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A digital transformation approach in hospitality and tourism research

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Abstract

Purpose – Because of the COVID-19, the digital transformation of global hospitality and tourism speeds up. This paper aims to provide comprehensive frame of the digital transformation for further hospitality and tourism research.

Design/methodology/approach – Through conducting a critical review of the impact of COVID-19, the current situation about the application of digital technology and digital transformation in hospitality and travel, this study used a qualitative approach to present the viewpoints.

Findings – This research presents a theoretical research framework for the hospitality and tourism about digital transformation, including possible directions, contexts and methods. It highlights the importance of digital transformation, and further proposing specific research topics.

Research limitations/implications – This research brings valuable implications and guidance for future research from the aspects of key research streams, research context and methodological approaches in hospitality and tourism about digital transformation.

Originality/value – This paper supplies existing critical reviewed research through paying attention to the digital transformation approach in hospitality and tourism, providing research guidance technically to the industry of hotels and travel.

Keywords Hospitality and tourism, Digital transformation, Critical reflection, Future agenda, COVID-19

Paper type Conceptual paper

1. Introduction

Due to the impact of COVID-19 and policy requirements since 2020, consumers cut down most travel and tourism activities (Hao *et al.*, 2020). This variation has not only directly affected the survival and development of the hospitality industry, but also brought a serious

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blow to the world economy. As we all know, the hospitality is vulnerable to sudden disasters, like pandemics, terrorist attacks and natural disasters (Chen *et al.*, 2021a, 2021b). Hotel managers need to take corresponding measures to meet the various challenges in different crisis. Due to the new demand of the new normal, contactless, hygiene and cleanliness are the key to the effective prevention of COVID-19 (Pillai *et al.*, 2021). Using intelligent means instead of human labor in hotels, such as artificial intelligence (AI) and robotics, noncontact payment and intelligent sensing equipment, can protect hotel consumers and front-line service personnel (Hao *et al.*, 2020), especially under circumstances of high contact.

In the Internet era, digital technology including information technology (IT) and information communication technology has been widely applied in the hospitality and tourism. On the basis of the disruptive technologies, digital transformation happened when the organizational structure and business model have changed because of the use of digital technologies. Under the influence of COVID-19, more consumers prefer intelligent hotels than human hotels (Kim *et al.*, 2021). Thus the digital transformation of hospitality is imminent, which is very important in future studies.

In recent years, digital transformation has become a topic of great importance to researchers. Although the literature of digital transformation is increasing, there are still some knowledge gaps in the existing review research. Existing reviews mainly focus on the development of digital technology in hotels and travel. For example, Tussyadiah (2020) reviewed AI, robotics and Internet of Things (IoT). Shin (2022) reviewed robot research in business management from a service ecosystem perspective, but they did not emphasize the transformation. Moreover, some scholars focused on smart tourism and smart hotels. Mehraliyev *et al.* (2020) summarized the latest progress of smart tourism; Law *et al.* (2021) put the smart hotel research into attention. Existing literature discusses smart hotels and tourism from the perspective of suppliers and consumers, but does not focus on the process to digitalization. In the new normal of COVID-19, it is important to understand the current status and future growth of the digital transformation in hotels and tourism, which requires a lot of research work. However, the number of literature in this field is rare.

In light of this research gap, this study provides a roadmap and direction for the future digital transformation research of hotels and tourism, with a critical analysis of the literature based on the following three comprehensive questions:

RQ1. What is the concept/definition in hospitality and tourism about digital transformation?

RQ2. Which topics are the existing research of the digital transformation in hotels and travel focus on?

RQ3. What are the ways to expand the future research on hospitality and tourism about digital transformation?

We proposed the framework for the future research on hospitality and tourism about digital transformation in the new normal of the COVID-19, summarizing three main study streams, and providing available directions and methods.

2. Literature review

2.1 Influence from pandemic

There are numerous difficulties the COVID-19 pandemic created to the hospitality and tourism industry. The occupancy of hospitality plunged during the outbreak and maintained at a low

level (Hao *et al.*, 2020). In 2020, hotel industry in China lost over ¥67bn in revenue, the hotel's revenue per available room in major Chinese cities fell more than 80% (Hao *et al.*, 2020). The impact of employee unemployment even exceeded that during the financial crisis. Most hotels face serious financial risks, especially small- and medium-sized hotels.

The hospitality and tourism was always impacted by the past disasters and crises, but the COVID-19 is different from them because of its three features, social distancing, lockdown and the new normal (Soto-Acosta, 2020; Park *et al.*, 2022). These are still the aftermath of the COVID-19 pandemic for the industry and the society.

First, COVID-19 is a highly contagious disease so it requires us keep social distance to protect ourselves not to suffer from the virus (WHO, 2020). So it has raised higher requirements on hygiene, cleanliness and noncontact services. In the period of COVID-19 outbreak, most hotels adopted intelligent noncontact services in virtue of mobile devices, applications and information systems, including self-service and remote check-in, voice identical control, robot service, face scanning, zero-second check-out and so on (Hao *et al.*, 2020). Hotels adopted these digital services to minimize contact with other people, so that reducing the risk of transmission and cross-infection from COVID-19 pandemic. For example, hotels with better service choose to use service robots, drones and smart household supplies to reduce personnel contact (Kim *et al.*, 2021), to give customers a better experience. Studies have shown that guests will prefer noncontact hotels such as using noncontact check-in and service robots (Kim *et al.*, 2021).

Second, many countries restrict travel and reduce the movement of people across regions, such long time travel bans have never been seen in previous disasters. This is a big blow to the tourism and the hospitality industry, which lead to less passenger traffic and lower turnover. Although the policy requirements and the reduction of travel have greatly influenced the business of the hotel industry because of the COVID-19, the society still needs the hospitality industry in the special periods. Providing hotels for isolation is a way to bring profits to the hospitality industry (Japutra and Situmorang, 2021), but will increase safety concerns. It requires hotels to make a better division of risk areas (Altuntas and Gok, 2021), disclose specific measures about health, disinfection and isolation. Even if the demand for guests to stay decreases, the hospitality industry can generate revenue from other businesses to ease the loss of COVID-19. Hotels providing catering services can sell semifinished products with webcast (Japutra and Situmorang, 2021). Hotels with personal characteristics (such as art hotels) can use social media to build a brand image, display creative features to the public and release other innovative products (Japutra and Situmorang, 2021).

Moreover, because of the high variability of COVID-19 virus and sudden outbreaks occur frequently, we are in and will be in the long-term new normal of the COVID-19. After the outbreak of COVID-19, the internet services, video-conferencing services and content delivery services have drastically increased (Branscombe, 2020). Under the needs for pandemic prevention, working from home and collaborating online have become routine for staff. Customers prefer contactless services through digital technologies to satisfy their needs more effectively and safely. Meanwhile, in the new normal of the COVID-19, precise lockdown and control management, entry and exit restrictions and retaliatory travel fever affect the development of tourism (Kuščer *et al.*, 2022; Milano and Koens, 2022). The dependence on IT remains high in hospitality and tourism. So these services are expected to continue in the new normal of COVID-19 (Hao *et al.*, 2020).

2.2 Digital technology

Digital technology play a core role in digital transformation, using digital technology accelerate the disruptions occurring to the industry and society levels mainly divided into

three aspects: consumer behavior and expectations, competitory environment and validity of data (Vial, 2019). In pace with the development of internet and science, digital technology is generally applied in hospitality and tourism. The following nine digital technologies have been applied in the business routine under the new normal of COVID-19, promoting health, cleanliness and safety at the request of COVID-19. They generally meet the standards of disruptive technology (Bower and Christensen, 1995). Because of constant and frequent outbreak of the COVID-19 pandemic, these digital means have become an important way for the service and management of hospitality and tourism. The new normal will propose new standards and protocols, such as improving hygiene, contactless payments, safe distance and so on [World Travel and Tourism Council (WTTC), 2020]. These digital technologies can help to achieve the new demands and are expected to take effect in a long time. They have disrupted the traditional business process of hotel and tourism industry in the present and future (Buhalis *et al.*, 2019).

2.2.1 Artificial intelligence and robotics. Robots can complete routine tasks like cleaning and sanitization, or help employees perform their duties. Hotels through using AI and robotics to improve consumer experience and stay competitive. Influenced by COVID-19, more hotels may use "unmanned" equipment, using robots for contactless services (Kim *et al.*, 2021). Service robots can replace employees to offer guarding, homemaking, catering and other service tasks (Tuomi *et al.*, 2021), and can also provide customized online experiences for different consumers following consumer preferences. Social robots are more accurate in ordering and delivery, controlling quality and collecting procurement data than human (Romero and Lado, 2021). Cleaning robots can monitor the cleanliness of crowded areas, accomplish automatic cleaning and disinfection of set areas.

2.2.2 Big data. Big data analytics is a very important IT in business analysis and decision support for hospitality industries, which improves the availability of data. Big data analytics can optimize the operation, revenue, cost and competitiveness of different scenarios of the hotel industry. It uses predictive models to calculate business opportunities and revenue, and calculate better solutions from multiple attributes such as past profits, long- and short-term goals (Pillai *et al.*, 2021). Many digital technology is driven by data, like AI, cloud computing, IoT and others. We can capture the service preferences of different consumers according to hotel big data, so that providing basic data support for these technologies (Mariani *et al.*, 2018; Mariani, 2019). Machine learning and deep learning could also help to analyze the data for hospitality innovation such as sharing economy enabled platform (Cheng *et al.*, 2019).

2.2.3 Cloud computing. A necessary requirement of big data is the storage and computing of massive data, which requires the use of cloud computing. Hotel big data on the cloud can be accessed without time and boundary restriction. It collects the statistical data of hotels and tourism entities, as well as the context of related activities (Buhalis and Leung, 2018). Processing hotel big data on the cloud provides uniform compliance standards for data integration, which make it convenient for big data analysis. Moreover, during the COVID-19 pandemic, employees can work remotely and integrate data through cloud files. This collaboration will continue in the future, disrupting corporate strategy, innovation and employee management.

2.2.4 Blockchain. The most important application of blockchain technology to the hotel industry is in the management of supply chain. By reducing the complexity of the chain, blockchain forecasts more accurate on demand when planning inventory procurement. Using blockchain to record information of the supply chain for food during COVID-19 helps make food safety transparent. Blockchain can also be used for payment transactions, achieving a cashless payment by simplifying and protecting currency transactions,

providing credit or financing facilities, helping hotel enterprises in budgeting and so on (Filimonau and Naumova, 2020). Under the COVID-19, the survival of hotels whose size is small or medium is worrying. The use of blockchain help to realize the point-to-point docking and service between hotels and consumers, which improve the level of trust, so that to carry out business without intermediaries and reduce costs (Rashideh, 2020).

2.2.5 Virtual reality and augmented reality. Virtual reality (VR) technology creates nonphysical realistic scenarios through information and communication systems, allowing consumers to fully explore a hotel through virtual travel before ordering a room. During the COVID-19, VR and augmented reality (AR) technology can help consumers have virtual access to the hotel company's restaurant, fitness center, spa, catering menu, table theme, room layout and so on to understand the up-to-date standards of hotel's cleaning and hygiene (Pillai *et al.*, 2021). With the tourism restrictions brought about by COVID-19, virtual tourism through VR technology has gradually risen. And tourism companies use VR, AR, XR and other technologies for destination marketing and providing virtual visit experience for tourists (Kwok and Koh, 2021).

2.2.6 Mobile terminals and applications. Mobile terminals such as phones and iPad can be applied for noncontact services in check-in, switching doors, dominating the room surroundings, ordering and booking a meal delivery to keep them hygienic and clean (Pillai *et al.*, 2021). With ICT applications to maintain efficient business activities such as communication, teleconferencing or itinerary planning, positioning nearby activities and searching information (Buhalis and Leung, 2018), travelers can arrange all activities without leaving home and reduce the security risks of travel.

2.2.7 The Internet of Things. The IOT also leads to the intelligent automation in hospitality and tourism, which refer to giving sensing, confirming and handling capabilities to everyday objects so that they can interact with other services and devices through the internet (Whitmore *et al.*, 2015). A virtual value chain model using the data of physical world obtained by sensors, enables hotel employees to track customer bills and supplies in real time (Pillai *et al.*, 2021). Intelligent lighting, electric curtains, intelligent thermostatic regulator and entrance lock sensor having "Do not disturb" function (Pillai *et al.*, 2021) can eliminate human contact and facilitate the disinfection of the hotel. The combination of sensors, wearable devices and intelligent system enables customers to control the smart-home devices in the room without contact and hotel staff can quickly grasp the information of the customer location and the security in the room (Buhalis *et al.*, 2019), reducing contact while providing personalized services.

2.2.8 Short-distance wireless communication technology. Software defined radio technology can provide ubiquitous connections and real-time synchronization for noncontact payment services through radio frequency identification (RFID) and NFC (Navío-Marco *et al.*, 2018). Using NFC applications in tourism allows payment, data transfer (ticket, product information, digital keys, etc.) and social activities without contact (Pesonen and Horster, 2012). RFID can support the foundation of IoT, bring many further service innovations (Harwood and Garry, 2015). In addition, through connecting the beacons located on top of signs and devices of tourists via Bluetooth, the hotel can provide real digital tourism offices (Navío-Marco *et al.*, 2018).

2.2.9 Collaboration technology. Collaboration technology and systems could help the hospitality industries to do more internal and distance-based IT-enabled collaboration, such as mobile collaboration, online group communication, video- or text-based e-meetings, especially in the context of noncontact requirements. Some methods such as collaboration engineering to optimize the collaboration process within systems could also help collaboration performance in the hotel management (Fu *et al.*, 2020).

2.3 Digital transformation

On the basis of the digital technologies like above, digitization refers to transforming into more usage of digital technologies in interaction, communication, business activities and business models (Verhoef *et al.*, 2021). The digital transformation refers to a process of using digital technology to make a disruptive impact on individuals, organizations and society, to improve the development of the industry (Vial, 2019).

Piccoli and Pigni (2019) suggest that introduction of IT or information system to an organization incurs organizational change in the order of automate, informate and transform. Transformation causes disruptions. It means that there are changes in the interaction between organizational structure and technical system when the organization selects, uses and manages technology. Many projects are digital, but not disruptive. For example, companies can apply digital technology to improve efficiency, save costs or increase sales. But these activities cannot be called actual transformations. The digital transformation should involve in using digital technology to drive significant reform of company's business model (Fitzgerald *et al.*, 2014). It is a company-wide phenomenon with a broad impact on individuals, organizations and society (Vial, 2019).

Under the influence of COVID-19, we think it is more necessary to discuss the digital transformation of hospitality and tourism. According to Kane (2014), the simple application of digital technology brings little value to organizations, which cannot be called "disruption." But when they are used in a specific context, they can develop new ways for companies to create value (Vial, 2019). Therefore, on the basis of definition about digital transformation proposed by Vial (2019), this paper defines the concept in hospitality and tourism about digital transformation as the process of using the nine digital technologies such as shown above to make destructive effects on stakeholders, enterprises and organizations, industries and society to improve the development of hospitality and tourism.

We classify digital transformation based on the different categories of product innovation, because we believe that the digital transformation of enterprises is a process of strategic innovation, which belongs to the category of innovation management. Product innovation has two types: one creates an innovative new product using new core technologies different from previous (Chandy and Tellis, 2000; Langerak and Jan Hultink, 2006), the other refines of existing products, processes, technologies, organizational structure and methods to provide substantially higher customer benefits (Jansen *et al.*, 2006; Zhou and Wu, 2010). Similar to production innovation, there are two kinds of digital transformation in our research.

On the one side, personalized inheriting, updating and improving digital technology in use on the basis of the original digital technology application can be called digital transformation. Many hotels have put service robots into use (Buhalis and Leung, 2018), and gradually use robots to replace human employees. With the help of AI and IoT, unmanned intelligent hotels appear and realize the noncontact accommodation experience without human waiters for the whole process. It uses robots, internet equipment and other facilities instead of human services. Consumers make online appointments, check-in with their faces, control indoor lighting, curtains, air conditioning and other facilities through sound and intelligent sensing, to achieve the whole "no contact." However, the development of unmanned intelligent hotel is still in its infancy, with the problem of high cost but the consumption boom is not high enough, making it appear for many years but has not been well developed.

On the other side, the development and application of new applications to realize the digitalization of hospitality industry management and business is also a type of digital transformation. Acceleration can be achieved effectively through check-in and check-out

procedures by designing and using the smartphone app as the digital key at the room entrance (Torres AM, 2018). Some hotels provide consumers with digital platforms for many functions in hotel to realize a high digitalization of the entire check-in process. AccorHotel hired more than 100 digital experts from 2014 to 2018 to help companies with their digital transformation, based on three components: universal mobile applications for all its hotels, strong focus on customers and tools to simplify the customer experience. And they acquire an online mobile platform to manage travel trips and connect them to Facebook and Twitter (Jelassi and Martínez-López, 2020).

Although most hotels choose to use IT and the internet to assist in their daily operations and management, many hotels are not highly digital. Hotels need digital transformation for more satisfying services and higher competitive, to keep up with the changes of age. But until COVID-19 outbreak, the digital transformation did not list on the strategic agenda of many hotels (Lam and Law, 2019). From the COVID-19, we can see that hotels with higher digitalization will have a better response. However, the digital transformation is not an easy thing, which requires a high cost of capital investment and the problem of facing the enterprise organizational structure adjustment (Lam and Law, 2019), which are all important issues that the hotel industry needs to consider in digital transformation.

3. Methodology

This study uses qualitative research methods to conduct a systematic review of the literature on the digital transformation of hospitality and tourism, to understand knowledge development in related fields in terms of directions, themes, contexts, methods and looking for possible opportunities for future research (Elkhwesky and Elkhwesky, 2022).

First, we searched for relevant published articles about digital transformation of hospitality and tourism from Google Scholar and Web of Science. The Google Scholar was chosen because it indexed data from academic networks, preferred over traditional databases (Gaur *et al.*, 2021). Meanwhile, Web of Science provided more papers come from a validated journal, which help our review (Elkhwesky, 2022). We set the keywords for searching as the combinations of ("digital transformation" OR "digital technology" OR "digitalization") AND ("hospitality" OR "hotel" OR "tourism" OR "travel"). In addition, nine digital techniques were used as keywords to help search for articles required for review. The retrieved result includes the papers which have the mentioned keywords in the sections of "title," "keywords" or "abstract." There was no restriction on the time of publication of the article in our retrieved result. Only papers in English were included. Moreover, we only collected the full-length journal articles into our scope to review. Others papers such as conference papers, reviews, research notes, websites and books were excluded. Each search results were reviewed up to ten pages.

Articles that meet the above requirements will also be carefully read in the abstract section to ensure that their topic and content are directly related, making sure good quality and reliability. Ineligible articles will be deleted and not included in our comprehensive review. According to the above screening criteria, 74 articles finally became our targeted articles in this study. Most of them came from the core journals in this field. Table 1 shows the list of source journals where the articles we reviewed published on.

Figure 1 presents the information about publication year of the 74 core literatures we reviewed. It can be seen that more and more researches are focused on digital transformation in hospitality and tourism. Especially since 2019, the year when COVID-19 outbroke, which proves that the emergence of COVID-19 pays higher attention to digital transformation in hotels and travel.

Later, we conducted a qualitative review to the content of the eligible articles, sorted out key information such as author, publication year, research topic, research method, main implication and so on (Day, 1989). Then we built a framework for future research direction based on a critical review of these literatures.

4. Results and discussion

The classification criteria for the reviewed themes presented in this section are based on the framework from Ritchie and Hudson (2009). This framework applies to a systematic review of the reference on the tourism and hospitality industry experiences, classifying research opportunities into the primary theoretical thinking and empirical research streams, we deem it applicable to the content of this study. According to the framework and previous experience, the following sections aim to:

- conduct conceptual work and research in hospitality and tourism about digital transformation, seeking to define and understand relevant concepts of the digital transformation;
- investigate the support and obstacles of digital transformation from management, behavior, policy and technology aspects;
- assess the impact of the digital transformation from individual, organizational and industry levels;
- focus on the latest context in the digital transformation, and consider new key research elements in these contexts;

Journal	No.	%
International Journal of Contemporary Hospitality Management (IJCHM)	8	10.8
International Journal of Hospitality Management (IJHM)	8	10.8
Information Technology and Tourism (ITT)	3	4.05
Journal of Hospitality and Tourism Technology (JHTT)	3	4.05
Tourism Review	2	2.7
Sustainability	4	5.4
Tourism management perspectives	2	2.7
Journal of Tourism	2	2.7
Other journals	39	52.7

Table 1. List of source journals

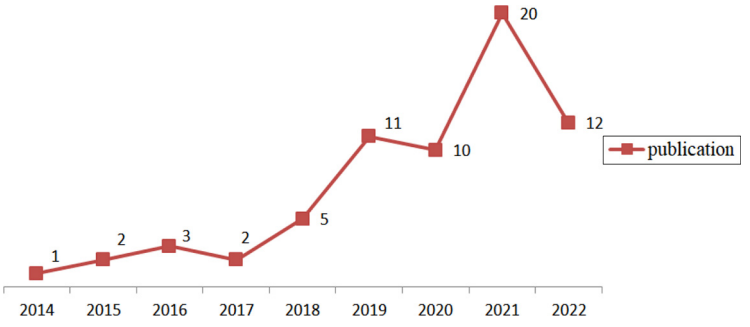

Figure 1. Frequency of publications from 2014 to 2022

- propose alternative methodologies that could be useful to investigate digital transformation of hospitality and tourism; and
- focus on future researches in digital transformation that may have important theoretical and managerial implications. (Figure 2 and Table 2)

4.1 Research directions

4.1.1 Conceptualizing "digital transformation". In this research stream, many scholars have put forward their own views on the concepts involved in the hospitality and tourism about digital transformation. In the existing research, the concept of digital transformation of hotel and tourism is related to such as smart tourism, smart hotel and DT competencies (Gretzel *et al.*, 2015; Leung, 2019; Busulwa *et al.*, 2022).

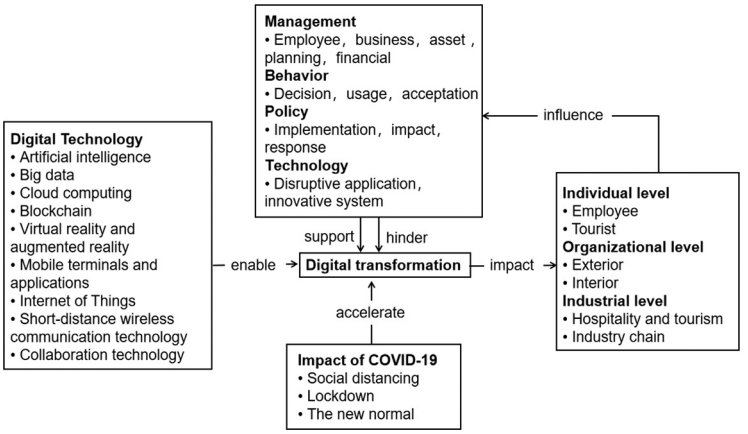

Figure 2.
Research framework for the digital transformation

Author(s)	Noun	Concepts about digital transformation
Gretzel *et al.* (2015)	Smart tourism	Smart tourism identified digital destinations, ecosystem of business routines and smart experiences as the three fundamental elements based on data and technology support
Kim and Han (2020)	Smart hotel	Smart hotel has four dimensions about its essential quality, including facilitation and domination, contactless environment, personalization, maintenance and safety
Pillai *et al.* (2021)	Hospitality 5.0	Hospitality 5.0 organically combines the advantages of employees and technologies in the hotel process, using the creativity of the human brain to facilitate the human–technology interaction, to realizing integrated workflow and intelligent system
Pencarelli (2020)	Tourism 4.0	Tourism 4.0 is a novel value ecosystem of tourism built by high-tech mode of service production on the basis of six common standards of I4.0
Busulwa *et al.* (2022)	Digitally enhanced capability	Digitally enhanced capability refers to significantly transforming the capability through adding new digital activities within the capability or promoting existing routines
Perelygina *et al.* (2022)	Digital BMs	Digital BMs refers to including BM configurations explained in multiple frameworks, such as e-BMs, IT-enabled and internet-based BMs

Table 2.
Concepts about digital transformation

According to the two types of digital transformation defined above, the relevant research defines the relevant concept in hospitality and tourism about digital transformation. In above two types of digital transformation, the majority of research is related to the first category, focus on digital business intelligent processes brought about by the application of hospitality and tourism, such as opportunities and challenges of big data use in smart tourism (Ardito *et al.*, 2019). Other studies considered smart hotel, smart tourism, focus on conceptual research focusing on digital hotels and tourism. Pillai *et al.* (2021) defined concepts and requirements for Hospitality 5.0. Pencarelli (2020) proposed and compared the concept of Tourism 4.0 and smart tourism on the base of Industry 4.0.

In addition, scholars have the opportunity to expand the concept of digital transformation in future research in the new normal of COVID-19. For example, COVID-19 drives the process of conceptualization of Hotel 5.0 (Pillai *et al.*, 2021). Considering the change of COVID-19 in different periods, in the face of different policies and tourist tourism psychology, take it as basal point to research, that is: how COVID-19 affects the conceptualization of the digital transformation in hotels and travel. In addition, the digital transformation strategies for different opportunities and challenges under the COVID-19 environment are also worth studying deeply.

4.1.2 The support and obstacle of digital transformation. The second key research stream is the elements that support or hinder the digital transformation, including several aspects such as management, policy, behavior and technology. Researches focus on the impact of management and technical capabilities on the digital transformation of hospitality, along with tourists' choice behavior, satisfaction, attitude and other aspects will affect the development of the digital transformation (Yang *et al.*, 2021; Zhang *et al.*, 2022; Busulwa *et al.*, 2022). Moreover, policy support is another focus of relevant research (Ezzaouia and Bulchand-Gidumal, 2020; Kuo *et al.*, 2017). (Table 3)

Category	Support/Obstacle	References examples
Management	DT competencies	Busulwa *et al.* (2022); Liu and Yang (2021)
	Management team's expertise and experience	Zhu and Zhang (2021); Kitsios and Kamariotou (2019)
	Operational scope	Zhu and Zhang (2021)
	Finance	Zhu and Zhang (2021); Alrawadieh *et al.* (2021)
	Leadership styles	Kazim (2019)
	Processes, people, culture and mindset	Lam and Law (2019); Morosan and Bowen (2022)
	Strategies and organizational integration	Thees *et al.* (2021)
Behavior	Tourist preferences	Zhang *et al.* (2022)
	Employee role	Hsu and Tseng (2022)
	Guests' acceptance	Yang *et al.* (2021)
Policy	Government support	Ezzaouia and Bulchand-Gidumal (2020)
Technology	Application of digital technology	Filimonau and Naumova (2020); Mariani (2019)
	System development	Buhalis and Leung (2018)
	Interoperability, data management, security and privacy, and responsiveness	Kansakar *et al.* (2019)
	Co-creation	Sarmah *et al.* (2017)

Table 3.
Support and obstacle of digital transformation

In terms of management, the implement of the digital transformation strategy of hospitality and tourism needs to face many management problems. The hotel's technology team needs to make adjustments in the technology, process, culture, personnel and mentality to achieve the digital transformation in the future (Lam and Law, 2019). To carry forward the digital transformation requires the managers to master the corresponding digital management ability to support the company's digital transformation (Busulwa *et al.*, 2022), as well as the employees' digital competence will impact the digital transformation (Hsu and Tseng, 2022). Financial capacity and the resources owned by enterprises are an important basis for influencing the decision of digital transformation of enterprises (Leung, 2019), and the research on the company's asset management is indispensable when we discuss the support and obstacle of digital transformation.

In terms of behavior, it mainly includes the acceptation behavior of the tourists and hotel employees to the digital transformation. The behavior decision of customers affects the strategy of enterprise innovation. In the new normal of the COVID-19, people paid more attention to digitalization in hospitality and tourism, including contact-free hotel systems, virtual travel and remote collaboration. For example, Kim *et al.* (2021) found that consumers prefer to choose more digitized hotels after the COVID-19 outbreak; but remote working connected by IT may instead increase employee exit behavior (Chadee *et al.*, 2021). Individual behavior is related to perception. According to the technology acceptance model (Legris *et al.*, 2003), a large amount of researches were conducted to study the satisfaction and behavioral intention of hotel digital technology from a perceptual perspective (Hailey Shin *et al.*, 2021; Chen *et al.*, 2021a, 2021b; Shin and Jeong, 2022). Meanwhile, the attitude and acceptance of employees in hospitality and tourism to the digital transformation are equally important. Vatan and Dogan (2021) show that employees reject the use of robotic technology. Torres and Zhang (2021) found that the use of digital devices increases employee work enthusiasm and satisfaction. In addition, trust is also an important aspect for customers which need to be taken seriously in research (Cheng *et al.*, 2019; McLean *et al.*, 2020; Palácios *et al.*, 2021).

In terms of policy, a transformation trend of an industry is inseparable from the support of policy (Kuo *et al.*, 2017). There are studies shown that policy support and government regulation are the drivers of the digital transformation of hotels (Ezzaouia and Bulchand-Gidumal, 2020). But from the results of the review, existing studies focus on policy is very limited. In the future research on policy most conduct policy analysis and research from multiple dimensions, such as policy formulation and design, policy implementation, assessment of policy impact, public response and support. In addition, different countries or regions have different social characteristics and policies, and the relevant research should be carried out in combination with the local conditions and local customs.

In terms of technology, the development and maturity of digital technology and its extensive use in the hospitality and tourism are the foundation of the digital transformation of the industry (Filimonau and Naumova, 2020; Iranmanesh *et al.*, 2022). We have summarized the application of nine mainly used digital technologies in the business of hospitality and tourism above. In the new normal of COVID-19, the use of digital technology in the hospitality has a broader boundary, contributing to contactless, health, cleaning, remote work and other crisis management (Pillai *et al.*, 2021; Soto-Acosta, 2020).

One of the future directions is how the original IT gets new applications in the hospitality and tourism to optimize its business processes and meet the challenges posed after COVID-19. Pillai *et al.* (2021) proposed in the context of Industry 5.0 and COVID-19, using the IoT and AI, sensors and smart environments build Hospitality 5.0 reduces contact rates and give hotels better sanitary conditions. In virtue of VR and AR technology, virtual travel

can allow hotel consumers virtually access to tourist attractions, hotel scenes and other places under the COVID-19 pandemic (Mohanty *et al.*, 2020). And hotels can also combine them with wearable devices to add VR devices available to consumers to the hotel facilities. The application to traceability of the blockchain can realize tracing to the source of the supply chain for catering and daily necessities in the hotel (Filimonau and Naumova, 2020). Moreover, when researching use of digital technology and digital transformation, the size and resource capacity of the hotel are also one of the factors that need to be discussed. For instance, Zhu and Zhang (2021) found the digital transformation of small- and medium-sized hotels is trapped, although it was confirmed to be very important for recovery from the COVID-19. The other side, Shin and Jeong (2022) focus on customer satisfaction and loyalty in digital luxury hotel.

Another future direction of research is designing the new systems based on the using of original digital technology or building a new technological industry chain integrate several digital technologies facing the new demand in the new normal of COVID-19. COVID-19 brought many new challenges on businesses restrictions, such as intelligent and efficient contactless services, higher standards for cleaning and disinfection. Targeted designing or improving related algorithm and system function for these problems can bring many theoretical guidance for the hospitality industry of IT development. Jiang and Wen (2020) proposed that in the context of COVID-19, how hotels can collect and use real-time hotel big data and develop infectious disease predict and analyze AI is a valuable research direction.

4.1.3 Impact of the digital transformation. The third research stream focuses the impact of the digital transformation, including positive or negative impact. In view of digital transformation make disruption on individual, organization and industry, future researches about this stream can be carried out from these three aspects. (Table 4).

For individuals, the digital transformation has impact on consumers, employees and hotel managers. The digitization of hotels and tourism will increase the tourist experience (Lin and Mattila, 2021). Hotels offering contactless services make visitors feel safer in the

Level	Impact	References examples
Individual	Overall value	Cuomo *et al.* (2021)
	Perceived experience	Lin and Mattila, (2021); Pelet *et al.* (2021)
	Satisfaction and loyalty	Chang *et al.* (2022)
	Escape from relationship, health	Egger *et al.* (2020)
	Addiction and isolation	Merkx and Nawijn (2021)
	Employee performance	Vo-Thanh *et al.* (2022)
Organization	Saving time, supporting the decision-making process and yielding more revenues	Alrawadieh *et al.* (2021)
	Reputation	Japutra and Situmorang (2021); Kim *et al.* (2021)
	Organization changes and management	Kuo *et al.* (2017), Li *et al.* (2019); Chadee *et al.* (2021)
	Financial, competitiveness, innovation, service quality, resource, resilience	Iranmanesh *et al.* (2022)
	Cost-benefit	Vo-Thanh *et al.* (2022)
Industry	Rebounding through the COVID-19	Zhu and Zhang (2021)
	Future trend	Xiang (2018)
	Information sharing	Buhalis and Leung (2018)

Table 4. Impact of the digital transformation

COVID-19 pandemic (Pillai *et al.*, 2021). Of course, it also has some negative impact. For example, the use of robotics may cause negative emotion including rejection among employees, or even voluntary or forced turnovers (Vatan and Dogan, 2021). The overload of IT has had its negative health effects (Egger *et al.*, 2020; Merkx and Nawijn, 2021). Besides, customers will face data security and privacy issues in the use of IT (Morosan and DeFranco, 2015). The individual impact of the digital transformation focuses on the individual experiences and attitudes of consumers and employees. Future studies can be measured in terms of perceived experience, satisfaction, change in behavior, continuing to dig down for the multifaceted impact.

For organizations, digital transformation helps companies recover from the COVID-19, which lead to larger number of visitors, higher turnover and better reputation (Alrawadieh *et al.*, 2021; Japutra and Situmorang, 2021). But the change of the enterprise strategy brings the problem of personnel restructuring because of employee turnovers (Li *et al.*, 2019). Work from home relying on IT helps enterprises to face the lockdown and contact-reduction requirements in the new normal of the COVID-19, but it also brings new problems to the employee management of hospitality organizations (Chadee *et al.*, 2021). The widespread use of IT like AI will change the number and skill commands of employees, which gives managers at risk of organizational changes and management (Kuo *et al.*, 2017). Future studies can collect data from more perspectives to examine the impact of digital transformation with qualitative or quantitative approach at the organizational level. In addition, from the perspective of the sustainability of future hotels and tourism enterprises, the research on the digital transformation and sustainable development of hotels should be carried out in the context of green IT.

For industries, the application of digital technology is reflected in the smart hotels, smart tourism and the digital practice in the pan-service industry (Chen *et al.*, 2021a, 2021b). At the same time, the upstream and downstream industries (customers and suppliers) will also be affected by the changes in hotels and travel. Big data, cloud computing and the internet can break through the information gap among the industries and reach the information sharing (Buhalis and Leung, 2018). With the popularization of digital transformation, future research should pay more attention to its impact on the industry, and study the important role of digital transformation in combination with other industries and society. As the era of Industry 5.0 is coming, the study of hospitality and tourism partly represents the digitalization of services, and the fields of discussion can be broader.

In turn, the impact of digital transformation will influence the management, behavior, policy, technology and other factors that support and hinder the digital transformation of hospitality and tourism. For example, highly using digital technology in tourism service has a passive influence on the health of consumers (Egger *et al.*, 2020), and technical overload can inhibit the experience of hotel guests (Merkx and Nawijn, 2021). Considering the negative impact, the design of the hotel information system can be improved (Stankov *et al.*, 2019). Cuomo *et al.* (2021) highlight a new approach to travel experience codesign because the big social data approach affects the value of visitors and decision-makers. Thus, future researches should put the impact mechanism in consideration to build a more comprehensive research framework. (Figure 3).

4.2 Research contexts

Nowadays, many concepts of novel digital scenarios have emerged. Research under these contexts is more innovative and contemporary significance. We can discuss the digital transformation under various research contexts including sharing economy, Metaverse, Industry 5.0 and green IT (Gursoy *et al.*, 2022; Akbar and Tracogna, 2018; Pillai *et al.*, 2021; Jenkin *et al.*, 2011). In aforementioned contexts, digital transformation turn to more diverse

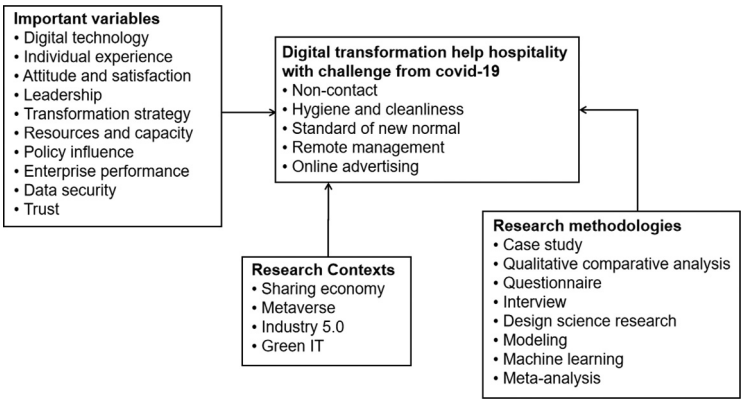

Figure 3. Research opportunities available for discussion

direction, not only disrupt the traditional hospitality and tourism services, but for the past digital technology also put forward new requirements. They influence and promote the development of digital transformation.

First, the sharing economy. For the accommodation industry, the prevalence of sharing economy leads to the rise of B&B. Customers can book rooms through P2P sharing platforms such as Airbnb (Akbar and Tracogna, 2018). Different from traditional hotels, the landlord is responsible for the hygiene of rooms. There is a lack of unified standards, and no traceability of the things in room. It is a big problem for the prevention and control of COVID-19. When carrying out the research, we can pay attention to the platform and the landlord responds to the impact and challenges under the COVID-19. Specially, blockchain will disrupt this type of accommodation and solve the trust problem lead by the sharing economy (Filimonau and Naumova, 2020). Future research should pay attention to it.

Second, the Metaverse. The Metaverse is a virtual world that maps and interacts with the real world, supported by AR, VR, 3D and other technological, and has a digital living space with a new social system (Gursoy *et al.*, 2022). The use of metaverse in the hospitality and tourism is related to virtual tourism, which provides an immersive experience without going to an actual tourist destination, and even after the pandemic ended with this tourism recovery during COVID-19 (Lu *et al.*, 2022). At present, the development of the Metaverse is still in its initial stage, but it is the future direction of the internet development and has high research value.

Third, Industry 5.0. In the Industry 4.0 era, digital transformation is inevitable for manufacturing industry, which drives the sustainable development of the supply chain (Bag *et al.*, 2018). On the basis of Industry 4.0, Industry 5.0 focuses more toward enhancing the humanized creativity of products and services than standard robotics (Nahavandi, 2019). Industry 5.0 heightens the position of digital transformation in the service industry, which will become an important context for the strategic development of hospitality and tourism (Skobelev and Borovik, 2017; Pillai *et al.*, 2021). In this context, researchers should study humanization and individuation as an important element in digital transformation of hospitality and tourism.

Finally, the green IT. Green IT pursues less waste, is more environmental protection, energy saving and achieves sustainable development in IT construction (Mishra *et al.*, 2014). While using digital technology in the hotel industry, it also strives to achieve the goal of economy and environment friendly (Gavrilović and Maksimović, 2018). Mejia (2019) found

that hotels are able to use green IT more successfully with green promotion technology and formal green leadership. The researches in this context can be carried out in combination with resources, environment and sustainability.

4.3 Methodological approaches

As the digital transformation of hotels and tourism is still in a start-state, qualitative methods were mainly used to study the concept, current status, required capabilities, obstacles and other aspects of the digital transformation in the previous research. Combining the research framework of digital transformation (Vial, 2019) and based on the review of the methods of previous studies (Table 5), we summarized the research methods applicable to the future research and respective research issues.

As shown in the table, the research methods of digital transformation in hospitality and tourism can be divided into theoretical and empirical. To sum up the published articles, it can be seen that the theoretical articles account for a larger proportion, which shows that the digital transformation is still in a stage of defining and understanding exploration. In the empirical research, there are many qualitative studies based on case and interview methods, which may because that the process and focus of digital transformation in hospitality and tourism is unclear. And a large number of scholars use questionnaires to study the key factors and paths of digital transformation, trying to improve the digital transformation of hospitality and tourism through quantitative methods.

In theoretical research, the methods of meta-analysis and systematic review provides a macroscopic and comprehensive understanding for the concept and experience areas related to digital transformation, such as smart tourism, smart hotel and DT competence (Gretzel *et al.*, 2015; Busulwa *et al.*, 2022). Such studies using these research methods should be continuously updated with the development of researches in this field, especially considering the impact of COVID-19.

In empirical research, most of the existing articles use qualitative methods, especially case studies and studies collecting data by interview methods. Case studies for one or more companies will allow researchers to get a preliminary understanding of the digital transformation of hotels and tourism. For example, the size and resources of the company have a decisive role in the digital transformation, the researchers conduct case studies on small- and medium-sized enterprises to explore its digital transformation and digital marketing (Alford and Jones, 2020; Zhu and Zhang, 2021). The interview method is often

Table 5.
Distribution of the applied method

Paper type	Method	Frequency	%
Theoretical papers	Viewpoint	9	12.2
	Literature review	12	16.2
	Concept development	8	10.8
Empirical papers	Case	6	8.1
	Interviews	13	17.6
	Documentary/internet data analysis	1	1.35
	Field investigation	1	1.35
	Expert panel	2	2.7
	Questionnaire	16	21.6
	Data science	2	2.7
	Modeling	2	2.7
	Design science research	2	2.7
	Overall total	74	100

used to collect the latest semistructured data from stakeholders. Leung (2019) conducted in-depth interviews on nine hotel stakeholders in Taiwan to research the definitions, expectations and known barriers of smart hotel.

Qualitative research methods can still help to realize many research in the future. Using a qualitative research method provides an overall understanding of the usage of digital technology in hospitality under COVID-19 (Chen *et al.*, 2021a, 2021b), especially the challenges and new opportunities brought by COVID-19 differing from previous disaster crises, such as noncontact and remote management, isolation of hotels and so on. Future research can transition from case to qualitative comparative analysis (QCA) and other broader research. Using QCA is possible to study how visitors can choose hotels with different degrees of digitalization after the COVID-19 outbreak. In addition to the case and interviews, the researchers can also use focus groups, photo-elicitation, ethnography and netnography to investigate the consumer experience.

In addition to the qualitative research methods, future research can also be used to measure and study the key factors in the digital transformation of hotels and tourism industries by using quantitative methods. The questionnaire was used to collect quantitative data on the tourism experience and satisfaction of smart hotel, to research the individual attitude to technical acceptance (Chen *et al.*, 2021a, 2021b). Then test the influence path of key variables involved in the digital transformation of hospitality and tourism. Researches on hospitality management from dimensions such as employees, entrepreneurs and finance can study the acceptance and effect of digital transformation (Hailey Shin *et al.*, 2021; Shin and Jeong, 2022).

Using the method of design science research, researchers can set experimental scenarios to evaluate the digital design through the experience of hotel employees and customers during the adoption of new technology. For example, Torres and Zhang (2021) designed experiments to study the impact of wearable devices on employee health plans and job satisfaction. Researchers can elicit different tourism and hotel accommodation scenarios, allowing tourists to experience the digital services of hotels and tourism, and measure the subjective feelings of tourists accordingly. For hotels and tourism enterprises with different digital capabilities, we can collect different interactive feelings of tourists by designing interactive scenes, and judge their attitudes toward the digital transformation of hotels.

Another commonly used quantitative research method is to build and use various models. The utility of digital technology can be measured to some extent by the change of the hotel's economic performance. For example, building mathematical model to seek the optimal configuration area of robots, sensors and other IT, or the optimal use of management and technology decisions (Altuntas and Gok, 2021). And the econometrics model can be used to evaluate the influence of digital transformation on businesses, studying the enterprise status like brand value, income, digital maturity and so on.

Machine learning models can also be used in the future research for predictions, feature mining, sentiment analysis and so on. Zhang *et al.* (2022) use natural language processing to mine consumers' emotions. In terms of practical application, the researchers design and improve the AI algorithm according to the actual situation of the hotel industry under COVID-19 (Cuomo *et al.*, 2021), which can narrow the gap of relevant technologies and play a great practical value for future digital transformation.

5. Conclusions and implications

5.1 Conclusions

The proposed research framework for hotel management is to promote relevant research and knowledge development on digital transformation in the hospitality and tourism

industry. As people reduce travel and avoid contacting, it has greatly threatened the survival of hospitality and tourism. The requirement of hygiene, cleanliness and noncontact hospitality services promotes the digital transformation proceeding. Through a systematic review of relevant literatures, this paper presents a theoretical research framework for the hospitality and tourism on digital transformation to meeting the opportunities and challenges brought by COVID-19.

This research reviews the literatures about impact of the pandemic on hotels and travel, nine major digital technologies and digital transformation. Especially, we made a qualitative review of research in hotels and tourism about the digital transformation and identifies future opportunities for digital transformation research in hotels and tourism during the new normal of COVID-19. Our study analyzes researches about digital service of hospitality and tourism from different domain perspectives, describes the current research status and proposes a future research agenda. We summarize the literature on the digital transformation of hospitality and tourism, presenting three research streams, as well as research backgrounds and approaches worth considering.

5.2 Theoretical implications

This study makes some theoretical contributions. First, it makes a comprehensive review on current researches of digital transformation in hospitality and tourism. We draw a knowledge map of this field and find the opportunities for further research. Second, this study performed a qualitative analysis of the reviewed literature, identifying three study streams from different categories of study topics, respectively, are conceptual digital transformation, the support and obstacles of digital transformation, as well as the impact of digital transformation. Meanwhile, we discussed the research methodology. Finally, this study expands the prospective agenda to discuss the digitization in hospitality and tourism. More future research can be carried out based on the research framework proposed in this paper, considering the important digital background, and the research methods in social science and IT can assist the future research. This article presents some insights and has implications for future research.

5.3 Practical implications

The COVID-19 pandemic led to a lot of huge challenges different from former disasters to the survival and growth of the hotels and travel industry, and digital transformation will be the future of the hospitality industry. This study has practical and useful significance in terms of hotel management. To seize the opportunities better and meet the challenges in the new normal of COVID-19, the hospitality and tourism should consider a reasonable layout and carry out the digital transformation.

First, digital transformation is an important strategy under the opportunities and challenges of COVID-19, which need relevant management personnel to implement from many aspects. Hotels need to integrate AI and IT such as robotics, cloud computing and blockchain, as well as information and communication technologies, for instance, the IOT and mobile terminal technology, to achieve greater contactless completion of management and room service, reduce the risk of the pandemic caused by the high exposure to the traditional hotel industry. To adapt to and optimize the digital transformation, hotel managers should have a series of digital management capabilities, and employees should also better change and play their new role in the digitally transforming enterprise.

Next, the hospitality industry needs to pay attention to personalization and pace with the times in the process of using digital technology. The hospitality need to use more digital means and decisions that have a high positive impact on the perception and behavior of

customers and employees, and pay attention to the impact of the policy. Consumer experience is very important to hospitality and tourism. During digital transformation, in the process of using digital technology to interact with consumers and providing services, enterprises should always pay attention to consumer feedback and adjust the digital transformation strategy.

Third, there are still many obstacles to digital transformation of the hotel industry, such as the pressure from capital and technology, the formed organizational structure and so on. The solution of these problems directly affects the process of digitization. The focus is on acceptance of employees and the financial income of the enterprise. Leaders need to think about what management style and leadership style can reduce employees' negative willingness in making digital transformation. And considering subsequent personnel management and organizational restructuring. In addition, digital transformation requires a large amount of funds and mature technologies. So companies should evaluate the resources they own, and reasonably calculate the benefit-cost ratio, to make better strategies in the digital transformation.

Fourth, this paper provides specific research directions and methods for researchers in relevant fields. Hotel owners should not only pay attention to the latest situation and relevant policies of COVID-19, but also to industry research in this field, from which can obtain in-depth ideas of developing digital transformation. According to the conclusions provided in this paper, facing the challenge of COVID-19, hospitality and tourism must carry out digital transformation in line with their own technology, organization, customers and other resources themselves.

5.4 Limitations and future research

The current article still has some limitations. First, by using specific keyword and retrieving the titles and abstract to search articles, few items may be omitted in the screening process during review. Second, the scope of the review can be expanded from journal papers to other types of articles. For example, the conference papers, editorial and research notes can be included in future review. Third, this paper provides three research streams for the research of digital transformation in hospitality and tourism, but it is not comprehensive. Future research can develop more relevant themes and conduct diverse research.

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