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Journal of Travel & Tourism Marketing

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t792306980>

INFORMATION TECHNOLOGY APPLICATIONS IN HOSPITALITY AND TOURISM: A REVIEW OF PUBLICATIONS FROM 2005 TO 2007

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Online Publication Date: 01 July 2009

To cite this Article Law, Rob, Leung, Rosanna and Buhalis, Dimitrios(2009)'INFORMATION TECHNOLOGY APPLICATIONS IN HOSPITALITY AND TOURISM: A REVIEW OF PUBLICATIONS FROM 2005 TO 2007',Journal of Travel & Tourism Marketing,26:5,599 — 623

To link to this Article: DOI: 10.1080/10548400903163160

URL: <http://dx.doi.org/10.1080/10548400903163160>

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INFORMATION TECHNOLOGY APPLICATIONS IN HOSPITALITY AND TOURISM: A REVIEW OF PUBLICATIONS FROM 2005 TO 2007

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ABSTRACT. The tourism and hospitality industries have widely adopted information technology (IT) to reduce costs, enhance operational efficiency, and most importantly to improve service quality and customer experience. This article offers a comprehensive review of articles that were published in 57 tourism and hospitality research journals from 2005 to 2007. Grouping the findings into the categories of consumers, technologies, and suppliers, the article sheds light on the evolution of IT applications in the tourism and hospitality industries. The article demonstrates that IT is increasingly becoming critical for the competitive operations of the tourism and hospitality organizations as well as for managing the distribution and marketing of organizations on a global scale.

KEYWORDS. Information technology, tourism management and marketing, research journals, publications

INTRODUCTION

The intense competition in today's business environment means that tourism and hospitality businesses have to work hard to maintain and develop their competitiveness. The success of a business, to certain extent, depends on its ability to acquire and utilize updated information to assist its management

and marketing processes. Hence, Information Technology (IT) assists organization to manage information dynamically and influences business competitiveness through assisting decision makers to make appropriate investments and decisions. IT helps to meet the demands for timely and accurate information by customers and the IT diffusion in the tourism and hospitality industries has

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The authors would like to thank the anonymous reviewers for offering constructive comments on an earlier version of this article. Mr. Cowoo Chen's assistance in data collection is also acknowledged. This project was partly supported by a research grant funded by The Hong Kong Polytechnic University.

recently increased at an unprecedented rate (Connolly & Lee, 2006; Singh & Kasavana, 2005). This is evident by the ubiquitous presence of IT systems that work cooperatively to assist managers to deliver quality service to their customers and to enhance operational efficiency and control costs. Researchers have stated that IT, by acting as a protector and enhancer, directly influences the experiences and behavior of tourists (Kim & Ham, 2007; Singh, Kim, & Huh, 2006; Winata & Mia, 2005).

More strategically, IT is gradually reshaping the fundamental structure of industry and society (Buhalis, 1998, 2003). IT can generate the knowledge at the center of a business's competitiveness (Chathoth, 2007; Ham, Kim & Jeong, 2005). Law and Jogaratnam (2005) further suggested that IT can transform the nature of tourism and hospitality products, processes, businesses, and competition, and that tourism and hospitality organizations that have failed to master the right IT systems would find difficult to direct and manage their information-intensive business damaging their competitiveness.

Tourism and hospitality are social phenomena, and the industries associated with them are largely application oriented. Researchers in this field have conducted, and will continue to conduct, research that generates innovative knowledge that will benefit these industries and ultimately society. As investment in and the adoption of IT are now indispensable components of the tourism and hospitality business, IT serves as a tool for both enabling and inducing change. As such, IT has recently drawn the attention of tourism and hospitality researchers worldwide, who have disseminated their findings in research journals. Niininen, Buhalis, and March (2007) demonstrated that IT supports consumer centricity, with consumers being able to use technology to select and customize their products as well as to personalize their experience.

It is advantageous for tourism and hospitality managers in general and marketing managers in particular to be aware of the

recent changes in IT and their relationship with customer service. As IT development becomes more sophisticated, industrial practitioners, educators, and policy makers may find increasing difficulty in selecting, analyzing, implementing, and operating new IT systems. Research journals, as a vigorous channel of knowledge dissemination, can offer peer-reviewed and unbiased information on IT analysis, evaluation, and industrial best practice. However, despite the enormous amount of effort spent by tourism and hospitality researchers on investigating IT, there are only a few reviews of the articles published on IT or the progress of IT in the tourism industry since its rapid growth in the early 1980s (Frew, 2000; Kirk & Pine, 1998; Kluge, 1996; Leung & Law, 2005, 2007; O'Connor & Murphy 2004, Buhalis & Law, 2008). Moreover, the review articles that do exist are limited, either because they examine only a few selected journals or because they cover work that is already somewhat outdated given the fast changing nature of IT and tourism.

In view of the paramount importance of IT applications in the tourism and hospitality industries and the absence of published articles that review the recent developments in this area, this article attempts to analyze the content of IT articles published in the major tourism and hospitality research journals in the period 2005 to 2007. This work will therefore be of use for readers in better understanding recent IT applications in tourism and hospitality from different perspectives.

METHODOLOGY

This study adopted content analysis to examine articles that were published by major tourism and hospitality journals between 2005 and 2007. At present, there is no standard list of research journals in the field. The list of 57 journals in the article of Arendt, Ravichandran, and Brown (2007) appears to be the most up-to-date and comprehensive as illustrated in Table 1.

TABLE 1. Journals Included in This Study (in alphabetic order of journal names)

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1. Acta Turistica
 2. Anatolia: An International Journal of Tourism and Hospitality Research
 3. Annals of Tourism Research
 4. ASEAN Journal on Hospitality and Tourism
 5. Asia Pacific Journal of Tourism Research
 6. China Tourism Research
 7. Cornell Hospitality Quarterly
 8. Current Issues In Tourism
 9. European Journal of Tourism Research
 10. Event Management
 11. FIU Hospitality Review
 12. Information Technology & Tourism
 13. Information Technology in Hospitality
 14. International Journal of Contemporary Hospitality Management
 15. International Journal of Hospitality & Tourism Administration
 16. International Journal of Hospitality Management
 17. International Journal of Tourism Research
 18. International Travel Law Journal
 19. Journal of Convention & Event Tourism
 20. Journal of Ecotourism
 21. Journal of Foodservice
 22. Journal of Foodservice Business Research
 23. Journal of Heritage Tourism
 24. Journal of Hospitality & Tourism Education
 25. Journal of Hospitality & Tourism Research
 26. Journal of Hospitality & Tourism Management
 27. Journal of Hospitality & Marketing Management
 28. Journal of Hospitality, Leisure, Sports & Tourism Education
 29. Journal of Hospitality, Tourism, Leisure Science
 30. Journal of Human Resources in Hospitality & Tourism
 31. Journal of Leisure Research
 32. Journal of Quality Assurance in Hospitality and Tourism
 33. Journal of Sport & Tourism
 34. Journal of Sustainable Tourism
 35. Journal of Teaching In Travel & Tourism
 36. Journal of Tourism and Cultural Change
 37. Journal of Travel & Tourism Marketing
 38. Journal of Travel and Tourism Research
 39. Journal of Travel Research
 40. Journal of Vacation Marketing
 41. Scandinavian Journal of Hospitality and Tourism
 42. The Journal of Hospitality Financial Management
 43. Tourism Analysis
 44. Tourism and Hospitality Research
 45. Tourism and Hospitality: Planning & Development
 46. Tourism Culture & Communication
 47. Tourism Economics
 48. Tourism Geographies
 49. Tourism in Marine Environments
 50. Tourism Management
 51. Tourism Recreation Research
 52. Tourism Review
 53. Tourism Review International
 54. Tourism Today
 55. Tourism: An International Interdisciplinary Journal
 56. Tourist Studies
 57. UNLV Gaming Research & Review Journal
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Source. Arendt, Ravichandran, and Brown (2007).

This was thus used in this study for data collection. In the period 2005 to 2007, a total of 215 IT-related articles were published in the journals on this list. During the identification process, the authors read the abstract of each publication to initially determine whether it is IT-related. Full-length publications of the identified abstracts were then thoroughly read to confirm their appropriateness. These publications were grouped into the three main categories—namely customers, technological development, and suppliers, which Buhalis and Law (2008) argued represent the industry stakeholders. Only refereed research articles were counted, and editor prefaces, Internet columns, and conference or book reviews were excluded. Each publication was then further categorized based on its role in the major marketing activities in tourism, as stated by Kotler, Bowen, and Makens (1999). The authors then independently reviewed the major categories and subcategories to confirm the accuracy of these terms. If a publication covered more than one area, then only the major area of focus was counted. Table 2 summarizes the counts of the articles in each category and subcategory, and the following three sections analyze the published articles in each category.

THE CONSUMER PERSPECTIVE

According to Kotler et al. (1999), no matter a purchase is conducted online or offline, consumers will go through the five stages in buyers' decision-making process before any purchase is made. These five stages include need recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior. The studies presented in the next five subsections show IT plays an important role in each of the stages of the buyers' decision-making process.

Consumer Need Recognition

Understanding consumer behavior and especially consumer information search

TABLE 2. Count of IT-Related Articles by Category

	No. of Papers	%
The Consumer Perspective	62	28.84%
Consumer Need Recognition	8	3.72%
Information Search	14	6.51%
Evaluation of Alternatives	4	1.86%
Purchase Decision	12	5.58%
Post-purchase Behavior	8	3.72%
Risk Management	3	1.40%
Education	13	6.05%
Technological Development	76	35.35%
Interoperability	18	8.37%
Web Design and Analysis	42	19.53%
Modeling	14	6.51%
Literature Review	2	0.93%
The Supplier Perspective	77	35.81%
Online Marketing	21	9.77%
Strategic Management	15	6.98%
Risk Management	14	6.51%
Marketing Information	27	12.56%
System		
Total	215	100.00%

behavior, can help industrial managers to develop, optimize search engine, and customize their websites to meet the needs of their customers. The Internet has become one of the most important sources of consumer information (Zins, 2007), especially for young and better educated consumers (Beritelli, Bieger, & Laesser, 2007; Casanova, Kim & Morrison, 2005; Seabra, Abrantes, & Lages, 2007). However, mature and senior travelers still prefer printed brochures as their major information source (Lin, 2005), and many travelers use the Internet in conjunction with offline information to plan a trip (Lee, Soutar, & Daly, 2007). Additionally, Lin, Wu, and Chano (2006) used an online survey to examine the perceptions of members of the online travel community of specific destinations. Other than travel, Griffiths, Parke, Wood, and Parke (2006) have examined the psychosocial impact of Internet gambling and factors that are related to gambling addiction.

Information Search

Consumers of different gender, age, nationality, educational background, and lifestyle display different search patterns (Kim, Lehto, & Morrison, 2007; Hallab & Gursoy, 2006). Many people prefer to book online when they have previously traveled to a destination and they feel familiar with the place, although many still treasure their established relationships with travel agents (Cheyne, Downes, & Legg, 2006). Kozak (2007) analyzed travelers from 36 countries to Turkey and concluded that different nationalities require different information sources. Travelers required different information from the Internet at different stages of travel. For instance, before departure, the availability of information can affect travel planning while later on they may seek reassurance from review sites that they have selected the right products (Lehto, Kim, & Morrison, 2006). Hyde (2006) identified six search strategies employed by first-time vacation visitors to New Zealand, within their first 24 hours of arrival. DiPietro, Wang, Rompf, and Severt (2007) found that upon arrival, the information that visitors receive can influence their venue decisions.

For customers searching on the Internet for the lowest room rates, the websites of travel agents and reservation agents are likely to be the best choice (Law, Chan, & Goh, 2007). In the Internet era, search engines play an important role in information searching (Ho & Liu, 2005), and the Google search engine in particular is perceived to be the most important tool (Law & Huang, 2006). To better understand the search patterns of customers using a search engine, researchers have analyzed search query formula (Pan, Litvin, & O'Donnell, 2007) and keywords (Pan & Fesenmaier, 2006). More recently, mobile technologies that provide a new and convenient way for tourists to gather information from any location, and perhaps more significantly at the destination, have been introduced. Mobile technologies support location-based services, interpretation at the destination,

and dynamic interaction with tourism suppliers (Buhalis & Law, 2008). Rasinger, Fuchs, and Höpken (2007) analyzed tourists' usage intentions with mobile guides.

IT can also assist in examining the tourist movement and in marketing research. Lau and McKercher (2006) used Geographic Information Systems (GIS) to track the tourists' movement pattern within a destination. This technique can have great benefits for tourism marketers to understand consumer behavior while at the destination and to develop strategies for creating tourism experiences. Interestingly, although tourists can locate travel information on the Internet, one study showed that only 3% of tourists surveyed ate at a restaurant that they had found on the Internet (Litvin, Blose, & Laird, 2005).

Evaluation of Alternatives

Consumers use IT extensively to evaluate alternative travel opportunities and to compare and contrast offerings. Using Meta Search Engines such as Kayak and Kelkoo, potential travelers can identify and evaluate products according to their preferences, filters, and requirements (Buhalis & O'Connor, 2005).

Choi, Lehto, and O'Leary (2007) stated that customers prefer information content to vary across different levels on Destination Marketing Organization (DMO) websites, and that their information needs and behavior change at different stages of travel. In addition, online shopping motivation differs according to the complexity of the website, with variation depending on the Internet skill levels of users (Beldona, Morrison, & O'Leary, 2005). According to the findings of a study conducted in Australia, different types of visitors have different levels of comfort when using technology at tourist attractions (Benckendorff, Moscardo, & Murphy, 2005). Furthermore, Pfaffenberg and Burnett (2007) indicated that the opinions and preference of consumers showed no differences or association in the type of websites they primarily use.

Purchase Decision

More customers now purchase tourism products through websites, and perceive that a website's image and usability directly affects their purchase intentions (Chiang & Jang, 2006; Law & Cheung, 2006b; Law & Hsu, 2006). As such, understanding customer perceptions is crucial to the development of a successful website (Benckendorff, 2006; Davidson & Yu, 2005; Law & Ngai, 2005). Additionally, the findings of Lu and Feng (2006) indicate that Chinese domestic tourists are less sophisticated than international tourists when purchasing hotel services and products, and that front desk and house-keeping services and room size are the most important factors that contribute to their perception of hotel standards. Moreover, Chinese customers were found to be less likely to rely on hotel branding when making online reservations, focusing instead on electronic word-of-mouth information and online security if they were more experienced Internet users (Kim, Ma, & Kim, 2006). Business travelers who look for comprehensive IT services in hotels are willing to pay for certain IT services because they understand that hotels have to bear the high costs of implementing such technology (Yeh, Leong, Blecher, & Lai, 2005). Such guests look forward to hotels adopting e-commerce and IT applications that meet their needs (Yeh, Leong, Blecher, & Hu, 2005). Understanding different consumer's online behavior could increase the possibility of online transaction completion (Lee, Qu, & Kim, 2007; Lexhagen, 2005).

Post-Purchase Behavior

After travelers have returned home, they often like to share and exchange their travel experience. Review sites such as Tripadvisor or Holidaycheck.de and blogs are popular digital platforms for travelers to express their feelings and to rate their experience (Thevenot, 2007). Pudliner (2007) defined blogs in the tourism context as a form of conversation and communication among travelers. He discussed tourism in the three

paradigms of tourism—namely as a language, a place of experience in space and time, and as an authentic experience. As tourists enjoy sharing their travel diaries and photo albums, the creation of a 3D e-tourism environment has been recommended to enhance the playfulness of the digital environment (Berger, Dittenbach, Denk, Merkl, & Pesenhofer, 2007). This will be possible with new applications that emerge in the marketplace such as Microsoft's Photosynth application.

After reviewing numerous travel blogs, Yeoman and McMahon-Beattie (2006) identified 16 trends that will shape the future of an information society—including broadband and mobile Internet access, online marketing, and a cashless gaming culture. They predicted that by 2015, the majority of consumers will purchase holidays through the Internet, and that the digital society will change their purchase behavior. Blogs themselves have changed the face of communication, and may lead to corporations potentially losing control of information exposure. If managers do not closely monitor the digital society, they will not know their customers' views and what is being discussed about their brand online (Dwivedi, Shibu, & Venkatesh, 2007). Pan, McLaurin, and Crofts (2007) further argued that Blog content affects readers' perception of the image of a destination. Different data sources—such as blogs, online travel magazines, review sites, travel websites, and official tourism websites—project different destination images, often chaotic and uncoordinated, because they bring content from different sources and target different audiences (Choi, Lehto, & Morrison, 2007).

Risk Management

One of the most important components in e-business is payment, and the purchase process cannot be completed without money being involved. According to Kim, Kim, and Leong (2005) and Miller (2006), the perceived risk of e-business is directly related to customers' purchase intention. As the travel

industry gradually relies more heavily on IT, there is also an increasing concern among consumers about privacy (Brown, Muchira, & Gottlieb, 2007), although gradually consumers accept that they will have to sacrifice privacy for better customer service.

Education

It is generally agreed that IT can assist both students and professionals to learn effectively (Connolly & Lee, 2006; Downey & DeVeau, 2005; Feinstein, Dalbor, & McManus, 2007). Web applications and virtual learning environments can provide a platform for students to study in groups to become more active and reflective learners (Altinay & Paraskevas, 2007; Cranage, Lambert, Morais, & Lane, 2006; Hassanien, 2006; Dale & Lane, 2007; McGugan & Peacock, 2005). Due to the high-turnover rate and high-training cost in the tourism and hospitality industries, computer-assisted instruction (CAI) is an effective way to deliver training programs to employees. Internet-based technologies can also facilitate information exchange between all types of employees (Zakrzewski, Sammons, & Feinstein, 2005). This is particularly the case for small- and medium-sized tourism enterprises that may not have the resources to undertake formal training (Peters & Buhalis, 2005).

Students are required to acquire certain e-commerce knowledge to cater for the future needs of the tourism industry, yet research findings show that not all academic institutes include e-commerce in their curricula (Dopson, 2005). Lashley and Rowson (2005) advocated that IT should be considered as a core skill in the hospitality and tourism industries, and that educators should teach computer literacy to improve students' study. Park and Khan (2006) identified the factors that influence students to participate in online surveys. Other than a tool for education, the Internet is also an important marketing channel for academic institutes for student recruitment (Han, Hu, Bai, & Jang, 2005).

Managerial Implications

In the hospitality and tourism industries, IT is critical for raising customers' awareness, developing a realistic promise, and delivering a comprehensive service. Managers should therefore use IT to manage their offerings according to their consumer behavior circle. For instance, managers should ensure that their website information focuses on customers' needs, and should maintain a high search engine ranking. They should also have a realistic expectation of the target users of their IT implementation and develop comprehensive solutions to satisfy the needs of all their stakeholders. For instance, restaurant managers should also use their websites as a advertisement channel for targeting local clientele, rather than purely to attract tourists. IT not only can enhance learning experiences and reduce training costs by CAI, it is an important marketing channel for academic institutes and industry recruiting students and staff (Zakrzewski et al., 2005). Industrial practitioners should also look at customer comments on blogs and discussion forums in order to learn from each other's experience (Peters & Buhalis, 2005). Finally, policies on customers' privacy protection in relation to IT usage should be stated clearly.

TECHNOLOGICAL DEVELOPMENT

Interoperability

The findings of previous research show that the adoption of IT can enhance the competitive advantage of a business (Eraqi, 2006). Baggio (2006) presented a complexity framework that models the relationship between IT and tourism. However, Connolly (2005) argued that as hospitality is an emerging field, it is more useful to use case studies as a qualitative research method to understand complex IT phenomena.

The domain name is an important component for companies going online, and Gertner, Berger, and Gertner (2006) stated

that having a memorable web name and address can increase competitive power of tourism websites. With the introduction of the “.travel” top-level domain in 2006, Wagner (2007) expected that there would be a tremendous increase in the number of registrations of travel sites with this suffix, which will help users to identify travel companies on the Internet. Hashim and Murphy (2007) investigated the use of domain names among around 500 Malaysian hotels, and found domain name has a significantly positive relationship with hotel size, category, and affiliation, and with progressive levels of Internet use.

Singh and Kasavana (2005) predicted that future IT applications will probably rely on wireless infrastructure, and that online purchasing with cashless payments will become more commonplace. Providing services at the destination, now that mobile phones have become a necessity in this era of wireless communication (Langelund, 2007), cultural tourism has reacted by introducing multi-media museum guides that use mobile device screens to enhance the tourist experience (Alfaro, Nardon, Planesi, Stock, & Zancanaro, 2005). Mobile computers will allow the personalization of services according to preferences, language skills, and depth of information required. Hence, Buhalis and O'Connor (2005) further suggested that e-tourism in the future will be focused on consumer-centric technologies, and that organizations need to adopt IT to be able to offer this level of service and remain competitive and innovative.

A good recommender system should merge trust, exploratory browsing, and personal factors to suggest suitable solutions that will meet personal criteria and preferences (Bauernfeind & Zins, 2006). Semantic web technology could be used to create a tourism information system that allows tourists to extract the necessary data through query management facilities (Bergamaschi, Beneventano, Guerra, & Vincini, 2005; Antoniou, Skylogiannis, Bikakis, & Bassiliades, 2005). Knowledge management of this type would enable the lodging

industry to centralize their application system (Beldona, Brewer, & Kline, 2006), and would allow tourists to locate their required destination information in a convenient and easy way (Pyo, 2005).

Dynamic package assembly helps individual customers to create their own travel packages. However, due to the non-standardized data format among the various available systems, there are difficulties with interoperability (Cardoso & Lange, 2007; McGrath & Abrahams, 2006). Although the act of standardizing for different players is a seemingly impossible mission, Dell'Erba, Fodor, Höpken, and Werthner (2005) set up a virtual interoperable network that allows data exchange through a system translation mechanism in a seamless way to show how interoperability might be achieved.

Web Design and Analysis

Websites are incredibly important, mission critical, and cost effective marketing tools for businesses. Having a good website not only generates more business opportunities, but also enhances a company's image and supports the interactivity with both institutional and individual customers. Ha and Love (2005) identified four design concepts with 17 subscales for the development of the websites of convention and visitor bureaus. Good web design goes beyond technology, design, and layout. It includes a wide range of content, usability, navigation, and interactivity issues. To increase web effectiveness, web designers should also consider network limitations, demographics, and the culture and soul of the site (Corfu & Kastenholz, 2005). Aesthetics, informativeness, and interactive features can also affect website effectiveness (Han & Mills, 2006b), while usability and content play a critical role in user satisfaction (Klausegger, 2005). For example, interface metaphors significantly affect user perceptions of system usability and their overall experience of a website (Xiang & Fesenmaier, 2005).

Website performance can be measured in various ways, such as evaluating a website's effectiveness by using the modified Balanced Scorecard Approach (Choi & Morrison, 2005; Myung, Morrison, & Taylor, 2005) or flow experience (Skadberg, Skadberg, & Kimmel, 2005). Other measurements include determining the adoption level of a website as an e-business tool through content analysis (Roney & Özturan, 2006; Küster, 2006) and identifying the factors that affect user satisfaction by using protocol analysis (Essawy, 2006). In addition, qualitative meta-analysis (Park & Gretzel, 2007). Kaplanidou and Veogt (2006) can assess the influence of website content on trip planning by using a Technology Acceptance Model (TAM). Kozak, Bigné, and Andreu (2005) analyzed national tourist office (NTO) websites against seven World Trade Organization "best practices" and tourism e-business strategies. Problematic integration theory has also been adopted to better understand online marketing activities (Han & Mills, 2006a). In examining how best to project a destination's image, researchers have analyzed both photographic and textual content from websites (Govers & Go, 2005; Singh & Formica, 2006).

In the context of website usability evaluation, four studies have found that ease of use is one of the most important determinants of perceived website quality (Au Yeung & Law, 2006; Cho & Agrusa, 2006; Jeong, Oh, & Gregoire, 2005; Park, Gretzel, & Sirakaya-Turk, 2007). Rather than subjectively distinguishing the value of each attribute, automated software can provide a more convenient and objective way to evaluate websites (Chan & Law, 2006). A good website should be inclusive and should cater to the needs of different types of online users, including visually impaired and disabled users (Han & Mills, 2007; Shi, 2006; Williams & Rattray, 2005; Williams, Rattray, & Grimes, 2006). Web designers should also consider culture and language as a factor affecting the success of a website (Kale, 2006). It is interesting to note that although Germany is the top spending

nation on international tourism, many non-European DMOs do not include a German-language version of their website (Arlt, 2006).

Previous studies have compared and contrasted the websites between and among different geographic areas. For instance, Law and Liang (2005) compared China-based and U.S.-based hotel websites using a multi-criteria decision-making approach, and found the performance of the latter to be significantly better than that of the former. Miao and Yu (2006) studied the tourism websites of these two areas and returned similar findings. Law and Cheung (2006a) further selected 30 North American-based, European-based, and Asia-Pacific-based travel websites and analyzed their online hotel reservation services. The study showed that North American-based websites performed significantly better than websites from the other two continents in certain attributes.

A destination's image in the online environment can be examined by looking at the content of travel websites. Stepchenkova and Morrison (2006) analyzed U.S.-based and Russian-based website content and suggested that Russian-based websites need both technical and content improvements. The TAM has also been used to examine the information search motivations of travelers on travel websites (Luo, Remus, & Sheldon, 2007). Baloglu and Pekcan (2006) examined the design and use of marketing elements on the Internet and showed that hotels in Turkey were neither using e-marketing effectively nor utilizing the Internet to its full potential. In case studies of Greek hotel websites, the online reservation and price information sections of smaller innovative Greek hotel websites performed far better than the corresponding sections of the top 25 hotel brand websites (Zafiroopoulos & Vrana, 2006; Buhalis & Kaldis, 2008). Often, though, hotel websites provide little online transactions, as they are primarily designed to serve as electronic brochures (Zafiroopoulos, Vrana, & Paschaloudis, 2006). A study evaluating 50 U.S. rural

tourism websites showed that they had poor interactivity and failed to work closely with neighboring destinations to enhance their horizontal content (Beldona & Cai, 2006).

Tourists expect to find functional information, education information, and emotional information on heritage websites (Poria & Gvili, 2006), and such websites should therefore be customized in accordance with tourist perceptions of the site in relation to their own heritage (Gvili & Poria, 2005). However, such official websites generally do not maximize their utility as marketing tools, due to a lack of consistency among the website elements (Lee, Cai, & O'Leary, 2006). Kim, Kim, and Han (2007) examined the perceptions of potential customers of seven online travel agencies through an online survey, and identified low fares and security as being the most important website attributes. To create a "best practice" standard for restaurant website analysis, Moreo, Cobanoglu, and DeMicco (2007) compared industry and academic restaurant websites by evaluating over 400 individual criteria in seven major categories.

Modeling

Various modeling methods have been presented to analyze tourist data. Delen and Sirakaya (2006) tested the three popular data-mining methods of artificial neural networks, decision trees, and rough sets, and found that the rough sets algorithm was the best forecasting tool among the three. Similarly, Kon and Turner (2005) compared the forecasting accuracy of neural networks and the basic structural method (BSM), and confirmed that the BSM maintained a higher accuracy in forecasting tourism demand. Bloom (2005) recommended that neural network applications be used to track the changing behavior of tourists within and between market segments. Other researchers have proposed modified neural networks for modeling tourist arrival (Pai & Hong, 2005) and time-series forecasting (Palmer, Montaña, & Sesé, 2006). Similarly, Petropoulos, Nikolopoulos, Patelis,

Assimakopoulos, and Askounis (2006) introduced a technical analysis system to forecast tourism demand.

The better the manager of a DMO understands tourist profiles and traveling patterns, the better they can market their destination. By using association rule mining, tourism organizations can identify different types of tourist profiling behavior (Emel, Taşkin, & Akat, 2007). Wong, Chen, Chung, and Kao (2006) adopted data-mining techniques to analyze the travel patterns of Northern Taiwan travelers and suggested that DMOs in Asian countries should promote their destinations in Taiwan. As an alternative to analyzing numerical data, text mining is another good choice for analyzing tourist data. Lau, Lee, and Ho (2005) demonstrated three examples of how text mining can be used as a tool for online text analysis. By making use of text-mining techniques, Singh, Hu, and Roehl (2007) examined research on human resources management published in the *International Journal of Hospitality Management* between 1994 and 2003, and classified the resulting textural contents into nine research themes. Additionally, various researchers have proposed models to enhance the marketing effectiveness of tourism websites. For instance, Law (2005) introduced an Object-Oriented Database Marketing model for application in Asia's hotel industry to enhance its marketing effectiveness; and Mills, Lee, and Douglas (2007) introduced a Modified Interactive Tourism Advertising Model that could improve a website's advertising effectiveness.

The Internet, as the primary search channel for tourists, naturally contains websites in different languages. Multi-lingual information searching applications can thus provide comprehensive search results for people who need to search using a keyword in one language and look for a search result in another language (Li & Law, 2007). Krieger, Moskowitz, and Rabino (2005) used Internet-enabled conjoint analysis to examine customer wants on cruise vacations, and identified word-of-mouth information

and past experience as contributing to customer perceptions and expectations.

Literature Review

The rapid development of IT in the past couple of decades has underscored the importance of understanding historical patterns and predicting future trends. Knowing what has occurred in the past few years can help researchers better predict and plan for future development. As such, Leung and Law (2005, 2007) examined IT-related articles published in six leading hospitality and tourism journals over the past 20 years and identified that the largest number of articles were about general business applications. Due to the increasing popularity of the Internet, publications on networking showed the highest growth rate in the most recent decade.

Managerial Implications

An easy to remember and relevant domain name could capture the growing market of online consumers. Moreover, industry practitioners should apply well-developed data exchange formats to achieve better inter-system communications, and should use centralized knowledge bases for tourists to use as a one-stop channel. Websites should also cater for disabled users, and multiple language sites should be made available.

It is also imperative for tourism and hospitality businesses to develop internal in-house IT resources and expertise to facilitate the communication between business managers and IT technicians. These professionals could collect, organize, and retrieve up-to-date and relevant technology information from the technical area and relate this information to managers. At the same time they should advise them on the latest technical developments and how they could be integrated into business decision-making process, strategic and operational marketing, and consumer interactivity in order to develop their competitiveness. These professionals could also inform the technical experts about the goals and

missions that the business managers, especially marketing managers, are targeting. Hence, the role of the electronic data processing or information systems department should be changed from merely providing technical support to advising senior management on how to adopt IT in an agile way to achieve business goals.

THE SUPPLIER PERSPECTIVE

Online Marketing

The Internet is an effective, efficient, and low-cost marketing channel. However, it can also reduce the opportunities for suppliers to have direct human contact with customers. Stockdale (2007) thus proposed using self-service technology to handle customer relationship management (CRM) to deal with this issue. As an example, the adoption of CRM for Ayurvedic medical tourism in India helped tourism suppliers shorten the geographic distance with overseas patients who required long-term or repeated treatments (Vijayakumar & Rao, 2005). E-relationship marketing (e-RM) through the Internet has also been introduced to maintain a close relationship between companies and customers, with research results showing that the adoption of e-RM is positively associated with the size of hotel companies (Bai, Hu, & Jang, 2006). The adoption of IT and relationship marketing (RM) could help tourism organizations maintain competitiveness and improve the management of business relationships with customers (Álvarez, Martín, & Casielles, 2007). A case study in Singapore showed that the majority of Singapore's hotels were at the "database collection" level in RM (Gan, Sim, Tan, & Tan, 2006), and that customers with different socio-demographic characteristics had a significant willingness to provide contact information for permission marketing. To attract customers to provide such information, the means by which customer contact information is collected should be varied (Brey, So, Kim, & Morrison, 2007). Hu,

Han, Jang, and Bai (2005) stressed that both the hospitality and tourism industries and academic institutes need to maintain a good relationship with their prospective customers and students, and proposed using database management techniques to provide efficient solutions to boost relationships with prospective students and customers.

Promotion on the Internet is generally regarded as being cost effective. For example, NTOs in the Caribbean have secured a competitive advantage by adopting the concept of the Unique Selling Proposition in promoting their websites (Miller & Henthorne, 2006). Wang and Fesenmaier (2006) argued that a successful web marketing strategy requires the integration and coordination of website features, promotion techniques, and CRM programs. A large number of Australian winery owners have adopted competitor-to-competitor hypertext link exchanges on their websites to form a strategic alliance and promote cellar-door tourism (Sellitto, 2005). However, a survey of over 600 U.S. convention and visitor bureaus showed that their Internet marketing activities were limited, and focused overly on providing travel information to prospective visitors (Wang, Hwang, & Fesenmaier, 2006).

Websites are not only a marketing channel, but also a business platform. A study conducted by Correia and Elliott (2006) in South Africa showed that although mature travelers are viewed as a small homogenous group of customers, the market actually comprises many different types of people who are comfortable in using the Internet to purchase tourism products. Successful websites must achieve a high hit and conversion rate, which is directly affected by consumer page clicking behavior, content, search engine optimization, and web page management (Murphy, Hofacker, & Racine, 2006). By analyzing the activity log of their company's website, managers can better understand consumer clicking behavior and thus gain a competitive advantage in conducting business (Kamuzora, 2006).

The Internet also changed the room allocation strategies of both hotels (Christodoulidou, Brewer, Feinstein, & Bai, 2007) and travel agents (Kozak, 2006) due to changes in distribution channels. In the future, these strategies are likely to change further as virtual reality via the Internet becomes an essential tourism marketing tool (Cooper & Macneil, 2005). A comparison of websites with different business models revealed that the websites of local travel agents offer better room rates than online websites (Tso & Law, 2005). This indicates that consumers need to shop around to search for the best rate (Thompson, 2005). This is addressed by "best price guarantees" offered by most international hotel chains. However, mid-segment hotels still rely on traditional distribution channels due to their lack of knowledge of electronic distribution (Dabas & Manaktola, 2007).

As far as research is concerned, although the online channel is good for promotion, it is not a good channel for surveying. The findings of Cole's (2005) study showed that the response rate and quality of data from web-based surveys were not as good as those from paper-based surveys.

Strategic Management

The ultimate focus of a business is performance and the maximization of profit. Computerized yield management systems can help managers increase their revenue and yields to improve profitability and financial performance (Emeksiz, Gursay, & Icoz, 2006). Adopting IT has helped hotels lower their operations-related transaction costs (Chathoth, 2007), and the perceived performance of hotel managers has been shown to be positively associated with their interaction with IT and budgetary participation (Winata & Mia, 2005). The customer booking decision model proposed by Chen and Schwartz (2006) confirmed that knowledge of demand influences willingness to book.

In the Internet era, e-mail inquiries are normally the first form of communication

between hotels and customers, and customers thus have a high expectation of receiving an e-mail response. However, in a study conducted in Austria, 20% of hotels did not respond to electronic inquiries at all, while more than 25% took more than 2 days to respond to e-mails, and only one third answered all questions raised in the inquiry e-mails (Matzlera, Pechlaner, Abfalter, & Wolf, 2005). It was also found that larger tourism organizations provided better e-mail response rates than smaller organizations, and that employees in smaller organizations answered e-mails poorly (Zehrer & Pechlaner, 2006). Other research findings have revealed that the longer that a hotel has adopted a domain name, the better they respond to e-mail inquiries (Murphy, Schegg, & Olaru, 2006). Having analyzed e-mail responses in 24 features, Murphy, Schegg, and Olaru (2007) recommended several areas that should be improved to enhance the quality of these responses.

As more people began to buy holiday packages from the Internet, researchers started to look at the disintermediation of travel agents. Bennett and Lai (2005) identified two principal ways for travel agents to overcome disintermediation; namely, repositioning themselves as travel consultants and becoming more technologically oriented. Some travel agencies have formed strategic alliances to strengthen their competitive advantage in the era of Internet (Huang, 2006).

Customer satisfaction and loyalty intention are strongly related to e-travel service quality. Ho and Lee (2007) proposed a 5-factor scale including information quality, security, website functionality, customer relationships, and responsiveness to measure e-travel service quality.

In developing countries, research findings reveal that IT managers have a high level of technical skills but need to further develop their business and communication knowledge (Tetteh & Snaith, 2006). There is also a positive relationship between innovation rate and hotel size, with hotels with more experience tending to be more innovative

(Jacob & Groizard, 2007). IT can be outsourced, but there are many factors that affect IT outsourcing considerations. Research has shown that many hotel managers consider IT outsourcing not purely because of cost savings but also for strategic reasons (Espino-Rodríguez & Gil-Padilla, 2005). Beritelli and Schuppisser (2005) stated that when implementing a new mobile project, the initial starting stage is the most critical, and trials among tourists can be used to test the feasibility of new business models.

Risk Management

With the heavy dependency on IT in the hospitality and tourism industries, system failure can have catastrophic consequences (Lu & Law, 2007). Knowledge-based systems can help managers to handle such crises more effectively (Mistilis & Sheldon, 2006). Making use of websites as a crisis communication channel also helps prevent the spread of diseases, and acts as a tool for stakeholders to share information during crises (Volo, 2007).

Risk management also involves the management of customer data. With more hotels introducing loyalty programs and promotional campaigns, customers are required to register online through specific websites. However, a study conducted by O'Connor (2007) showed that only a few companies display third-party privacy certificates to ensure that guests' data are protected from inappropriate use. O'Connor (2006) also found that hotels can use cookie technology to implicitly collect information about the personal identity of browsers.

One of the most important components of e-commerce is payment. To make online payment safe, travel agency websites should provide secure transactions to protect consumers' data (Wu & Chang, 2006). Chen (2006) proposed a model and listed the major determinants of consumer trust on a travel website. However, another study identified that only a very small number of Canada-based websites of small hospitality businesses used secure servers to handle online

bookings (Hudson & Gilbert, 2006). In addition to payment, another legal component in hotel reservations is the terms and conditions, and Wilson (2007) emphasized that many reservation transactions can be completed without customers having to express their acceptance of the company's terms and conditions.

Hotel IT managers should not only consider external security (the Internet), but should also concern themselves with internal network security. Cobanoglu and DeMicco (2007) confirmed that around 15% of hotels had reported virus attacks, of which 7.7% reported "Denial of Service" attacks.

Previously, gambling only took place in casinos, but now online gambling websites have been set up to exploit new business opportunities. Controlling this geographically barrier-free activity has become a legal concern for most, if not all, countries (Rose, 2006, 2007; Warren, 2006). Andrie (2006) presented an international regulatory model that allows individual countries to have discretion over the activities of its citizens and to enforce penalties on illegal gamers.

Marketing Information Systems

Compared with the situation in 1997, the adoption of IT among hotels has substantially enhanced the areas of customer service and operational effectiveness, rather than merely replacing paper systems (Law & Jogaratnam, 2005). However, the services enhanced by IT vary largely among hotel categories (Singh, Kim, & Huh, 2006). Examinations of the effect of IT applications on performance in lodging operations have shown that guest-related interface applications are not as mission critical as front-office applications and restaurant and banquet management systems (Ham, Kim, & Jeong, 2005; Kim & Ham, 2007). A case study of U.S. convention and visitor bureaus showed that the capability of organizations influenced their IT usage and led to distinct implementation effects (Yuan, Gretzel, & Fesenmaier, 2006).

Oronsky and Chathoth (2007) explored the use of technologies and identified the factors that motivate managers to implement new technology. They found that managers basically understand that IT can improve organizational efficiency, but believe that there are barriers to the adoption of new technologies, including the cost of adoption, lack of information sources, and lack of strategy within management (Cobanoglu, Demirer, Kepeci, & Sipahioglu, 2006). The adoption of e-procurement, for example, can enhance operational effectiveness, but can also be a disaster if the implementation lacks preparation. A case study of a chain hotel's e-procurement implementation showed that they suffered from a lack of purchasing standardization (Kothari, Hu, & Roehl, 2007). Firms often adopt e-procurement slowly due to a lack of knowledge, skills, and trust, and erroneous risk perceptions (Sigala, 2006). Technology adoption is thus a complex process that can be affected by several internal and external factors. Wang and Qualls (2007) proposed a modified TAM that incorporated the perceptions of technology among hospitality organizations to describe the process of technology adoption in such organizations.

Several studies have focused on Internet usage in terms of attitudes and perceptions toward Internet implementation in the lodging industry (Garau Vadell, 2005; Ayeh, 2006), the integration of the sales process and web-based marketing tools by marketing professionals (Gregory, Kline, & Breiter, 2005), and the planning and implementing of websites among small- and medium-sized tourism enterprises (SMTEs; Sellitto & Burgess, 2007). Although more SMTEs are now "online," the information that they provide on their websites is of poor quality and outdated (McGrath, 2007; Buhalis & Kaldis, 2008). Similarly, a case study in Thailand showed that all hotels had websites and e-mail communications with customers, but that there was a large variation in their reliance on the Internet to communicate and transact with customers (Sahadev & Islam, 2005). To cater for the expansion of wireless

networking service provision, many hotels have adopted WLAN. However, social, technical, and organizational factors influence the adoption decision (Schneider & Datta, 2006).

Tourists generally look for a high volume of information when they travel, especially when visiting cultural sites. Storytelling mobile tour guides can thus enhance the tourist experience not only by providing general historical information, but also by including role-playing games to deepen users' interest (Kim & Schliesser, 2007). They can also be customizable to individualistic preferences. Mobile technology can also be used for coordination during large festivals, and an enjoyable and useful mobile coordination service motivates staff usage (Lexhagen, Nysveen, & Hem, 2005). Location-based information and services are not only convenient for tourists, but can also be made available for residents to enhance local cohesion, and support the interactivity between the community and the industry (Edwards, Blythe, Scott, & Weihong-Guo, 2006). Various studies have shown that with information provided by GIS on tourists' interests and attitudes, NTOs could carry out better tourism planning to meet the different needs of tourists (Ejstrud, 2006; Hasse & Milne, 2005; Hultman, 2007; Raghuvanshi, Belwal, & Solomon, 2006).

Although environmental concerns have been raised in the travel industry, many managers are not willing to deal with them due to resource constraints. In such cases, computer simulation tools and decision support systems could be used to help tourism organizations to better plan and manage visitor flows (Lawson, 2006; Bousset et al., 2007). In addition, DMS websites should train prospective visitors to have realistic expectations as well as the locals on ways to interact with visitors. Case studies conducted by Chan and Ho (2006) revealed that the resources that are essential to the development of environmental management systems (EMS) in hotels fall outside the balance sheet. As EMS can reduce costs,

it has been suggested that hotels start low-cost EMS projects, and then develop mid-scale and large-scale projects when they are confident with the results.

Managerial Implications

Due to the service-oriented nature of the tourism and hospitality industries, many managers and employees have only limited IT knowledge (Law & Jogaratnam, 2005). They generally do not have a clear understanding of how advanced IT can improve their business performance, and thus cannot communicate well with technical experts. Limited technical IT knowledge, however, is not a sufficient reason for lagging behind. To remain competitive, practitioners should explore the potential opportunities emerging through IT, and be proactive in recognizing the capability of technology. To achieve these goals, tourism and hospitality managers should maintain a good relationship with customers by using technology-assisted tools, irrespective of the size of their company. In addition, managers should set up appropriate security policies for online payment, and should rapidly respond to email inquiries. Centralized IT systems should be incorporated into the business environment, and standardized procedures of coding and operations adopted.

CONCLUSIONS

This article reviews the development of IT usage in the tourism and hospitality industries in the past few years. It enables readers in general, and tourism and hospitality managers in particular, to better understand the latest research findings and some of the best managerial applications of IT in the field. Having analyzed the content of 215 articles, websites apparently play an important role in marketing. This is evident as about one fifth of the included articles are related to this subject. Furthermore, the number of studies that are related to consumers is relatively small as compared

to the other two categories. In particular, only three articles discussed customers' concerns on data privacy. In the present highly web-driven marketing environment, it is crucial to put data protection in first place. By tradition, the customer-oriented nature of the tourism and hospitality industries has led managers to regard IT and service as two unrelated and incompatible concepts. As a result, IT has played a secondary role, especially in the hospitality industry. Despite the increasing emphasis on IT utilization, many managers are still reluctant, if not resistant, to incorporating IT in their high-level decision-making processes. There is little, if any, mutually understandable communication between managers and IT technicians, and it is unlikely that managers have sufficient knowledge to conduct any realistic assessment of the benefits and drawbacks of using IT at work.

Managers can, and should, deal with future IT-related issues by integrating IT into the company's strategic management and business mission. A way to achieve this goal is to constantly upgrade the IT knowledge and skills of staff, as in this way overall technical proficiency can be assured. Additionally, managers should maintain close contact with the IT industry so that they will be able to appreciate technological trends and developments. After careful analysis, the right IT can then be incorporated into the business and be part of a business process re-engineering exercise that can support the business to maximize its full potential.

Despite its contribution, a major limitation of this article is the inclusion of only 57 research journals and the exclusion of other publications. These excluded publications comprise research journals of other disciplines, newly launched tourism and hospitality journals, books, conference proceedings, and professional journals. For instance, the proceedings of ENTER conferences, which are organized by the International Federation on Information Technology and Travel and Tourism and represent the world's largest annual IT and

tourism event, feature plenty of research articles on IT and tourism. Conference proceedings, books, and professional journals use a different peer-reviewing system from research journals, where multiple rounds of revisions are needed before an article is accepted for publication. Another future research opportunity is to analyze the methodologies adopted in these prior studies in detail. In this way, the popularity of each type of technology can be known. In addition, tourism researchers, and especially those who are established academics, are likely to publish their research findings in mainstream journals. As such, it would be worthwhile for similar future reviews to extend the coverage of publication channels and also the period of analysis. Finally, another opportunity for future research opportunity would be to compare and contrast the cultural and geographical differences among the published articles to determine the extent of the "digital divide" in the context of cultural and geographical differences.

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SUBMITTED: August 8 2008
FINAL REVISION SUBMITTED:
November 10 2008
ACCEPTED: November 28 2008
REFEREED ANONYMOUSLY