Guest editorial: Challenges and prospects of AIoT application in hospitality and tourism marketing

Background

The global tourism industry is growing rapidly and has become one of the most important engines of economic and social development. However, COVID-19 pandemic has hit the global tourism industry, and the performance of hospitality sectors, such as airlines and travel services, has avalanched. As a result, many countries are now relying on domestic demand to support them. The tourism industry is looking forward to the early release of the pandemic to welcome the long-awaited tourism opportunities. But what can we do to prepare for the arrival of tourists during and after the pandemic? Technological developments affect tourism in terms of sustainability and the storage of visitors' data. The technological sustainability of tourism is considered from two perspectives (Gretzel *et al.*, 2020). Firstly, these technologies can provide efficient resource management in all sub-sectors that make up the travel and hospitality industry (e.g. transportation, accommodation facilities and events). Secondly, the development of information technologies facilitates information sharing on a global scale. The effectiveness and importance of concepts such as cloud computing, Internet of Things (IoT), data mining and artificial neural networks as the basis for storing and analysing big data will have a substantial impact on the tourism industry (Mariani, 2019).

With the popularity and development of internet technologies, big data, virtual reality (VR)/augmented reality (AR), cloud computing and blockchain, smart tourism has gradually changed from a mere rhetorical concept to practical application (Cranmer *et al.*, 2020; Rashideh, 2020; Samara *et al.*, 2020; Yung and Khoo-Lattimore, 2019). The big data platform of smart tourism provides comprehensive, multidimensional analysis of data on tourist attractions, pedestrian flow, traffic, hotels, etc. Through the full integration of various tourism resources, data mining and artificial intelligence (AI) technologies create an intelligent tourism ecosystem to provide tourism applications for governments, enterprises and travellers. For example, some museums are using AR and VR technologies to provide additional information and navigation services to enrich the forms of tour content.

On the other hand, there is a growing utilization of AI to enable travel companies to transact orders more quickly, allow consumers to compare prices and content more effectively and provide travellers with more personalized and demand-driven services. As AI technology matures and becomes more widely available, more people are enjoying the convenience and functionality of AI in the tourism industry. AI trained by deep learning can continuously correct errors, offer possible options and provide the users with the desired relevant and highly personalized information within seconds (Goel *et al.*, 2022). Thus, AI can assist the tourism industry in processing and analysing data to provide personalized and tailored services to travellers, simplifying the process of booking trips for travellers and greatly enhancing their travel experience. In addition to translation and price comparisons, this trend applies to many other areas, where AI learning can provide consumers with troubleshooting methods in a short period of time, such as gathering and recommending flight, hotel and restaurant information for consumers to save time and money, where consumers can get immediate answers and no extra staff workload is required. In terms of

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blockchain applications, Irannezhad and Mahadevan (2020) elaborate on seven major branches of blockchain technology in the travel industry and present several hypotheses about the potential motivations and barriers for travel consumers and providers to the adoption of blockchain.

In this special issue, we select several research papers based on smart hospitality application and service, aiming to extend the knowledge and concept of smart hospitality platforms. This concept provides a fundamental perspective to academia and practitioners to deliver smart service and apply on-demand service (Benlian *et al.*, 2011; Chou *et al.*, 2014), and users could adopt this service by deploying the functions and module of AI. This is especially critical in the post-COVID era when the hospitality industry tries to adopt smart services to increase their service and revenue.

Smart hospitality themes in hospitality and tourism marketing

This special issue includes five themes: the first theme is the technical application on natural language processing, including voice assistant and Chatbot (Buhalis and Moldavska, 2021; Yoon and Yu, 2022). The second theme is crypt technology with payment and transaction log mechanism like blockchain service (Su *et al.*, 2022). The third theme is based on extended reality (XR), which covers VR, AR, and mixed reality (MR). XR technology moves the human interaction into a virtual and/or hybrid mode, and the applications in hospitality situations include labour training, tourism destination simulation and commercial marketing (Chang and Chiang, 2022; Chen *et al.*, 2022; Leung *et al.*, 2022; Lui and Goel, 2022; Santoso *et al.*, 2022). The fourth theme is marketing technology (MarTech) which is important in the hospitality industry and will help the firms to use social media, online reviews and other similar range of software and tools to achieve marketing goals (Zhuo and Wang, 2022). Lastly, the fifth theme is smart hospitality which is a business strategy that involves strategic thinking from all the stakeholders. When a firm implements new technology to deliver smart service, it should also re-evaluate the needs at different phases of the customer journey and redesign the service process for human–smart technology collaboration (Hsu and Tseng, 2022; Wu *et al.*, 2022).

An exemplar using a smart hotel framework based on smart hospitality themes

In this editorial, we present the system flow based on a smart hotel framework to aggregate and explain the concept that encapsulates the aforementioned themes in a real situation (Figure 1). This system is the smart hotel platform at the teaching hotel in National Kaohsiung University of Hospitality and Tourism (NKUHT) in Taiwan. We extend the concept of software-as-a-service (SaaS) and call it hospitality-software-as-a-service (HaaS). The multi-tenant HaaS model allows service providers to provide various hospitality information services and applications on-demand (including software, hardware, storage facilities, maintenance and buildings) to multiple users and thus obtain high economies of scale (Benlian *et al.*, 2011; Chou *et al.*, 2014; Chou and Chiang, 2013; Hsu, 2018).

The NKUHT smart hotel system is based on a hybrid cloud and provides several HaaS solutions for the different fields such as the hotel, tourism and other hospitality-related industry (Benlian *et al.*, 2011; Buhalis *et al.*, 2022; Huang and Rust, 2018; Sun and Rob, 2017). The HaaS delivery model is based on a network connection and the applications are accessed via web browsers. This delivery model is becoming increasingly popular in a variety of smart service business models. There are four important characteristics of HaaS: multi-tenancy, high economies of scale, low control and low customizability. From the perspective of corporate clients, HaaS is a one-to-many model of service delivery. When a

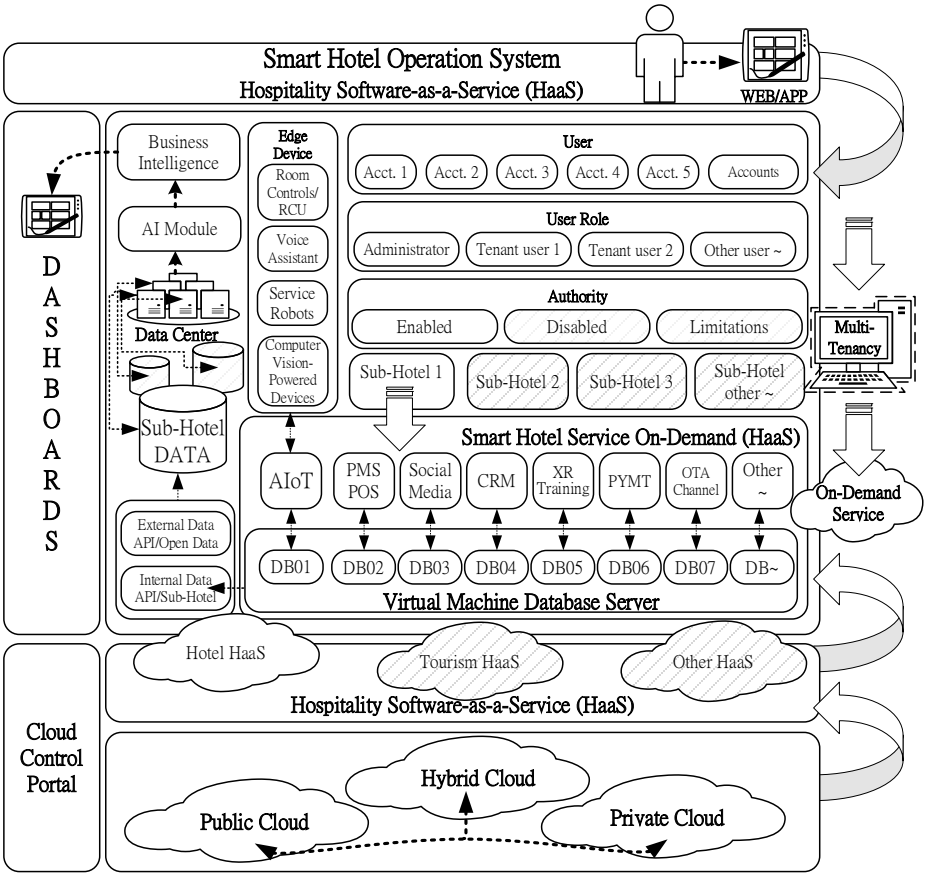

Figure 1.
Hotel hospitality-software-as-a-service (HaaS) framework

hospitality firm subscribes to a single HaaS service provider, it could find itself constrained by the lack of flexibility and options offered by the HaaS provider in terms of leasable systems and service packages. The HaaS provider also has the full control over future upgrades for the HaaS system, which further increases the uncertainty of corporate clients concerning the adoption of HaaS solutions.

In this on-demand smart service system, we integrate AI as an analytic module to collect and analyse the data from IoT, domain operation data, MarTech logs and open data to build the data warehouse as a big data engine (Arıca *et al.*, 2022a, 2022b; Chang *et al.*, 2020; Cobanoglu *et al.*, 2022; Liu *et al.*, 2022). The distributed intelligent system builds the firms' capability of adaptive sensing, efficient communication as well as intelligent analytics (Monteiro and Parmiggiani, 2019; Wunderlich *et al.*, 2019).

AIoT application design in hospitality and tourism marketing

The trend of IoT is to control the environment of the hotel rooms by the room control unit. The remoted logs are transferred by application programming interface as well as collected and analysed through mechanical censoring and cognitive services on HaaS. In NKUHT

HaaS, we use the dashboard outcomes to assist decision-making, and collect data from voice assistant, detect emotion through facial expression and analyse this data using the AI module for emotion prediction and operations management. These capabilities are becoming critical to organizations' success and surpass the importance of thinking tasks (Huang *et al.*, 2019; Huang and Rust, 2018; Ivanov and Webster, 2019).

NKUHT smart hotel also provides the following service: edge device and power over ethernet equipment with computer vision power by facial recognition device, robot service in hotel room service scenario based on devices through cognitive services, and visual cognition analysis deployment of various newly developed statistical procedures and algorithms for prediction on HaaS (Gefen *et al.*, 2011; Khan *et al.*, 2019).

Extended reality application design in hospitality and tourism marketing

In the advent of technology, AR, VR and XR have disrupted how firms conduct marketing, advertising and branding activities (Hackl and Wolfe, 2017). The global AR, VR, MR and XR market is expected to be close to US$300bn by 2024 (Alsop, 2021). By performing a quick search on these two concepts in Google Scholar, one could see that both topics have reach almost 175,000 document work. VR is a computer technology that replicates an environment (real or imagined) and simulates a user's physical presence and environment to allow for user interaction (Burdea and Coiffet, 2003; Gutiérrez *et al.*, 2008; Vince, 2004). The virtual immersive environment affords the consumers a unique experience when they feel physically present by simulating similar experiences a real environment can provide. In contrast, "AR overlays graphics or video on top of what people see in the real world using computer vision and object recognition" (Hackl and Wolfe, 2017, p. 9), and it can thus be used to improve engagement between consumers and firms so as to enhance the brand experience and purchase intention (Sung, 2020). The arrival of 5 G mobile communication provides numerous opportunities for VR and AR applications to enhance immersion, interaction and imagination through faster information processing (Zhuang *et al.*, 2020).

XR has become a popular research topic in terms of technology in hospitality and tourism. We believe that metaverse would be the next recent hype, especially in terms of theory-based research (Yung and Khoo-Lattimore, 2019). While metaverse is at its initial phase, researchers have called for future research in staging customer experience in metaverse and developing metaverse customer experience journey, evaluating the possible changes in consumer attitude and behaviour as well as transforming the businesses perspectives in marketing and operations (Gadekallu *et al.*, 2022). As metaverse is becoming a new norm of social media, the security issues of users' data and the ownership of digital content become critical. The decentralized, immutable and transparent characteristics of blockchain lend itself to metaverse application (Gadekallu *et al.*, 2022).

Conclusion

The environmental dynamism, including the rapid development of the digital-based economy and the global crisis, as well as the complexity of consumer behaviour, has propelled the development and use of advanced technology in hospitality and tourism. Smart service application by HaaS allows hospitality and tourism firms to understand and predict consumer behaviour better and make more informed decisions on their training, marketing strategy, communication process and business operations. In future research, we are evaluating not only hospitality operators' service quality but also the smart service quality across tourism businesses. This takes the efforts from the managers, the service providers and the customers to design the new service process, implement the smart

service and develop a scale to measure smart service quality by HaaS (HaaS-Qual) (Benlian *et al.*, 2011; Chou and Chiang, 2013; Huang and Rust, 2018; Ivanov and Webster, 2019).

This special issue aims to encourage and increase the collaborations between scholars and practitioners on knowledge extension, best practices and potentials around the AIoT in the hospitality and tourism fields during and after the pandemic. The integration of AI and IoT enables data collection and analysis to be done through a distributed structure HaaS and builds the firms' capability of adaptive sensing, efficient communication as well as smart service provision in hospitality and tourism industry. In line with the aims and scope of the *Journal of Hospitality and Tourism Technology* (JHTT), we are delighted that the articles published in this special issue have extended our knowledge about AIoT's implications to hospitality and tourism marketing and provided meaningful insights and ways forward to scholars, practitioners and the relevant stakeholders in the hospitality and tourism industry.

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