can create messaging systems that deliver user-generated content to the social circle in the context of the users’ physical locations (Carlsson, Walden, & Yang, 2008).

Accommodation experience is one of the essential components of tourist experience, which begins with hotel booking and ends up with the check-out of guests (Huckestein, & Duboff, 1999). Previous studies identified that mobile technology has been developed to penetrate more and more into this process (Adukaite, Reimann, Marchiori, & Cantoni, 2013). More hotel companies and OTAs launched their mobile applications or the websites particularly designed for mobile devices. Beyond the preconsumption stage, which

mainly consists of room bookings, the hoteliers are integrating the mobile platform to also provide services during the consumption of accommodation, through functionalities such as online check-in, hotel room upgrades, dining reservations, spa reservations, room environment controls and TV controls, and loyalty programs (Adukaite et al., 2013; Anuar et al., 2014).

While previous studies generated useful insights on the availability of functions of hotel-related mobile apps and the benefits perceived by managers of hospitality business, little is known regarding users' perceptions and actual behaviors of using these smartphone apps. It is argued that without users' input it is difficult to know the values, benefits, and potential problems related to smartphone applications as perceived by the users. Also, the limited information on the actual use of these mobile apps offers little knowledge about the consequence (e.g., behavioral changes) of the adoption and use of these apps. Because of this, any actions and further investment on the development of mobile apps can be aimless. In addition, there has been little research on the impact of this increasingly important technology on the distribution and marketing of the hotel product, especially on how the hospitality industry uses smartphone apps to connect with their customers for product distribution and relationship management. As such, the goal of this study is to investigate the capabilities and effectiveness of existing hotel-related smartphone apps in order to identify problems and challenges for the hotel industry.

There are potentially many theoretical perspectives to understanding user adoption and evaluation of technology in hospitality (Y. H. Kim & Kim, 2010). For example, built upon the general theory of consumer behavior (Ajzen, 1991; Fishbein & Ajzen, 1975), the technology acceptance model (TAM; Davis, 1989), the unified theory of acceptance and use of technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003), and more recently the UTAUT2 (Venkatesh, Thong, & Xu, 2012) have been widely applied in various fields to understand technology adoption and evaluation. These models have been recognized for their capability to explain the adoption of various technology artifacts because they capture the key reasons for people to adopt a certain technology. Therefore, these models, particularly TAM and UTAUT (and UTAUT 2), have been widely applied to examine the adoption of technology for travel purposes in the tourism and hospitality field (e.g., D.Y. Kim, Park, & Morrison, 2008; Morosan, 2011; S. Oh et al., 2009; Panagopoulos, Kanellopoulos, Karachanidis, & Konstantinidis, 2011). However, these models have been criticized for the limitation in understanding users' experience of technology artifacts in context-specific situations (Wang et al., 2014). For instance, the UTAUT2 used seven constructs (i.e., performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit) to explain user's use of technology artifacts. These constructs describe the fundamental reasons for technology adoption but are incapable of identifying the context-driven

reasons for technology adoption, such as the specific information and service needs when the technology artifact is used for replacing human agents and the security considerations when the technology artifact is used for payment. Therefore, this study proposes to adopt a model or framework that can be more relevant to the contexts in which people consume hotel products.

This study argues that the user experience of hotel-related smartphone apps should be examined and better explained using the framework proposed by Park, Gretzel, and Sirakaya-Turk (2007). This framework identifies the underlying dimensions for evaluation of online travel agencies including the satisfaction of the users' needs (fulfillment), the richness and reliability of information (information/content), the effectiveness of customer service (responsiveness), ease of use, security, and visual appeal. The hotel-related smartphone apps can be considered in many ways similar to online travel agencies, with the primary goal to provide information and make reservations. Generally speaking, hotel-related smartphone apps are designed to provide more efficient and innovative online service to consumers, and they extend most of hotel-related online services that are available on the desktop- or laptop-based websites to mobile platform (Adukaite et al., 2013; Wang & Xiang, 2012). Hotel-related smartphone app users adopt the tools to cater their needs for a variety of hotel-related information, product reservations, transactions, and even the communication with hotel customer service (comScore, 2013). Besides the information and content offered by the apps, app users also acknowledged that ease-of-use is one of the primary reasons for their adoption of smartphone apps to facilitate travel (D. Y. Kim et al., 2008). In addition, security remains the foremost concern among the users of smartphones for online transactions (Credit Union National Association, 2013). Finally, the interface of a smartphone app can influence the user experience (Hsiao, 2013). Therefore, the framework proposed by Park et al. (2007) is considered adequate for evaluating user experience within the context of smartphone apps. Specifically, fulfillment refers to the satisfaction of a variety of users' needs on the mobile platform by the functionalities of the hotel-related smartphone app. Second, information/content refers to the quality of the information/content available on the app, for example, the degree to which the information is reliable, complete, or up-to-date. Third, responsiveness refers to the efficiency of customer service in addressing users' requests sent from the app, for example, timely response and appropriate feedback. Ease-of-use, visual appeal, and security and privacy refer to the effectiveness of the smartphone app in delivering the above functionalities and content. This study analyzes the user's experience of hotel-related smartphone apps from these six dimensions.

METHODS

There are basically two types of hotel-related smartphone apps available on the apps market: one developed by OTAs (i.e., “OTA apps” hereafter) and the other by hotels (i.e., “hotel proprietary apps” hereafter). Both types of apps are used by tourists to obtain hotel information and reservations. This study conducted a content analysis on a collection of consumer reviews of both types of hotel-related smartphone apps. Online comments from customers are an authentic source in exploring customers’ perceptions and preference, as well as their actual experiences with, and evaluation of, a product (e.g., Xiang, Schwartz, Gerdes, & Uysal, 2015). Given the exploratory nature of the study, the analysis first aimed to identify features of these apps, and then an evaluation framework was applied to examine the reviews of the two types of apps to assess app user’s experience from different dimensions.

Data Collection

A computer program using the programming language C++ was designed to extract customer reviews of smartphone apps from iTunes App Store during December 2013. The reviews of apps were available in iTunes App Store by Apple Inc. The computer program was designed to collect all the reviews posted for each app between June 2009 and December 2012. A total number of 6,110 customer reviews associated with the 21 apps were collected and all were analyzed. The apps included in this study are the most popular smartphone hotel product-related apps in iTunes app store in terms of number of customer reviews. Eleven OTA apps and 10 hotel proprietary apps were selected and analyzed. Table 1 shows the list of smartphone apps selected with respective number of user reviews and average ratings associated with the reviews (i.e., the overall rating by all app users).

Data Analysis

Content analysis was used to (a) identify the major features offered by each selected app based on the descriptive information from the developers (Table 2), and (b) identify the specific opinions towards these features from the customer reviews of the apps. First, in the developer’s description of each app, the main features of each app were identified and coded accordingly; the major features of each app were then listed and compared between the OTA apps and hotel proprietary apps. Second, user reviews were reviewed and coded under the framework of six core dimensions of app user’s experience (i.e., fulfillment, information/content, responsiveness, ease-of-use, security, and visual appeal). The reviews that mentioned several features were broken down and coded differently. For example, a user, who

TABLE 1 List of hotel-related smartphone apps

Category	App name	No. of customer reviews	Average rating score
OTA	Tripadvisor	1,488	4.5
OTA	Expedia	1,112	4.2
OTA	Jetter for iPhone	552	4.8
OTA	ToucHotel	457	4.2
OTA	Travelocity	310	1.9
OTA	Hotelsbyorbitz	148	4
OTA	Jetter iPad hotels	124	4.7
OTA	Orbitz	108	4.0
OTA	Hotwire hotels	57	4.6
OTA	TellmeWhere	34	4.0
OTA	Hotels near me	5	2.6
Hotel	Hilton	600	1.8
Hotel	Marriott International	402	2.6
Hotel	SPG	383	2.2
Hotel	Choice Hotels–Book Now!	97	2.8
Hotel	Hyatt Hotels	82	3
Hotel	Best Western to Go	43	2.7
Hotel	Wyndham Hotels and Resorts	42	2.0
Hotel	W Hotels Worldwide	35	4.1
Hotel	Holiday Inn Express Hotels	20	3.3
Hotel	Shangri-La Hotels Resorts	11	3.9

Note. OTA = online travel agencies.

rated the app with a score of 5 on a scale from 1-5 with 5 being the most favorable, wrote:

I loved the auto fill option, smart dudes. The info is highly reliable: I checked for hotels on Kayak, TripAdvisor and Google and none gave me useful info like this app, plus I got a deal that was (anonymously) posted on Priceline at a lower price, since there are no fees here.

Three keywords were identified (“auto fill,” “info,” and “deals”) and were coded into reservation, hotel information, and deals, respectively. The keywords that were used to match with the features (i.e., the coding frame) are listed in Table 5. Further, positive and negative reviews were identified to analyze customers’ perceptions and preferences toward the features. Positive and negative reviews are differentiated based on the rating score and the number and percentage of negative ratings (i.e., rating score 1–2) and positive ratings (i.e., rating score 4 – 5) were calculated. For reviews with a rating score of 3, that is, a neutral rating score, we read the review contents to determine whether customers were complimenting or complaining about the apps. The numbers and percentages of positive and negative reviews were calculated. Last, an importance-performance map was constructed for both OTA apps and hotel proprietary apps (H. Oh, 2001).

TABLE 2 App features available in the selected smartphone apps

ID	App features	Functions (Summary of app developers' descriptions)
1	Reservation	To make reservations and complete transactions.
2	Location awareness (GPS technology)	To recognize the current location of tourists and provide relevant suggestions based on tourists' inquiries such as hotels and restaurants.
3	Hotel information	To provide information (descriptions and details) about room types, amenities, and photos.
4	Destination information	To provide information about destinations such as local weather, maps, attractions, activities, and transportation.
5	Hotel property search	To enable the search of hotel properties by entering city, locations, or hotel names.
6	Search filter and sort	To provide advance search functions including filtering and sorting by indicators such as price, distance, and average ratings.
7	Travelers' ratings and reviews of hotel products	To provide user generated reviews regarding the hotel properties.
8	Click-to-call	To enable a "one-click-to-call" for customer service directly via the apps.
9	Interactive map	To display hotels and other point-of-interests (e.g., hotels/restaurants/attractions) searched by tourist in an interactive map, which users can touch the points for more information.
10	Loyalty program account access	To integrate with rewards program so that smartphone users can manage their rewards accounts via the application to check and redeem rewards points.
11	Offers and promotions	To provide information on the deals and offers of accommodation.
12	Mobile exclusive	To provide deals only available through the smartphone apps.
13	Social network integration	To enable the access of social networking sites such as Facebook and Twitter, encouraging the direct sharing on the social networking sites.
14	Mobile check-in and check-out	To enable check-in and check-out via the app.

FINDINGS

Overview of Smartphone Apps Functional Features

In total, the OTA apps and hotel proprietary apps offer 14 features, which are described in [Table 2](#).

[Table 3](#) and [4](#) present the app features provided by each of the OTA apps and hotel proprietary apps, respectively. As can be seen, users' ratings and reviews is the most popular information service offered by OTA apps

TABLE 3 Functionalities of online travel agency apps ($N = 11$)

Features	n	Expedia	Hotels near me	Hotels by Orbitz	Hotwire Hotels	Jetter for iPhone	Jetter iPad hotels	Orbitz	TellmeWhere	TouchHotel	Travelocity	Tripadvisor
Travelers' ratings and reviews of hotel products	8	X		X		X	X		X	X	X	X
Reservation	7	X	X	X	X	X	X			X		
Location awareness	7	X	X	X	X			X			X	X
Hotel information	7	X	X	X	X		X	X		X		
Mobile exclusive	6	X		X		X	X	X			X	
Hotel property search	5			X		X	X				X	X
Interactive map	4			X	X				X		X	
Search filter and sort	4	X		X	X			X				
Click-to-call	2				X			X				
Destination information	2							X	X			X
Offers and promotions	2			X					X			
Social network integration	2								X	X		
Loyalty program	1	X										
account access												
Mobile check-in and check-out	0											

TABLE 4 Functionalities of hotel proprietary apps ($N = 10$)

Features	n	Choice Hotel			Holiday Inn		Shangri-La hotels	Wyndham	W Hotels Worldwide	Best Western to go
		SPG	Marriott	Book Now	Hilton	Express				
Reservation	10	X	X	X	X	X	X	X	X	X
Hotel property search	8	X	X	X	X	X	X	X	X	X
Location awareness	7		X	X	X		X			X
Hotel information	7	X	X	X	X		X		X	X
Click-to-call	7	X	X	X			X		X	X
Loyalty program	7		X	X	X					
account access	7	X	X	X	X	X				X
Destination information	5		X					X		
Interactive map	4			X					X	X
Offers and promotions	4	X					X	X	X	
Social network	3								X	X
integration	2		X							
Mobile check-in and check-out	2							X		
Search filter and sort	2				X					
Travelers' ratings and reviews of hotel products	1									X
Mobile exclusive	0									

(8 out of 11 apps), followed by reservations (7 apps), location awareness (7 apps), and hotel information (7 apps). As for hotel proprietary apps, all 10 apps offer reservations, followed by hotel property search (8 apps), location awareness (7 apps), hotel information (7 apps), “click-to-call” (7 apps), and loyalty account access (7 apps).

The results show that smartphone apps offer comprehensive information services as well as innovative smartphone-enabled services. Information services, such as hotel information, offers, and promotions, are supported by context-awareness features, like location-based services. The search filter also provides suggestions to users based on users’ locations or search requests. Apps also integrate a social networking platform that enables instant communication for users. Both OTA apps and hotel proprietary apps aim at serving the basic purpose of offering room reservation services to users. In sum, the results confirm that OTAs and hotel brands utilize smartphone apps as another distribution channel to enhance revenue by offering basic functions, such as a database of hotel properties and a reservation system.

The focus of OTA apps and hotel proprietary apps are different. By examining the number of apps offering the features, we identified that both apps mainly serve for reservations and information search. However, OTA apps focus on offering information services with a database of different hotels for users to make accommodation choice by comparing hotels, while hotel proprietary apps are more likely to offer functions such as loyalty account access, destination information, and social network integration to add values to consumers and facilitate a seamless accommodation experience.

Evaluation of Smartphone App Features Based Upon User Reviews

All user reviews (6,110 records) associated with the 21 chosen apps were analyzed. In 6,110 reviews, 232 of them are suggestions given by users to app developers on improvement of app functionality and performance, while 5,878 reviews are the comments on the functionality of apps. Among these 5,878 reviews, 4,265 (73%) are about OTA apps and 1,613 (27%) are about hotel proprietary apps. Table 5 presents the number of reviews that mentioned each feature in sequence for OTA apps and hotel apps.

In the fulfillment dimension, deals is the most mentioned feature in OTA apps (460), followed by reservation (191), integration with website (99), integration with rewards program (14), calendar integration (7), and integration with Passbook (5) for OTA apps; while reservation is the most mentioned feature for hotel apps (247), followed by integration with rewards program (129), integration with website (117), deals (21), calendar integration (11), integration with Passbook (8), and online check-in/out (8). It seems that the OTA apps users mainly care about the deals function because they are more

TABLE 5 App features in user reviews

Core dimensions of app user experience	Features	Keywords	OTA apps			Hotel proprietary apps			
			No. of reviews	% positive reviews	% negative reviews	No. of reviews	% positive reviews	% negative reviews	
Fulfillment	Reservation	Bookings, auto fill, on-the-go, reservation	191	56	44	247	32	68	
	Integration with website	Login, account, my trips	99	8	92	117	0	100	
	Integration with rewards program	Rewards, points	14	0	100	129	29	71	
	Integration with Passbook	Passbook	5	60	40	8	25	75	
	Deals	Deal, save, price	460	95	5	21	33	67	
	Calendar integration	Calendar	7	100	0	11	9	91	
	Online check in/out	Check in, check out	0	0	0	8	12	88	
	Easy to use	Easy, simple	714	99	1	81	89	11	
	Useful	Useful, helpful	261	75	25	98	50	50	
	Search	Search, filters, sorting, search options, search results	149	40	60	91	15	85	
	Ease of use	App Download	Fast, quick	260	95	5	65	25	75
		App Stability	Crash, fail, bugs, stability, error	149	8	92	319	0	100
		Convenience	Convenient, handy, time saver	113	98	2	30	93	7
		Saving user credentials	Keep logged in, remember me, credentials	0	0	0	64	0	100
Bookmark		Store, save	0	0	0	7	57	43	
Hotel information		Information, details	930	90	10	110	40	60	
Customer ratings and reviews		Reviews, comments	411	97	3	2	50	50	

(Continued)

TABLE 5 (Continued)

Core dimensions of app user experience	Features	Keywords	OTA apps			Hotel proprietary apps		
			No. of reviews	% positive reviews	% negative reviews	No. of reviews	% positive reviews	% negative reviews
Information/Content	Mapping	Map, GPS, near me feature	196	69	31	95	22	78
	Social network integration	Facebook, twitter, social network, what your friends recommend	29	76	24	0	0	0
Responsiveness Visual appeal	Commercial ad	Ads	5	20	80	0	0	0
	Customer service	Call, contact	23	26	74	14	3	11
	Overall design	Design, layout, interface, visual, appeal	246	84	16	96	61	39
Security and privacy	Security	Secure	3	100	0	0	0	0

likely to use OTA apps to search for deals or keep updated with the deals information, while the hotel proprietary apps users are more likely to adopt the apps for reservation and use of the rewards program. Based on the percentages of positive and negative reviews, it can be concluded that the OTA apps satisfied the users' needs on deals, while the hotel proprietary apps were unsatisfying in providing reservation service. Also, both OTA and hotel proprietary apps did not do well in integrating the app with their websites, which was criticized by many users.

In the ease-of-use dimension, easy to use is the most frequently mentioned feature in reviews for OTA apps (714), followed by useful (261), app download (260), search (149), app stability (149), and convenience (113); while for hotel apps the most mentioned feature is app stability (319), followed by useful (98), search (91), easy to use (81), app download (65), saving user credentials (64), convenience (30), and bookmark (7). It seems that "app stability" of hotel propriety apps is problematic. Of the sample, 319 users posted strong negative reviews regarding this point. The search function of OTA apps was also criticized by majority of users who mentioned this feature.

As for the information/content dimension, hotel information is the most frequently mentioned feature in OTA apps (930), followed by customer ratings and reviews (411), mapping (196), social network integration (29), and commercial ad (5); hotel information is also the most frequently mentioned keyword in hotel apps (110), followed by mapping (95) and customer ratings and reviews (2). It seems that OTA apps had a majority of positive reviews on providing hotel information, customer ratings and reviews, and mapping, while hotel proprietary apps were criticized for unsatisfactory performance in mapping and providing hotel information. Customer service in the responsiveness dimension has 23 reviews in OTA apps and 14 reviews in hotel apps. Both types of apps failed to provide satisfactory customer service through apps, as reflected by a large portion of negative reviews. In the visual appeal dimension, 246 reviews in OTA apps and 96 reviews in hotel apps mentioned overall design. Most of reviews are positive towards this feature. For the security dimension, only three reviews on OTA apps and none on hotel apps mentioned this feature.

Importance-Performance Analysis of Smartphone Apps

Based upon the features identified in user reviews, an importance-performance map is constructed for hotel proprietary apps and OTA apps, respectively (see [Figures 1](#) and [2](#)). The importance dimension (horizontal) is the ratio between the total number of reviews of a specific feature and the highest number of reviews among all features (i.e., app stability [319] in the hotels case and hotel information [930] in the OTAs case). For example, the reservation feature has a total number of reviews of 247, which

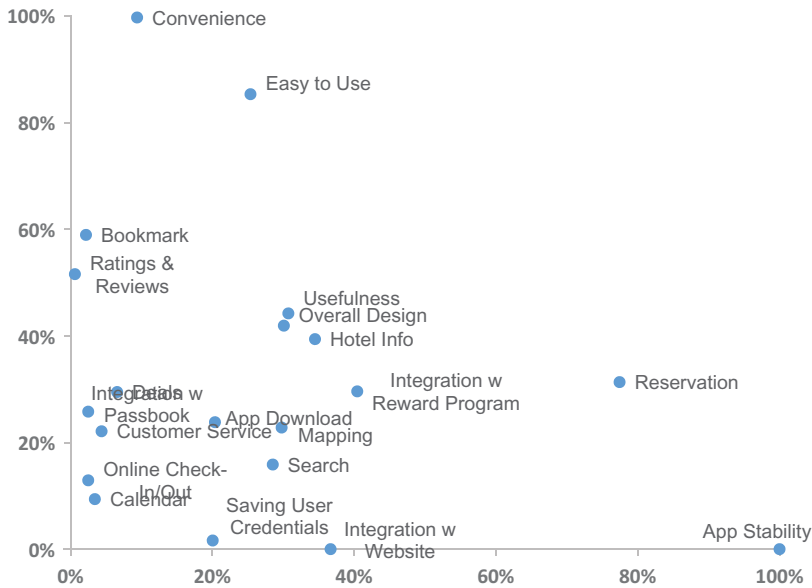


FIGURE 1 Importance-performance analysis of hotel proprietary apps.

indicates the level of importance for this specific feature as approximately 77% (247/319). The performance dimension (vertical) is established using the ratio between the percentage of positive reviews among all reviews for a specific feature and the highest percentage of positive reviews among all features (i.e., convenience [97%] for hotel proprietary apps and calendar [100%] for OTA apps). For example, there are 75 positive reviews for the feature reservation, which gives a percentage of approximately 30%, while the highest percentage of positive reviews among all features is for convenience, with 29 positive reviews out of 30 (97%). This gives a performance ratio of 31% (i.e., 30%/97%) for reservation. In essence, both importance and performance levels for a specific feature are calculated against the benchmarks of all features, (i.e., the highest number of reviews [importance] and the highest percentage of positive reviews [performance]).

These importance-performance maps reveal users' evaluations of each of the design and functionality features of smartphone apps in a visual way. For hotel proprietary smartphone apps, two types of features (i.e., app stability and reservation) are considered very important while receiving very few positive reviews. Particularly interesting is the feature of app stability, in that it is the most important feature with the highest number of reviews. However, it received no positive reviews at all, indicating a significant deficiency in this feature. On the other hand, features such as convenience and easy to use were considered, perhaps, less important (with fewer reviews) but received relatively more positive reviews. It seems, in general, users were

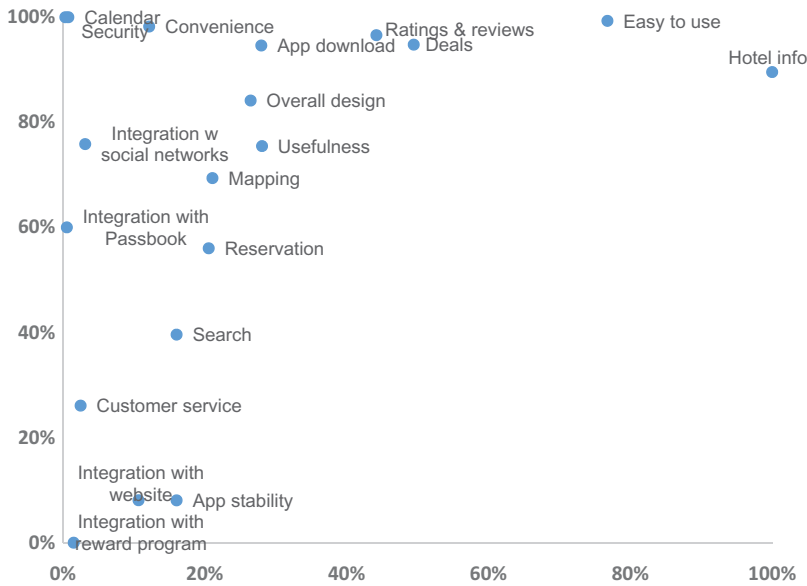


FIGURE 2 Importance-performance analysis of online travel agency apps.

happy about the overall design of the apps while having many complaints about the consistency of the apps, the basic function to make hotel reservations, as well as their integration with hotels' websites and reward programs. For example, many customers complained that apps "crash and shut down every time when open it" and they expressed that "until the developers fix the crashing there is no point in downloading the application." Also, customers complained that they "cannot log in to make reservations or check account information" and that "without the ability to log in, the app is 100% useless." It seems that users highly value stable apps and the function of integrating with hotel website; however, these proprietary apps failed to deliver these values.

Consumers generally perceived OTA apps as favorable. Specifically, among some of the important features such as hotel information, easy to use, deals, and ratings and reviews, OTA apps received high percentage of positive reviews. Also, it seems users were quite happy about the overall design and usability of these apps, which is reflected in categories such as convenience, download, overall design, and usefulness. It is somewhat surprising that the hotel information feature received very high percentage of positive reviews compared to the hotel proprietary apps. For example, users mentioned in the reviews of OTA apps that they were "able to get all information necessary to make the best hotel choice very quickly" and "so simple and yet all the information needed to make a decision is right there at a glance." Users also liked that "hotel information is concise and

comparing choices is a snap.” It showed that users considered these apps could provide timely and relevant information to assist in making decisions quickly. Users also prefer apps that are easy to use. In the reviews, customers expressed that apps are “easier to use than the website” and “intuitive and simple.” Compared to hotel proprietary apps, OTA apps were outstanding in providing deals to users. For example, users commented that they “found hotels and deals that they didn’t find in other major travel apps.” They also expressed that they would use the apps again because of the attractive deals. For the important function of making reservations, OTA apps received relatively more positive reviews than hotel proprietary apps. Also, it seems users did not think app stability, integration with website, and integration with reward programs were serious issues with OTA apps.

Generally speaking, OTA apps were perceived more favorably than hotel proprietary apps although both types of apps were seen as useful and easy to use. It is surprising to see hotel proprietary apps “lost” to OTA apps in areas such as providing hotel information, integration with websites, and making reservations. OTA apps were also evaluated as superior in integrating consumer ratings and reviews, social networks, as well as mapping functions. In addition, users provided recommendations in terms of improving the usefulness of both types of apps. For example, for OTA apps the two most frequently mentioned features were search (50 cases) and hotel information (23 cases). The reviews showed that customers wish to have more search-filtering options and detailed hotel information. For example, users suggested that “it would be nice if this app had filters that allowed you to narrow your search results by amenities, star level, etc.” and that they “would love to see more content on hotels to help in my booking and decision making process.” As for hotel apps, the three most mentioned features are integration with Passbook (16 cases), integration with rewards program (14 cases), and reservation (14 cases). Customers suggested: “developer should incorporate Passbook in this upgrade,” “wish it would let us see any rewards activity,” and “apps needs to allow retrieval of reservations by confirmation number.”

IMPLICATIONS AND CONCLUSION

Information technology continues to present opportunities and challenges for the hospitality industry (O’Connor, 2008). Mobile technology, especially smartphones and their apps, have been touted as the next technological wave that could transform the hospitality and tourism industry. Importantly, today’s mobile technology is expected to change the patterns of travelers’ use of the Internet for travel planning and decision-making (Wang & Fesenmaier, 2012). While still at their early stage of development, smartphone apps offer a window that allows us to gain an understanding of the opportunities and

challenges the hospitality industry is facing in order to identify and develop effective strategies. While exploratory in nature, this study offers several important implications.

First, this study documented the state of the art of hotel-related smartphone apps and utilized user reviews to learn about user experience in a cross-sectional way. The results show that smartphone apps offer functions that are generally available on websites such as reservation, hotel information, and hotel property search, as well as innovative smartphone-specific services such as location awareness and an interactive map that exploits the mobility of smartphones to enhance the mobile reservation experience. In addition, smartphone apps offer system intelligence that enhance the core functions in the mobile context. For instance, the hotel property search can be based on the locations of users, and the nearby hotels are listed first. Besides these core functions, the designers of hotel-related apps enabled a seamless user experience across devices. Many apps have the features of integration with the company's websites and integration with the loyalty program. In addition, the hotel-related smartphone apps reflect the concept of social computing. The customer reviews were displayed to facilitate decision-making, and the social networks were connected to enable experience sharing. The findings confirm that mobile technology is leveraging the benefits of Internet and social media and providing comprehensive support for travelers in accommodation experience. As such, this study confirms the increasing significance of utilizing smartphone apps as a product distribution channel as well as a new way to engage with today's travelers. In addition, the findings clearly show there are great degree of variations among OTA apps and hotel proprietary apps in terms of the design and functional features implemented in the apps. This seems to suggest there is very little consensus regarding the design of hotel-related smartphone apps except the very basic functions such as reservation, search, and hotel information.

Second, the results on users' perceptions over OTA and hotel proprietary apps showed that customers expressed favorable attitudes towards smartphone apps that provide timely and relevant information that enable them to make decisions quickly. Also, users stressed the importance of ease-of-use and the convenience of apps. On the other hand, they disliked apps that lacked stability and were poorly integrated with the website. While the overall design and usability were perceived in favorable ways, it seems that app development is still at a very preliminary stage and many apps are prone to crash, are incompatible with the company's website, and are ineffective in creating personalized user experiences (despite the few positive reviews on saving user credentials).

Third, this study identifies the different preferences of OTA apps users and hotel propriety apps users. Although two groups of users shared common interests on the reservation function, the ease-of-use of the app, and the search of hotel basic information, they showed their differences in the

purpose of app use. The OTA apps users are more likely to use the apps for deals, customer reviews, and hotel search, while the hotel proprietary apps users are more likely to use the apps for the loyalty program. For the user of a hotel proprietary app, the selection of hotel brands to stay in is not a focal problem. More likely, the user would like to associate the booking and consumption with the loyalty program.

Last, this study clearly shows that hotel proprietary apps are lagging behind OTA apps in several important functional areas, including providing hotel information, facilitating booking services, and ensuring the stability in the use of the apps. From the hotel industry's standpoint, one may argue that it is somewhat unfair to compare hotel proprietary apps against OTA apps, because they are intended to serve different purposes aside from making reservations. For example, OTA apps may be seen as a shopping tool while hotel proprietary apps may carry other functions that are critical to a particular hotel brand (e.g., as a customer relationship management tool). Nonetheless, hotel proprietary apps, in general, received relatively fewer positive reviews in relation to certain important aspects such as app stability, the basic reservation function, and their integration with websites and hotels' reward programs. These seem to be important "misses" for the hotel industry to take actions upon in order to achieve optimal results through these new channels.

This study has several limitations. Particularly, as the data of this study is limited to descriptive information provided by app developers and customers on iTunes app store, more in-depth understanding of customers' perceptions over particular features may not be able to be extracted. It is suggested that future research can confirm and further understand customer perceptions by adopting focus group approach. Also, the data of this study limits the consideration of user's background, which may influence the objectivity of the comments. For instance, the level of technology sophistication (e.g., how much the user knows and can use the smartphone app) can influence the ratings and comments on the app. In addition, the importance-performance analysis of these smartphone apps was based upon the assumption that the importance of an app feature is reflected in the frequency it is mentioned in user reviews. However, the mention of a feature could suggest that it has particular negative or positive impact on user experience. As such, the "importance" dimension does not capture and distinguish the positive/negative connotation of the user review. Nonetheless, this study has gained a preliminary understanding of the user experience related to hotel smartphone apps, and it is hoped that this knowledge can be helpful for hoteliers in developing more effective communication and distribution strategies in utilizing today's cutting-edge mobile technologies.

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