Smart hospitality: Taiwan hotel stakeholder perspectives

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Abstract

Purpose – *The term smartness has been discussed in the academia for many years; prior research has listed numerous advantages and encouraged business entities to implement smart technologies. However, stakeholders' knowledge level, support intention and barriers to smart technology have been under investigated. Without the support of stakeholders, smart projects can hardly be implemented. This paper aims to explore the above-mentioned under investigated area and identify the gaps between academia and the hotel industry in Taiwan.*

Design/methodology/approach – *In-depth interviews were conducted with nine hotel stakeholders in Taiwan with investors, owners, managers, technology suppliers and information technology consultants. Three key areas were focused on: smart hotel definition, expectations from smart hotel and known barriers for implementing smart technologies.*

Findings – *The definition of smart hotel among all stakeholders was inconsistent. Stakeholders defined a smart hotel according to their role in the organization: revenue boost, service customization, operations effectiveness and in-room automation. However, the key functions of smart technologies, such as interconnectivity and interoperability with business partners' application (e.g. online travel agencies) and linkage to external Big data for accurate revenue forecast, were not mentioned by the interviewees. In addition, social media monitoring, robots and artificial intelligence were not mentioned during the interview.*

Originality/value – *This study attempted to identify Taiwanese hotel stakeholders' perspective on smart hotel and to compare the outcome with academic research. The result indicated that there is a big gap in the definition of "smart hotel" among stakeholders and academia and reflected several barriers that prohibit hotel owners and investors in implementing smart systems.*

Keywords *ICT, Taiwan, Technology adoption, Barriers, Stakeholder perspective, Smart hotel*

Paper type *Research paper*

1. Research background

Rapid developments in information and communication technologies (ICTs) have changed the business operation process and purchase intention in the hospitality and tourism industry. Hotel stakeholders, who can be categorized into direct and indirect stakeholders, have been using technologies to maximize their yield, monitor competitors' performance, expand the distribution channels, improve corporate image via social media and setup best strategies. Hotel direct stakeholders who participate directly in hotel operations and strongly influence daily operations are influenced by ICT in various ways. Hotel owners believe that technology assists improving financial performances. International chain hotels adopt cutting-edge technologies to create a high-tech image (Siguaw *et al.*, 2000). Hotel managers expect technologies to reduce man power and time spent on operations (Buhalis and Law, 2008) and enhance service quality (Tuominen and Ascenção, 2016). Hotel guests expect faster and effective information search for best hotel to stay with the best room rate (Xiang and Gretzel, 2010), and their stay experience can be enhanced by cutting-edge in-room technologies (Šerić and Gil-Saura, 2012). The ubiquitous use of smart phones and

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mobile networks with high-speed internet connection improves business operation and marketing and management strategies (Kim *et al.*, 2014). Therefore, the implementation of smart technology enables effective and efficient operation tasks without geographic boundaries. However, integrating data across platforms is still not fully automated. Manual operations lead to inconsistent information and inaccurate statistics; therefore, prior research has recommended that applications across different platforms should be interconnected and interoperable (Leung and Law, 2013). High-speed internet and Web-based applications catalyze the standardization of communication protocol so that operational data can be inter-exchanged seamlessly.

1.1 Limitation of the recent hotel information and communication technology applications

Hotel direct stakeholders, including hotel owners and investors, manager and employees, destination management offices, hotel guests, online travel agencies (OTAs), suppliers, airlines and event organizers, form a hospitality ecosystem. Tremendous organic and digital data flow within the ecosystem electronically and manually improves hotel managers' strategic planning and employees' daily operation productivity. To cater to different operational and management needs, a hotel implements distinct types of application systems, such as a property management system, point-of-sales system, sales and marketing system, in-room information and entertainment system, energy management system and communication system. All these systems are supplied by different vendors, and most of them are rarely interconnected and interoperable unless a customized interface program is developed upon hotel request (Leung and Law, 2013). Smart network can dynamically interconnect all stakeholders and create an effective and efficient ecosystem (Boes *et al.*, 2016) so that hotel operation and management-related data can be exchanged automatically via interoperable technological platforms. However, interlinking the ecosystem is a challenging task, as no standardized communication method currently exists among practitioners. Recent revenue management applications use historical data to predict a future booking pattern (El Haddad, 2015). Nevertheless, with the dynamic changes in political, economic, social and technical environment, internal data cannot fulfill the needs of producing accurate forecast and pricing strategies. An effective yield management requires both external environment context and internal Big data to generate accurate revenue forecast (Denizci Guillet and Mohammed, 2015; Ramos *et al.*, 2015). Decision support systems aggregate these two sets of data and generate scenarios that allow hotel management to choose the best solution that fits their management needs.

Travel agencies have strong bonding with hotels. Customers use OTAs and meta search engines to search for the best match hotel with the best room rate (Leung *et al.*, 2014). Hotels nowadays rely heavily on online channels, especially OTAs, attracting last-minute bookings to accomplish their last-minute revenue strategies. Recently, many hotels have manually adjusted the daily room allotment and room rate on individual OTA platform, and these tasks are time-consuming and labor-intensive. Some hotels therefore subscribe a third-party online channel management platform to centralize online channel management for effective revenue management strategies' execution, but manual tasks still apply.

Technology adoption in hotels face several barriers, and perceived cost on technology implementation, which affects the organizational readiness, is one of them (Reino *et al.*, 2013). However, factors causing "high perceived cost" were not further examined. Hotel owners and investors have high expectations from ICTs. They expect reasonable return on investment (ROI), as profit is the key principle in business. A clear justification of ROI for the technology purchased as initial investment and pay-off period of the smart hospitality platform implementation is apparently one of the major hotel owners and investors' concern (Čižmar *et al.*, 2010; Masa'deh *et al.*, 2015). Another concern is frequent update and upgrade of technology, so it is hard to know the best purchase timing before it gets

outdated right after installation. Prior research has confirmed that ROI and longevity are key procurement factors of business technology (DiPietro and Wang, 2010). This indicate why the progress of ICT adoption in the hotel industry is relatively slower than that in other industries (Reino *et al.*, 2013), as the hotel industry cannot justify the decision to adopt ICT.

1.2 Toward smart hotel

Contemporary hotel management requires tremendous amount of data, including internal Big data (such as hotel reservation history and marketing statistics) and external context (information collected from the external macro-environment such as economic, political and environmental), that support the management strategic planning and decisions (Ramos *et al.*, 2015). Managers can make use of a decision support system for scenario testing to enhance their marketing and strategic planning accuracy (Pan *et al.*, 2015). Latest forecasting models incorporated with artificial intelligence increase the accuracy on tourist demand, resulting in better finance and strategic planning (Huang, 2014; Claveria *et al.*, 2015). Room rate may be one of the key factors that affect tourists' hotel choice, but the content and creditability on social media and user review websites can change tourists' booking intention (Noone and McGuire, 2013). With the smart hotel network, revenue management activities can be supplemented by the external data and increase the accuracy of the forecast (Ng, 2010; El Haddad, 2015). Smartness refers to the integration of smart features that automate and simplify daily business activities (Leonidis *et al.*, 2013; Buhalis and Amaranggana, 2015). Smart technology allows users to obtain required and precise services automatically from information accumulated in technical devices (Li *et al.*, 2017). Interoperability is the key in smart network, and data must be interexchangable among public and private organizations (Jin *et al.*, 2014; Sun *et al.*, 2016). Data and technology capabilities provided by the Internet of Things (IoT) determine a suitable business model for this emerging technology. Involving smartness means that business entities can interconnect multiple stakeholders (business partners) through a dynamic platform to support prompt business information exchange and a comprehensive decision-making process (Porter and Heppelmann, 2014; Buhalis and Amaranggana, 2015). Prior studies have focused on the exploring components of smart cities (Jin *et al.*, 2014; Harmon *et al.*, 2015; Nuaimi *et al.*, 2015; Boes *et al.*, 2016) and move toward smart tourism (Gretzel *et al.*, 2015; Boes *et al.*, 2016; Wayne, 2016). Other than a study conducted on electronic data interchange among internal hotel application systems (Leung and Law, 2013), majority studies on implementation of smartness on hotel were related to guest experience on in-room technology (Miočić *et al.*, 2012; Leonidis *et al.*, 2013; Neuhofer *et al.*, 2015) or organizational performance (Bin Ayob and Ibrahim, 2016; Melián-González and Bulchand-Gidumal, 2016).

A smart network cannot be successful without sensors and beacons. Internal sensors assist hotel applications to monitor operational activities on going inside and outside the hotel (Yick *et al.*, 2008). Beacons can identify guests' location and send out personalized message (Toedt, 2016). IoT enables machine-to-machine interconnection of conventional physical objects via the internet and can intercommunicate and interoperate through remote controls by users (Hersent *et al.*, 2011; Holler *et al.*, 2014). As each physical object can communicate with the other automatically, the need of human intervention is minimal (Alsaadi and Tubaishat, 2015). With the implementation and development of a smart city network, the sensors installed around can further assist hotels in providing advance personalized services to hotel guests. External sensors installed around the city collect massive external data such as weather, road conditions and airport traffic situation. These contextual data can be aggregated with the hospitality database to implement effective revenue management.

Interconnectivity and interoperability of applications and smart network has been discussed for more than a decade; most of the studies on smartness have been conceptual

frameworks or related to tourists' perceptions. Limited studies have focused on stakeholders' view point. Academia has highlighted the importance of a smart network for a decade, but have the key features and definition of smartness delivered to hotel stakeholders? Key stakeholders have strong influences on technology adoption and procurement decisions. They need to justify their investment with ROI; therefore, it is important to understand their knowledge level of smartness. If they do not have a clear understanding of smart network and smart hotel, convincing them to roll out smart technology in hotels is very difficult. Based on the background, three research questions were established:

RQ1. What is the key stakeholders' knowledge level on smartness?

RQ2. What do they expect from a smart hotel?

RQ3. What known barriers are expected when implement smartness in their hotels?

Through the interviews, stakeholders' perceptions on the three questions can be obtained. The findings can be compared with recent academic definition and the gap between academia and the stakeholders' point of view on smart hotel can be identified.

2. Method

Taiwan has a long history of being a technology manufacturing hub (Woodman, 2013) and has ranked 15th worldwide on technological infrastructure (MOEA, 2017). In addition, the government has heavily participated in transforming Taiwan into a smart city (Wang and Wu, 2015) by installing free Wi-Fi around the whole country for not only residents' but also tourists' use (Taiwan Government, 2017). All this evidence shows that Taiwan has been working toward smart network. However, a prior study on hotel service failure in Taiwan indicated a high dissatisfaction level from outdated technology and poor Wi-Fi connections (Loo and Leung, 2016). This contradiction brought out the research questions. Invitation letters were sent to a group of participants who were hotel key decision-makers and who have influential power on ICT product procurement. All of them had participated in a conference on smart tourism held in Taipei, Taiwan, in July 2016. After one month, nine participants showed interest to participate. Telephone interviews were conducted from August to November 2016. Five interviewees involved in hotel management comprise one stakeholder from an investment bank, two stakeholders who are representatives of a company owning a hotel and two hotel operation managers. The remaining four interviewees were sales executives of hotel information technology (IT) application vendors and IT consultants. As this study focused on smart technology adoption, only investors, owners, hotel managers and technology suppliers who are related to purchase decision were included; hotel guests' opinions were excluded.

In-depth interviews were conducted in Mandarin, and the interviewer noted down the key points during the conversation. Each interviewee was asked three key questions, followed by follow-up questions for clarification. The three key questions are as follows:

- In your own point of view, what is the definition of smart hotel?
- What would you expect from your hotel if it is a smart hotel?
- What barriers would you expected when implementing smart technology to your hotel?

As one of the objectives of this study is to understand the definition of a smart hotel from stakeholders' perspective, the researcher did not mention anything related to smart hotel before the interview began. Each telephone interview lasted for 30-45 min and was audio recorded for transcribing. The transcribed text was read and categorized according to hotel operation and management by the author and then validated by one hotel manager (who was not involved in the in-depth interview) and one hotel management lecturer. Table I shows the background information of each interviewee.

Table I Interviewees' background

Interviewee	*Company background*	*Age*	*Main job duty related to it procurement*
Banker A	She is the chairlady of a local investment bank association and the hotel owner of two budget hotels in Taipei	Late 60s	Her organization is looking for potential hotels with smart components to acquire in the near future
Owner Representative A (Rep A)	Her company owns a local hotel chain with five hotels around Taiwan. The number of hotel rooms ranged from 40 to 60	Mid-40s	Oversees the hotels financial performance and central purchasing
Owner Representative B (Rep B)	His company owns a local four-star hotel with around 300 rooms in Kaohsiung	Mid-50s	Oversees the hotel financial performance and purchase. In-charge of the hotel renovation project planned in 2018
Manager A	He is the financial controller of a four-star hotel and has been working in hospitality industry for almost 20 years	Early-50s	Control and monitor the hotel budget and financial performance; review IT proposals
Manager B	She is the front office manager of a three-star hotel and has been working in hospitality industry for more than 10 years	Mid-40s	Oversees front office operation and customer service. Review and comment on IT proposals in operation perspective
Sales A	His company sells in-room information and entertainment system. He has been working in this company for 2 years	Late 30s	Prepare proposal and conduct system demonstrations for hotels in Taiwan, Hong Kong, Macau and China on their system
Sales B	He is the sales director of China-based IT company. Their products mainly focused on property management system and interface customization with in-room technology	Mid-40s	Major customers are in China but now wants to expand to Taiwan market. Branch office just setup in early 2016
Consultant A	He is VP of a hospitality IT association and CEO of an IT consulting company	Late 50s	Organize conferences and workshops that connect hotels with IT companies
Consultant B	He is an independent IT consultant	Mid-40s	He provides professional advice on new hotel technology strategies and old hotel renovation IT implementation plan

3. Findings

3.1 Define smart hotel

The common definition of smart hotel among nine interviewees was improve operation effectiveness and efficiency, increase employee productivity and hotel revenue and reduce operation cost. Other than these three common perspectives, the remaining opinions shared among nine interviewees were quite different. Their definition was highly related to their job nature. Owners and investors view smart hotel as "fashion," which can increase profit. Banker A mentioned that:

> This is future trend, so all new hotel should be smart. We will acquire two new hotels in Taipei with certain smart technologies installed and make our customers aware our hotels are smart.

Smart hotel maximizes hotel turnover and profit. Rep A indicated that "smart system can assist hotel general manager to define better marketing strategy and rate plans to maximize room rate." Rep B shared a similar opinion, "the hotel executives could review the system more frequently to adjust the room rate, increase the daily occupancy, and achieve the best RevPAR" (RevPAR: revenue per available room).

From operations' perspective, smart hotel can increase the service quality level. Manager A defined smart hotel as "provide speedy, convenience, accurate and all direction service." Manager B said, "... a remote home that understands you." From suppliers' and consultants' point of view, smart hotel can not only increase human interactions but also enhance the brand image. Sales A emphasized that "smart hotel could bring in temperature, warm customer's heart and feel the beauty of the world." Sales B said that "[smart hotel] could match modern people's needs by saving time and money." According to Consultant A, "technology can save employees operation time, so they can spend more

time to communicate with customers"; while Consultant B said that "cutting-edge technology can generate noise in town, increase brand awareness, and visibility on social media."

3.2 Expected from smart hotel

All the interviewees considered that the hotels they are currently working with were not "smart." Their expectation from a smart system was quite similar and can be categorized into three areas, namely, operation, management and guest experience.

3.2.1 Operation. All interviewees agreed that a smart system can "speed up" and simplify the operation procedure. Internal departments can interchange data automatically, as all the application systems are interconnected and interoperable. All of them expected that the smart system can increase employees' productivity so that they can reduce head count in each department. With regard to service quality, Manager A stated that "... automated system can reduce human errors which leads to less complaints." Sales B said that "all customer records are digitized therefore it is easier to search from the database, increase operation efficiency." From human resources' perspective, all interviewees believe that after their hotel turns smart, the number of employees can be reduced, because the operation procedure could be simplified and partly done by the automated procedure.

3.2.2 Management. All interviewees believed that with the implementation of a smart system, hotel brand image can be enhanced in two ways. First, with the latest technology implemented, a hotel can be labeled as a "high-tech" hotel, and then the hotel can form a standing image among competitors. Second, hotel guests would feel excited when interacting with new technology and "... can share their experience [with the smart system] on social media with friends and help to promote our hotel as high-tech hotel" (Banker A). Among all five hoteliers in this study, none of their hotels has installed a revenue management system. Manager A expected that:

> [smart system] can help hotel to make use of the historical data to increase daily room rate, so we no longer need to depend on our Director of Sales personal experience and professions to prepare the rate strategies.

ROI and profits not just are investors and managers' main concern; they also expect cost and wastage to be reduced after implementing the smart system. Manager B stated that "The system can detect human movements so air-condition and lightings can be adjusted automatically for lowering utility fees." Rep B said that:

> I heard about a system installed in kitchen that can help to monitor expiry date and inventory, I expect this system could reduce the food wastage and reduce the minimum stock level.

Banker A expected that:

> [smart technology] enhanced customer service, then our hotel brand image will be increase. This will lead to the value of the building increase and finally the land value will also be enhanced.

3.2.3 Guest experience. Smart technology can enhance hotel guests' stay experience. In-room technology can be an extension of five senses. Automated systems adjust the room ambience through lightings, temperature, background music and in-room scent to ensure a cozy environment throughout their stay. Manager A stated that "customers do not need to spend much effort to achieve personal needs"; and Consultant A said that "smart hotel are for lazy people; hotel guests just need to laid back and the system can do everything for them." The smart system should able to provide convenience and proper check-in and check-out process. With the popularity of mobile devices, hotel guests are no longer required to stay in a long queue for check-in and check-out processes. Consultant B pointed out that "customer booking details including credit card information stored inside

PMS [property management system], therefore there is no point to require customers to check-out at the reception counter." Technology could enhance travel convenience and cultural exchange. Both Manager A and Sales B pointed out that advance technologies such as Google Translate can reduce the miscommunication and misunderstanding. They can adopt an instant translation service to communicate with non-English and non-Chinese customers.

3.3 Barriers to become smart

All interviewees agreed that a smart system brings in numerous advantages in hotel operations, management and customer services; however, they all admitted that there were at least three main barriers to overcome before their hotels become smart.

3.3.1 Financial barriers. Interviewees from hotel management side agreed that smart systems are expensive, and it is not easy to fund a smart system without good justification. Banker A and Rep B also mentioned that they need to "calculate carefully and have good justification on the ROI before I can justify the purchase." Interviewees from supplier side admitted that many hotel owners and investors require vendors to provide ROI estimation. Sales B mentioned the difficulties on this calculation:

> Benefits from technology are quite intangible, you cannot quantify the value of brand image, word-of-mouth, and conveniences. . . It is also difficult to calculate the percentage of productivity increase from each employee.

Other than ROI, Manager A also pointed out that:

> Our hotel owner concerns about how long the system could last as technology changes so fast, they are worried the equipment they purchase would be obsolete in one or two years.

Furthermore, Rep A indicated that "blocking hotel rooms for installing new system will decrease RevPAR … leads to financial lost [daily room revenue]," which is a common financial concern among investors.

3.3.2 Technological barriers. To implement a smart system, hotels need certain changes in both infrastructure and operation procedure. Most of the hotel management interviewees worry about the large scale of infrastructure modification, wiring, additional electricity sockets and furniture modification. Banker A stated that "the system is expensive and it would be a heavy burden if we need to largely renovate our hotel to cater the system installation," and Manager B pointed out that "operation would be affected if we need to close down some hotel rooms or hotel lobby in order to install the system."

Other than initial investment, operation issues and system maintenance are hotel management's concern. Rep B and Manager B both mentioned that "we need to hire additional professionals to monitor and maintain the system." Manager B stated that:

> Our PMS is interfacing with POS system, but not accounting system because our Financial Controller worry the direct interface could mess-up the financial data as automated data were not pre-audited by accounting staff.

While hotel managers are concerned about the technical issues, suppliers shared a different point of view. They believed that all these concerns have been well taken care of. Consultant B stated that "smart systems interfaces are mainly web-based so the installation and implementation were simple and straight forward," and Sales B said that "XML is the most popular and well tested communication protocol, so I cannot see there is any problem in data exchange among application systems."

3.3.3 Behavioral and attitude barriers. Modern technologies are not always welcome by employees and managers. More importantly, mid-level managers' attitude can be a major barrier when implementing smart systems. Rep A mentioned that:

> "One of my peer is not a big fan of technology, he is worry about ease of use and data security, and always shows negative attitude toward new technology proposal.

Sales A shared a different view point: "with the popularity of smart phone, Internet and friendly system interfaces design, I believe most of the employees could easily handle the system after training." Manager A is concerned about employees' feelings:

> Many of our employees have been working here for 20 to 30 years, they are comfortable with the existing system and operation procedure, so some of them are reluctant to make changes . . . and I am not sure how many of them can operate it [smart system] smoothly.

Job insecurity makes employees feel negative attitude toward smart systems. Robots and artificial intelligence decision systems can automate operation processes and replace humans (McClure, 2017). Manager B shared her past experiences on POS system implementation 15 years ago:

> Some cashiers worry they will soon be replaced by the system [POS] and lost their job . . . they have negative attitude during system training . . . and now none of our restaurant has cashier.

Many hoteliers are not only reluctant to be the first mover but also worried that their newly purchased system will be outdated soon. Consultant B stated that:

> My customers always ask me to provide user list but seems no one want to be the first one. . .but when majority hotels are using it, they would worry this system will be fade-out very soon.

This is quite contradictory because technology changes fast; if they cannot act fast, the system they brought would be outdated in one or two years. Banker A emphasized on the importance for not being the first mover: ". . . able to seek for advice or hire employees from other hotels, they could share their experience with us."

4. Discussions

The definition of smart hotel stated by Taiwanese hotel key stakeholders during interviews was not consistent. They all agreed that a smart system can increase efficiency and revenue and reduce cost. Most of the interviewees look at smart technologies as customer-centric (in-room facilities), employee-centric (improve working efficiency or reduce workload) and revenue-centric (save cost and increase revenue). Their perception and definition of "smart hotel" is mainly associated with their role in the organization. Hotel owners and investors expect that the term "smart" could help their hotel to enhance reputation and brand image, leading to good financial return after implementation of the smart technology. Hotel managers expect that smartness could improve their operation effectiveness and efficiency and save man power. Technology sales and consultants packaged their products with "smart" hotel to enhance their brand image and form uniqueness among competitors. Several of them perceived that operation automation is "smart"; and some view smart hotel as "fashion trend" that can draw customers' attention. Many hotel stakeholders expect a smart system to improve operation efficiency and reduce cost. However, they were not aware that smartness can lead to specific strategic and marketing plans that assist decision-making on best pricing and rate strategies (Bilgihan *et al.*, 2011). Hotel investors and owners are concerned about ROI and the life span of the technology. As technology changes rapidly, they feel risky to spend tremendous amount money that lasts for only a short period (DiPietro and Wang, 2010). However, customer service experience is intangible, so it is not difficult to use service quality for ROI justification (Masa'deh *et al.*, 2015). Hotel operation is strongly related to travel intermediaries; however, most hotel applications are not connected with their business partners; therefore, manual operations are required (Leung and Law, 2013). Several definitions of smartness defined by academia were not been mentioned in this study. None of the interviewees mentioned that interconnectivity and interoperability with business partners' application is "smart." The role

an OTA plays in a distribution channel is becoming increasingly important. Hotel employees currently need to spend tremendous amount of time to control the room allotment and to adjust the room rate on each OTA platform that can affect the last-minute rate strategies. Therefore, it is crucial to let hoteliers understand the importance of interoperation with business partners (Ling *et al.*, 2015).

Furthermore, none of them associated smart with beacon, robots or artificial intelligence. Currently, several hotels have adopted robots to communicate with customers (Hilton, 2016) or are using robots to conduct hotel operations (Henn-na Hotel, 2015). However, none of the IT vendors and consultants mentioned them in smartness definition. The recent promotion of smart technologies focused on a single function or task, such as delivering message to customers and front desk operations, but was not in a comprehensive interoperable application form. Social media plays an important role in hotel selection, but none of the interviewees emphasized on the management responses on social media platform. Prior studies have mentioned the importance of handling customers' complaints and feedback online for service recovery (Assaf *et al.*, 2015; Loo and Leung, 2016). On one hand, many of them were not aware of the importance of review, so they did not respond to customers' feedback promptly. On the other hand, they might not associate social media with smart technology, as they manually monitor the reviews. In addition, they were unaware that smart technology can help them monitor online review platforms and enable them to respond on time via systems.

As mentioned in Section 1.2, prior studies have defined smart hospitality as integration and automation of business activities (Leonidis *et al.*, 2013; Buhalis and Amaranggana, 2015), incorporation of external environment for strategic planning (Ramos *et al.*, 2015) and delivery of messages to customers via sensors and beacons (Holler *et al.*, 2014). Apparently, these definitions did not reflect in the answers by hospitality stakeholders; their perceptions of smartness were still related to streamline operation, cost saving and creating a high-tech brand image.

5. Conclusions and research limitation

The hotel stakeholders in this study reflect that Taiwan hotel owners and investors are concerned about operations more than strategic planning. They still believe cost saving to be the first priority and were unaware that technology could improve their strategic planning and lead to better financial returns. The interviewees were unaware that interoperable technology can streamline operation procedures with business partners by interactive systems. Last-minute pricing strategies and allotments can increase hotel yield with OTA system automation (O'Connor, 2016). Hotel owners and investors expected tangible ROI calculation on smart technology investment; however, they were unaware that this investment can not only save cost but also improve operation performance (Li, Xie and Huang, 2013) and customer satisfaction (Cobanoglu *et al.*, 2011), enhance guest stay experience (Buhalis and Amaranggana, 2015) and maintain positive word-of-mouth (Erdem and Cobanoglu, 2010) and employee job satisfaction (Ko *et al.*, 2016). These outcomes are intangible to measure. Operations with social media, sensor and beacon and robots and artificial intelligence were overlooked by all participants. They might be unaware of the importance of system monitoring on social media, which could assist them to monitor the e-word-of-mouth and increase the booking intention from customers (Ladhari and Michaud, 2015). Many hotel managers were worried that technology could lower employees' job security level. They should bear in mind that technology is not a replacement of employees but a tool that helps employees to perform better. Operation processed need to be reviewed to cope with robot operations (Osawa *et al.*, 2017). Managers should brief their employees about how smart technology could enhance their job efficiency and job performance, which could not only make their customers happy but also secure their job.

This study sheds light on the differences in smart hotel definitions between stakeholders and academia. Though smartness has been discussed in academia for decades, industrial practitioners are still unable to fully understand its functions and definitions. For technology sales and marketing, this study reflected that IT consultants and salespersons in Taiwan were not fully aware of the complete definition of smart technology. They should, on one hand, enhance and update their knowledge regularly and, on the other hand, deliver the recent definitions to hoteliers. Many hoteliers' perceptions of technologies were still limited to cost saving and employee productivity (Law and Jogaratnam, 2005). Stakeholders should enrich their knowledge on smart technology implementation and concentrate on data interconnection and interoperability to streamline information exchange among supply chain.

This study has several limitations. First, with a total of nine interviewees with one or two interviewees in each category, the opinions cannot be generalized for Taiwanese hotel stakeholders. Second, none of the interviewees was from five-star hotels; therefore, the result cannot reflect five-star hotels' practices. Finally, IT vendors and consultants included in this study were local suppliers. Their company size was relatively small, so their products and marketing focus might not reflect the real smart technology development trends in the smart technology market.

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