Chapter 13
Technology Application in the Chinese Tourism Industry

Mohammad Musa, Preethu Rahman, Zhi-rong Kang, and Syed Far Abid Hossain

Abstract Technology has brought exciting changes to our lives by altering our decision-making, communicating, learning, entertainment, etc. Tourism is a dynamic practice that needs tools for decision-making and competition in economic, social, and environmental sustainability demands. In the current era of high technology and development, big data, artificial intelligence, virtual reality, augmented reality, "3S" technology, and smart tourism are widely applied in all aspects of social life. It plays a good role in the promotion and growth of the tourism industry. This chapter intends to determine the significant technological changes, influences, and customers' relationship with the industry in recent years. We defined and proposed philosophical, methodological, technical, and realistic uses of technology for the Chinese tourism industry to support advanced technical services to satisfy customers' needs. Future technologies suitable for Chinese tourism are systematic planning and layout of scenic spots, investigation and evaluation of tourism resources, destination planning, tourism information management and application, tourism environment monitoring, etc. The future technology gradually becomes familiar for travelers to China since it promotes its tourism industry 3.0. and industry 4.0 worldwide. The Internet and the Internet of Things (IoT) include inserting

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A. Hassan (ed.), *Technology Application in Tourism in Asia*,
https://doi.org/10.1007/978-981-16-5461-9_13

sensors with vehicles, suitcases, buildings, etc., to make substantial improvements to the travel industry. Technical innovations and institutional changes are the reason for the evolution of the Chinese tourism industry.

Keywords Technology · Smart tourism · "3S" technology · Industry 4.0 · Customer experience · Augmented reality (AR) · Virtual reality (VR)

Introduction

From the printing press to the internet, innovation and technological development have become essential drivers for notable changes in people's lives. Each of the incredible developments has let us investigate unseen ways. Technology and innovation could be a vital portion of the business's tourism industry and improve customer experience. Tourists around the world may find the best hotels for themselves, reserve a room, search the most accessible routes to reach a tourist destination, learn about the other visitors' comments, have lingual support or interactive experience in a museum, and may get a personalized excursion, so on so forth. This list is endless and what makes it possible is the technology and innovation. It is critical for stakeholders to keep up with the most recent innovation patterns inside the industry, particularly within the imperative time of epidemic like COVID-19. From the holiday destination we chose to return from our journey, innovation and travel play an essential role. According to a Google Travel survey, 74% of vacationers plan their trips online, up from 13% previously (Vidal, 2019).

The industrial organization has a significant impact on the rate of productivity and innovation of the industry. Technological innovations and institutional changes in the organization are the main driving force to promote evolution and development. Institutional changes help enterprises operate in a more relaxed environment and implement resources in a larger space. They also help the evolution and development of organizational capacity in the tourism industry. Technology, including information technology and management techniques, enhance efficient operating at a greater enterprise-scale and a larger geographical scale. Under the synergetic effect of technical and institutional factors, industrial organization evaluates continually, and the direction and extent of this evolution decide the competitiveness of the industry. The synergetic effect of technical and institutional factors promotes the evolution of the different types of organizations, thus impelling the travel industry's expansion.

The tourism industry in China has grown rapidly and gradually becomes a crucial national economic system. China took three decades to complete the historic leap from a great tourism resources country to a great tourism industry country. According to the United Nations World Tourism Organization (2019), China now accounts for more than a quarter of the money spent by outbound visitors, paying twice as much as the next-largest spender, the United States. In China, only 5% population has a passport, while others are using the travel pass. As a result, the

Chinese government issues about ten million new travel documents per year. China's tourism industry has made substantial progress since reforming and opening. Technologies improve the consumer experience, increase the amount of data collected by connected devices, and broaden analytics' reach and creates the opportunity of delivering genuinely personalized customer experiences and potentially create new products and services. The application of technology and networking in China's tourism has developed significantly since 1997. Especially during SARs in 2003, network technology showed its incomparable advantages as it is rapid and convenient and without any personnel contact. According to related experts, booking flights, hotels, and scenic spots are the applications of network technology in China's tourism industry. This technological development is combined with the application of network technology in epidemics like SARS in the hope of further development of China's tourism (Xiang-yu & Jie, 2005) (Fig. 13.1).

Today's technology is inclusive and smart. Smart technologies like mobile devices, digital platforms, big data, open data, the internet of things (IoT), three-dimensional printing, socially interactive robots, artificial intelligence, virtual reality, augmented reality, Blockchain, NFC, QR codes are transforming the tourism industry and creating new opportunities, new challenges. This chapter is about the technology used in tourism, provides a valuable contribution for people interested in tourism, as a professional, researcher, student, and decision-maker. It includes two sections that emphasize: the present and future scenario of technological applications in Chinese tourism, and the importance of technologies to enhance the customer experience.

We aim to show how smart technologies can influence the consumer relationship in the tourism industry and presents tools and techniques applicable to the sectors

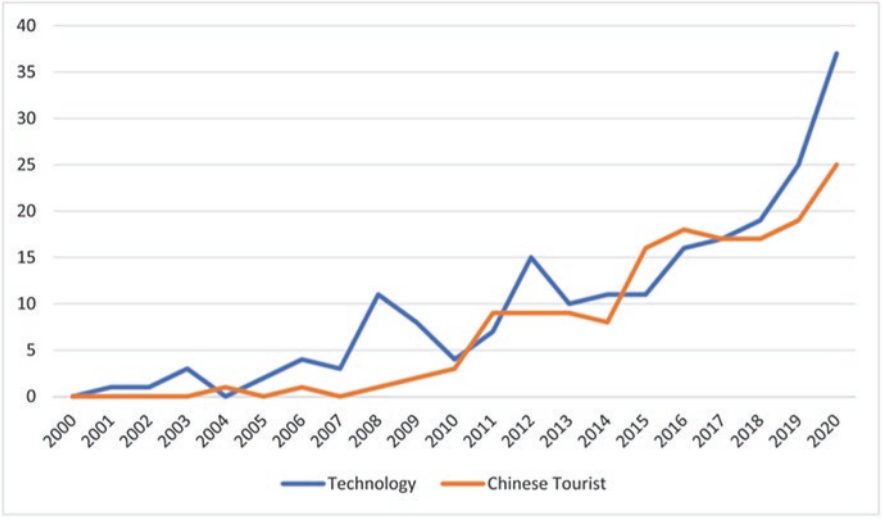

Fig. 13.1 "Technology"and "Chinese tourist" research (2000–2020). (Source: Wu et al., 2020)

under analysis. The chapter's objective is to bring together similar academicians who are committed to seeking scientific and rational solutions to challenges and provide a forum for them to share their views, put forward ideas or models, and contribute to the field with their inspiring insights.

The Present Scenario of Technological Applications in Chinese Tourism

"3S" Technology for China's Tourism

Knowledge is becoming increasingly relevant in tourism as the economy grows. It is entirely essential to use modern technologies to deal with complex tourism planning and management. Remote sensing (RS), geographic information system (GIS), and global positioning system (GPS) have all been used in China's tourism industry in recent years (Ting & Qiao, 2011). The traditional techniques and procedures are incapable of adapting to the condition of the tourism industry's accelerated growth. The core technologies can collect, process, and apply information, and the outstanding characteristics are high-speed and real-time information collection and processing, high precision, and quantifiable information application. The technology has been widely used in resources, environment, population, and disasters (Li Yulin & Lingling, 2020). For the comprehensive improvement of the level of tourism management and services, the systematic planning and layout of scenic spots, the careful design of tourist routes, and the optimal allocation of time and space need a rich geographic information system (Li Yulin & Lingling, 2020).

The progress of remote sensing (RS), geographic information system (GIS), and global position system (GPS) started in China in the early 1980s. The Chinese central government formulated a proposal for remote sensing technologies in China at the end of the 1960s. Since then, remote sensing sensor research and development have been included in National Five-Year Plans. The new remote sensing tools have been used to explore resources and observe the environment (Chen et al., 2000). RS and tourism have a similar feature in that they cross disciplines and application areas and have piqued the attention of geographers, economists, industry, environmental planners, anthropologists, and archaeologists. As a result, the opportunity for RS applications in tourism is substantial.

According to many case studies on China's tourism, it can be identified that the current applications of RS in China include the following aspects: first, to determine the physical environment and the location of the tourism destination, especially the remote destinations of Chinese southwest and northwest; second, to investigate tourism resources quantity and quality, which several Chinese provinces have adopted; third, to draw all kinds of integrated tourist maps for the tourism planning, including the map of tourist resource, the distribution map of tourist place, landscape pictures, literal introduction, advertisement, etc.; fourth, to employ the technology of virtual reality and remote sensing data to make dynamic tourist planning,

which can facilitate the product promotion and marketing to the potential tourists; fifth, to use it as the substantial data source of GIS to make tourist planning geographic information system to service for the tourist decision and the host environment.

GIS applications in tourism and recreational planning demonstrate that GIS is a powerful and valuable technology Ting and Qiao (2011), which can help with tourism preparation and decision-making. In many Chinese case studies using GIS technologies for tourism, GIS architecture and network research were carried out. The number of prospects for GIS implementations in tourism planning is as follows (Farsari & Prastacos, 2004): first, visitor flow control includes using GIS to define the significant visitor activity spaces within a destination and the flows between destinations. Authorities can enforce strategic infrastructure plans (e.g. building public transportation systems linking various tourist activity spaces). Second, the stock of equipment and material utilization: This includes the use of GIS concerning the question of environmental justice (namely, the fact that tourism may not benefit all segments of society equally). It also includes compiling a resource inventory to recognize overlapping, and compatible land uses and practices, accessible facilities, and natural resources. Third, assessing the effects of tourism development: Geographic information systems (GIS) can be used to illustrate the effects of tourism on different industrial sectors in a time-series and spatial format (Chen, 2006).

GPS used in China's tourism is relatively less than GIS, mainly employed by adventurous activities (Ting & Qiao, 2011). Some Chinese planers try to use it to track the tourist location in the large desert and forest areas; besides, GPS technology is also used for ecotourism visitors to investigate the migration of birds. The use of GPS in tourism management could improve the modernization and safety of tourism enterprises and the development of new tour fashion. GPS devices have the advantage of obtaining accurate data over land-based tracking methods. This is used to investigate micro-level data, such as studies that document the number and density of visitors visiting historic towns, attractions, theme parks, and so on so forth, all of which necessitate high-resolution data (Shoval & Isaacson, 2007). Employing GPS and GIS for data collection and management is now a new method for investigating, evaluating, and managing tourism resources (Ting & Qiao, 2011). Some Chinese tourism companies offer boat trips along rivers, lakes and bays and uses GPS to support it. The actual track of each trip could be recorded and are available for users to view. It is possible to display the paths taken, and the speed reached. The route data could be made available as an image displayed on the internet or mapping software (Ting & Qiao, 2011).

The increasingly mature "3S" technology can be used as a new technical means of the tourism industry to make up for the traditional research methods' flaws, and "3S" technology is a modern comprehensive surveying and mapping technology based on RS, GPS, and GIS, combined with network technology, communication technology, and other technologies (Li Yulin & Lingling, 2020). It is increasingly applied to tourism resource investigation and assessment, destination preparation, tourism knowledge management and implementation, tourism climate monitoring, etc. to provide public tourism, shopping, navigation, and positioning.

Virtual Reality (VR) and Augmented Reality (AR) Technologies in Tourism

The innovation and growth of tourism technology and apps accessible by smart devices offer greater diversity in tourism and tour operations. Augmented reality (AR) and virtual reality (VR) applications focused on smart technology are viewed as new resources for raising awareness and collecting knowledge about visitors, and delivering information to tourists. Cultural, scenic spots cover many ancient buildings, like graffiti, carved arts, and activities, and it is easy to damage these ancient buildings and monuments. In the current phase of tourism resource creation, we will use AR and VR technologies to view all sorts of scenic spots publicly in a three-dimensional manner so that the public can feel as if they are in actual circumstances, in order to encourage the development of the urban tourism sector and preserve the urban ancient buildings and structures. While protecting tourism resources, we can maximize tourism resources' development by using this tremendous innovation of recent times.

AR means overlaying computerized imagery on the user input, resulting in a live video feed of the physical surroundings. AR lets users keep track of their location through GPS-enabled smartphones or devices (Çeltek, 2020a, b; Goswami, 2020; Taylor, 2013). This technology allows for integrating new knowledge into an existing image (Berryman, 2012; Çeltek, 2020a, b; Craig, 2013; Goswami, 2020). The very first purpose of an augmented reality device is to project the physical world into the third dimension in order to make the physical world more realistic for the user and allow them to communicate with it (Azuma et al., 2001; Çeltek, 2020a, b; Goswami, 2020). AR can be applied to various interface technologies such as Heads-Up Displays (HUDs) (Çeltek, 2020a, b). AR as a technique blends a real-time vision with simulated computer-generated images, resulting in real-time augmented reality experiences (Çeltek, 2020a, b). Thus, Hassan and Rahimi (2016) and Çeltek (2020a, b) described AR as an advanced visual technology that blends reality with computer- modelled images in the current medium. A similar description was addressed by (Jung et al., 2015) and (Dadwal & Hassan, 2016) and defined Augmented Reality as a mix of real-world digital imaging computer simulations.

AR allows tourism companies to erratically integrate the computer-based digital future into actual existence, which appeals to tech enthusiasts (Craig, 2013; Çeltek, 2020a, b). Tourists may profit from smartphone AR apps in many ways that include looking for posting or swapping information and helpful tips, as well as leaving notes on a site or destination within a vast network. As a result, the interaction between different users, such as tourists, can be improved, and an exchange of experience among tourists can be created (Çeltek, 2020a, b). Personal computers with webcams, kiosks, digital signage, window screens, mobile phones and laptops, AR supported glasses, and head-mounted displays are examples of AR platforms used in tourism (Craig, 2013; Çeltek, 2020a, b; Jung et al., 2015).

Augmented reality can be assorted in four groups: marker-based, marker-less, projection-based, and superimposition-based (Chung et al., 2015; Çeltek, 2020a, b; Jung et al., 2015; Dadwal & Hassan, 2016) (Fig. 13.2):

- The position and the orientation of the marker are determined and placed on the virtual material in a **marker-based augmented reality** that is identified by Çeltek (2020a, b) where recognition of the markers by image processing methods involves rapid and lower processing power, a camera, and QR code and equivalent points are used.
- In **markerless augmented reality**, technologies like GPS, speed meters, and accelerometers are used as distinct virtual reality in the absolute increased reality. This technique uses virtualization according to the device's location through the extensive use of cell phones and creating the data.
- Virtualization is possible in two or three dimensions in **projection-based augmented reality**. Artificial light can be projected onto a physical plane in a two-dimensional version to determine how the consumer interacts with it, while a three-dimensional immersive hologram can be produced with laser-plasma technology in a three-dimensional version.
- Item detection is used in **superposition-based augmented reality**. In its virtual reality image, the associated object is identified and superimposed.

Virtual reality is defined as the computer-generated platform, created by a three-dimensional and artificially simulated environment, which empowers people to get a similar experience like actual situation, identified by tourists' requirements and needs, travel plans, places people wish to visit, and activities focused on objectives. The virtual environment is made by joining intelligent programming and equipment to help clients feel connected with the original climax (Çeltek, 2020a, b). Digital simulations were created using digital computers in the early years of virtual reality technologies. Today, 360-degree images and videos are found in augmented reality devices and are mounted on them (Wei, 2019).

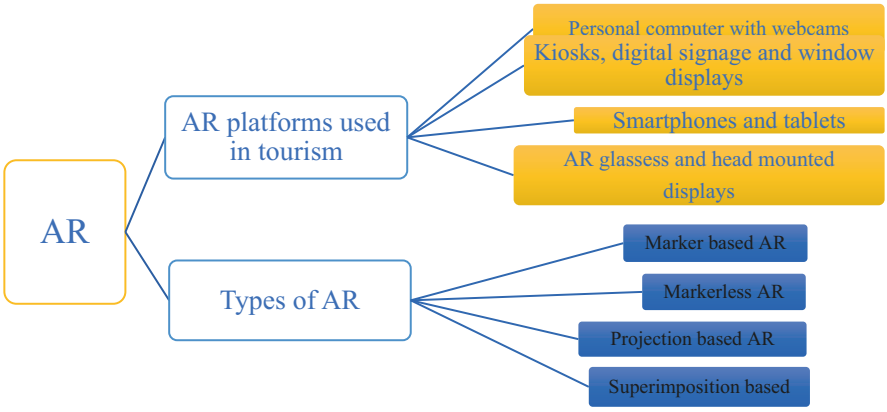

Fig. 13.2 AR platforms and types. (Source: Chung et al., 2015; Craig, 2013; Çeltek, 2020a, b)

A device with enormous computer capacity and an input headset consists of three main components. Virtual reality is used in a simulator (such as, gloves, joysticks, pedals, and motion platforms like, Virtuix Omni). Sensors (magnetometers, accelerometers, gyroscopes), optics, a video screen, etc., are all included in the head package (Ali & Kemal, 2020). VR technology is currently and potentially developing into six major tourism areas: planning, management, communications, history, education, accessibility, and the protection of the heritage (Guttentag, 2010). VR allows visitors in epic tourist activities (such as amusement park rides) to explore blended reality, a blend of simulated and interactive experiences (Wei, 2019).

The new virtual reality technology, which integrates computers, human interaction, and sensor technology, is connected with different technical methods. It forms three-dimensional images and stimulates peoples' senses from different angles, such as vision and hearing, so that the public can experience different natural landscapes and ancient buildings (Xinyun & Yibo, 2020). With the help of virtual devices, the interaction between virtual devices and the public can have improved, and practical application of virtual technology also can create a "real world" with the help of a new interactive way and then solve the problem of overcrowding in the busiest week (Xinyun & Yibo, 2020).

There are three types of virtual reality simulation: non-immersive stimulation, semi-immersive stimulation, and utterly immersive stimulation (Ali & Kemal, 2020).

Several sensory organs are stimulated in non-immersive augmented reality to avoid interfering with the users' environmental reality. A gateway or window allows the user to access this three-dimensional computing world. i.e., when you boot up your favorite game on your PS4 or Switch, that gaming world is a non-immersive virtual reality. However, Desktop-based virtual reality devices are inexpensive and easy to use.

The user is partly embedded into the 3D space world of semi-immersive virtual reality (i.e. a multi-user experience with 3D sound and massive projection screens). For example, partially immersive virtual reality can help pilots experience flying a plane. The user is heavily interested in the virtual world in 4D videos with flight simulations, but is not different from its reality.

Many senses are triggered by the hardware which is attached to the user end and fuses with the virtual area to cover the user's field of view entirely in totally immersive, enlarged realities. Digital reality fully immersive offers practical consumer interfaces (i.e., isolating the user from the real world and often offering a single user experience), such as Oculus Quest, HTC Vive etc. (Ali & Kemal, 2020).

Due to the availability of cost-effective VR viewers such as Google Cardboard and a range of VR-related tourism material, anyone will experience virtual city tours and tourist attractions worldwide. There are no limits to the potential for virtual mass visits to actual tourist destinations (Tussyadiah et al., 2018) (Fig. 13.3).

Several scholars have recently examined the advantages of virtual reality in the travl and tourism sector. From the view of tourists', VR involves increasing the enjoyment of tourism (Bonetti et al., 2019; Çeltek, 2020a, b; Moorhouse et al. 2018), promoting and coping with enjoyable social encounters (Çeltek, 2020a, b). Because of the benefits of VR, businesses and destinations that have adopted it have

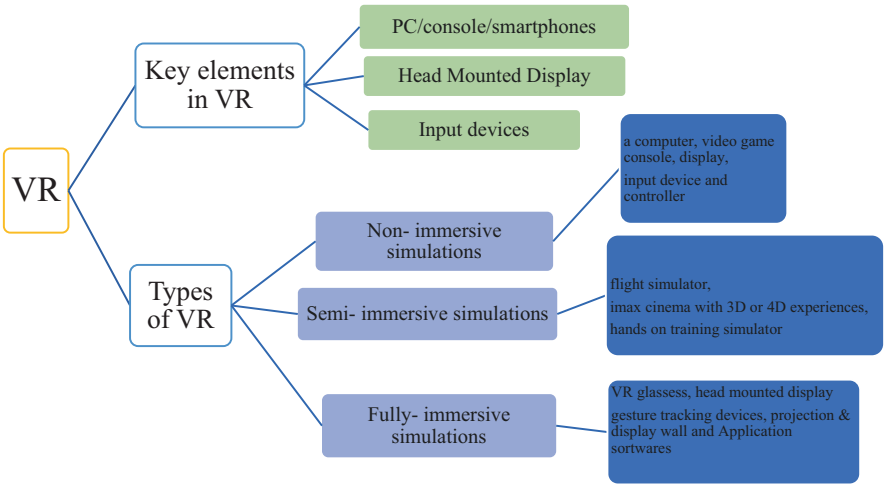

Fig. 13.3 Key elements in virtual reality and the types of virtual reality. (Source: Adapted from Çeltek, 2020a, b)

considered considerations such as promoting, sales, and delivery (Çeltek, 2020a, b; Moorhouse et al., 2018), revenue creation, preservation, and heritage security (Çeltek, 2020a, b). VR research has also shown that it can promote cultural heritage and arts from a tourism standpoint (Çeltek, 2020a, b; Marasco et al., 2018). Table 13.1 outlined below the benefits and drawbacks of AR and VR in tourism.

Smart Technology in the Tourism Industry

Artificial intelligence is most widely used for society's needs and practices as the foundation of advanced and emerging technology. In order to represent the population, tourism companies, government bodies, and other persons or organisations more effectively, Smart tourism incorporates the current physical resource and information tools and creates a new tourism format. It is widely accepted that intelligent tourism entails the use, for example, of the high-tech internet of things, cloud computing, highly efficient data collection, intensive data mining, tourism planning, and growth connectivity networks of the next decade, tourism expertise, development of business, industry management etc. (Wang Jun, 2020).

Technological advancements are one of many reasons that play a vital part in the advancement of tourism. People would not achieve economic growth and a safe and fast journey if technical progress did not occur. Companies in the tourism and hospitality industry could not offer their services to the guests in such quality and quickly without technology. Technology has made a positive contribution to tourism and has been a significant factor in tourism growth. The relationship between tourism and technology has begun to pique scientists' interest, especially after the

Table 13.1 Benefits and drawbacks of AR and VR in tourism

	Benefits	Drawbacks
Augmented reality	Brands that elicit favorable reactions gain recognizability in the minds of consumers, The navigation empowers users to create new types of contact, which, in turn, encourages new ways of communicating Unlike traditional media, there is no geographic or temporal constraint on our use of space and time. It offers consumers a way to present their material to others. In comparison to other newspapers, it is significantly less expensive. It serves the needs of tourists who need travel-related knowledge about the community. It enables the seamless availability of different resources, up-to-to-date information, which is very useful and at the right time and just right. It has much versatility concerning distributing messages, photographs, or content. Offers interactive explanations which integrate map-based data and add-on details. Increases market recognition. Market reputation. Geo-targeting. Interactive marketing. Personalization, viral marketing, socialization, emotional connection, repeat engagement. Provides filtered content specific to the traveller's desires and helps to provide a more personalized experience.	AR is a highly sophisticated and complex service. AR does not have any fixed standards. Tall buildings can affect the efficiency of existing GPS systems in smartphones (it may happen even indoors). It includes privacy-related problems. Ethical issues and user issues. It is dependent on the user's permission or involvement. People are not conscious of it and do not appreciate it.
Virtual reality	Practical advertising. Encourages tourists to visit actual museums and serves as an indirect publicity tool for attractions. Allows visitors to see previews of destinations, as well as their respective sights and services. Sustainability and heritage protection. VR systems can be used for direct marketing as well. Try and buy. Customer engagement. Increasing brand awareness. Brand reputation. Gamification. Full immersion.	It is dependent on the user's permission or involvement. Its health implications are also unknown. People have a poor understanding of how to take care of it.

Source: Bonetti et al. (2019), Çeltek (2020a, b), He et al. (2018), Moorhouse et al. (2018), and Tussyadiah et al. (2018)

1980s. Information and communication technologies (ICT) have played a critical role in the economic growth and transition of tourism since the 1980s (Ince & Samatova, 2020; Porter, 2001). Many tourism scientists investigated the relationship between tourism and technology from different angles. Buhalis and Law (2008)

and Navío-Marco et al. (2018) in their study titled "Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of tourism research" and "Progress in information technology and tourism management: 30 years on and 20 years after the Internet-Revisiting Buhalis & Law's landmark study about e-Tourism", respectively has attempted to analyze the impact of recent advances in information technology on tourism. Again Buhalis (1998), in his study titled "Strategic Use of Information in the Tourism Industry," examined methods for using innovations in the tourism industry. Buhalis and O'Connor (2005), in their study titled "Information Communication Technology Revolutionizing Tourism," researched information and communication technology in tourism.

Even though tourism is a labor-intensive industry, technical advancements are important historical landmarks in tourism. Technology plays a vital role in the tourism growth process. Since technology influences the form, type, and standard of services offered in lodging, transport, food and beverage firms, and entertainment and leisure industries, it also directly impacts the quality of tourism destinations (Ince & Samatova, 2020). The global impacts of new technologies have substantially impacted tourism enterprises' innovation practices to deliver higher quality and high-performance offerings to their visitors. Tourism businesses benefit from various applications in different countries worldwide, including smartphone phones, remote check-in and check-out transactions, smart devices, cloud technology, virtual reality applications, and augmented reality applications. The advancement of information and communication technology continues.

Smart tourism is a system that focuses on improving the quality of life of visitors and takes advantage of information technology that is commonly used for this purpose. G. Philips first discussed intelligent tourism in 2000 as a long-term, profitable, and complex solution to developing, diversifying, and commercializing tourism businesses and goods (Ince & Samatova, 2020). The World Tourism Organization (WTO) established it in 2015 by combining it with the principles of information and communication technology (ICT) and smart destinations (Yalçınkaya et al., 2018). Smart tourism is an expression of a shift from a product-oriented to a service-oriented mindset (Ince & Samatova, 2020; Gretzel et al., 2015) and developed as a system.

According to Ince and Samatova (2020), smart tourism consists of tourists, services (enterprise), AI, destinations, public enterprises, internet and connectivity, and cloud technology (Fig. 13.4, Table 13.2).

In the field of smart tourism application of artificial intelligence technology has been widespread, especially the identification of patterned image content, including fingerprint recognition, text recognition, iris recognition, face recognition, plate identification, etc. (Yalçınkaya et al., 2018). The video analysis technology can identify the video stream with continuous state characteristics, analyze and judge the clustering behavior characteristics, and promote scenic spots' safety management to a new height. Based on the aforementioned artificial intelligence technology's integrated application, the scenic area's security management's delicate operation can be realized.

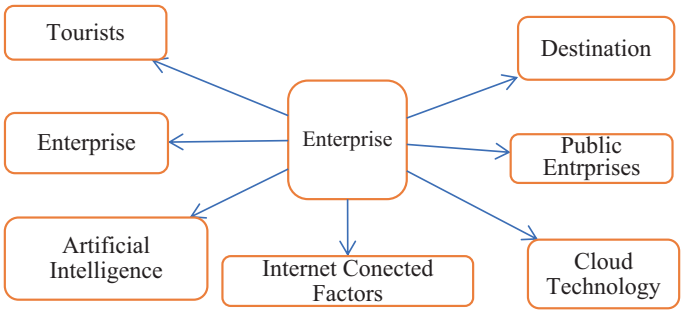

Fig. 13.4 Smart tourism scheme. (Source: Ince & Samatova, 2020)

Table 13.2 Tourism applications in smart tourism

Tourism applications in Smart tourism destinations	Subsidiary functions	Destination compounds	Smart tourism destination dimensions
Allows tourists to witness digital recreations of touristic areas as well as time travel.	Interpretation	Attraction	Smart people, smart mobility
The vehicle tracking system offers a real-time transportation network and information and delivery to end-user computers.	Planning	Accessibility	Smart life, smart mobility
To allow them, the hotel should create an energy demand dependent on environmental sustainability and conduct energy audits.	Sustainability	Facilities	Smart environment
A multilingual application provides various services, such as an electronic travel guide and various visitor packages.	Guidance	Accessible packages	Smart people, smart mobility
NFC tags and QR codes are used to access information about nearby points of interest via mobile devices.	Estimate (close) marketing	Activities	Smart mobility
A Complaint Management System is provided by different ICT networks, such as SMS or smartphone apps, which guide complaints from visitors to the appropriate officers.	Feedback	Subsidiary equipment	Smart life

Source: Buhalis and Amaranggana (2013)

Artificial intelligence technology aims to simulate certain intelligent human behavior, using computer software and hardware, including theoretical research and technological practices, the acquisition and expression of know-how, information retrieval, logical reasoning, comprehension of natural languages, smart robot, etc. Encouraging and using artificial intelligence technologies in intelligent tourism has given us a new chance to improve conventional tourism.

Big Data, Artificial Intelligence, and Their Implications in the Tourism Industry

In the tourism industry, the application and promotion of artificial intelligence technology have laid a scientific and technological foundation for smart tourism development (Çeltek & Ibrahim, 2020). It has been widely used in tourism services, scenic spot management, market forecasting, and other aspects and has played a role in promoting the tourism industry's development.

In order to connect with visitors and meet their needs with personalized offerings, tourism firms use artificial intelligence and big data. Via big data, tourism professionals can find out more about their customers. The greater their expertise, the more they will serve their customers. AI has been a major part of operations because it adds real benefit and will continue in this trend (Çeltek & Ibrahim, 2020). Tourism firms, as in many other sectors, use AI tools to decrease costs and fix bills. For multiple purposes enterprises use artificial intelligence, including involvement with prospective customers, the analysis of increasing data volumes, the attraction of the target audiencia, the rapid gathering of knowledge, summary information, decision-making and customer contacts (Çeltek & Ibrahim, 2020).

Travel requires repeated analyzes of documents by different categories of people. Complex boarding and liquidation processes (particularly for cruise ships) are in place, which will help reduce the need for this paper process. Tourists can use airports, immigration, customs, and board aircraft with facial recognition without inspecting their travel papers. With a quick face check, customers can use blockchain integration and face recognition technologies to pay in restaurants and duty-free stores. Technology from Blockchain permits the use of reliable documents to complete transactions (Saulat, 2018). Through artificial intelligence, tourism companies may save money, eradicate human error and provide better service. In the touristic industry, data mining is further use of AI. Filtering a large volume of information rapidly can lead to concrete conclusions regarding consumers or opportunities. The hotel collected information on its guests using artificial intelligence and evaluated this information for overall results through samples and online reviews (Revfine.com, 2021).

The term "big data" refers to a vast collection of data sets that cannot be analyzed or processed using conventional data analysis techniques (Xu et al., 2020). It is referred to as 5V: Volume, Velocity, Variety, Verification, and Value (Atalay & Celik, 2017; Çeltek & Ibrahim, 2020). Big data technology can help tourism businesses gain helpful knowledge such as a deeper understanding of tourists' behavior, recognizing changing tastes and needs, and tracking tourists' geographical position. For example, based on their tastes, online behavior, and geographical location, it is possible to recommend hotels, restaurants, and activities to visitors (Elisabeth et al., 2013). Some big data applications also help you to monitor the efficacy of tourism policies and regulations. It retrieves data from any source and analyzes it to find answers that can save money and time, create new projects and plans, and make wise decisions (Çeltek & Ibrahim, 2020). Marriott International is the best example

of a hotel chain leveraging big data to estimate its rooms' optimum price. The approach is based on the development of relevant algorithms for quicker and more precise data processing. It allows sales accounting to be available through the internet and expanded through all activities of a hotel chain, including restaurants, catering, and conference facilities.

MGM Resorts International is a travel organization that has used extensive data analysis to further its personalization approach. The corporation effectively used Facebook's big data software, resulting in a 300% growth in sales over 3 years. Airlines can predict market demand by analyzing macroeconomic and weather records (Davenport, 2013). Hilton, a global travel corporation based in the United States, employs new data architecture to derive knowledge from data to serve consumers best. Hilton relies on data mining to gain a 360-degree view of each client, including booking data, customer profile data, and even information on how guests use the hotel's services. Gaining these experiences enables Hilton to properly understand and value its clients, resulting in more repeat trips and happy visitors (Brar, 2019).

Many of the advantages of AI and machine learning occur behind the scenes, which is why we concentrated on B2B organizations that use AI-based applications or platforms to assist travel and tourism firms with conversions and engagement on the backend. Hotels will micro-target their consumers, thanks to artificial intelligence and big data. Since each customer is exceptional, it is critical to building customized deals for each one. Some guests are more inspired by rewards with a unique experience, such as local cuisine or microbrew tastings or an upgrade to VIP status, than by discounts. Marketers can use big data analytics to fit the best deal to the right buyer, and AI can guarantee distribution at the right time and to the right user (Çeltek & Ibrahim, 2020).

The Future of Technological Applications in Chinese Tourism

Industry 4.0 and the Tourism Sector

"Industry 4.0" is a new revolution in the modern era. Industry 4.0 brought significant revolutions in the tourism industry (Bilotta et al., 2020) and motivated tourists to visit various destinations (Lin et al., 2018). Industry 4.0 is a technologically enhanced and technology-oriented method to attract consumers in various arena. The most common or well-known industry 4.0 adoptions are: Big Data, Automation system, Virtual Reality (VR), Augmented Reality (AR), Robotics, and so on so forth (Liao et al., 2017). China, at present, is pretty good at using various applications of industry 4.0 (Zupan Korže, 2019). However, the need to use this in the tourism industry is a new phenomenon. The tourism industry's success may depend highly on this industry 4.0 application and usage (Stankov & Gretzel, 2020). Tourist's experience of industry 4.0 in the tourism industry has been positively discussed in

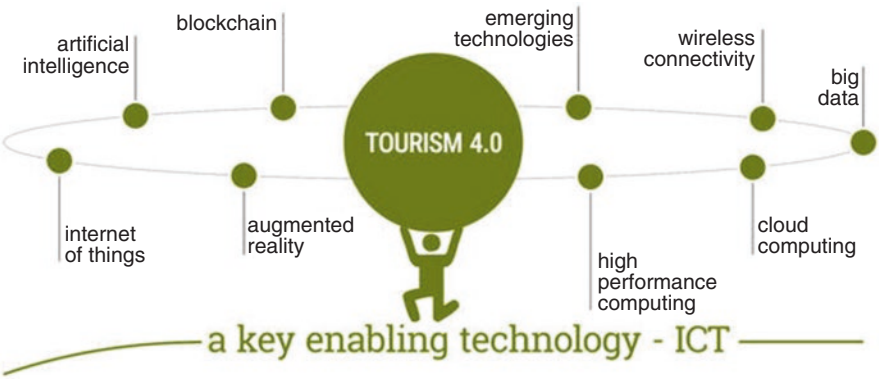

Fig. 13.5 Tourism 4.0. (Source: Peceny et al., 2020)

the scholarly articles. An example here to include is the usage of blockchain technology in the Chinese tourism industry. The impact of industry 4.0 on the Chinese tourism sector can also influence travelers worldwide due to the advanced technological benefits. Sharing bikes, sharing electronic vehicles in China have already been popular among tourists. Day by day, technology will be more sophisticated and attract more people to sustainable tourism development. So, the blessing of industry 4.0 enabled the tourism industry as tourism 4.0 (Peceny et al., 2020) (Fig. 13.5).

E-Customer Relationship Management in Tourism

E-customer relationship management in tourism can ensure frequent exposures for the tourism industry. However, to do so, basic CRM could be the initial tool (Dorcic et al., 2019) to be more digitalized. It is to mention that E-customer relationship management in tourism has not yet been discussed as a well-researched topic. E-Customer Relationship Management in Tourism can build a solid customer base that can be contacted frequently, and organisations can save many advertising costs in this regard. In the case of e-customer relationship management in tourism, e-wom is a very effective phenomenon. If the tourism industry has an ideal e-customer relationship management system, then the existing customers will be satisfied and comment positively on the website or in the App system (Ince & Samatova, 2020). Besides, rating or ranking by the existing customers is also vital. Sound and systematic e-customer relationship management can ensure a good rating for the organization (Fig. 13.6).

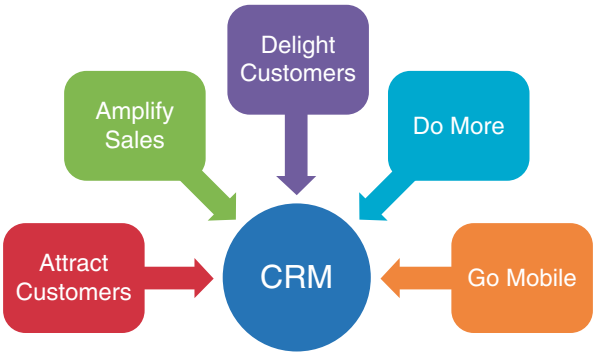

Fig. 13.6 Tourism CRM System. (Source: trawex, 2021)

Smart Applications in Tourism

Smart applications are widely used in the tourism industry nowadays (Bodkhe et al., 2019). In the contemporary era, the applications are getting smarter. For example: with updated applications from mobile operators, tourists can enjoy seamless Wi-Fi connection anywhere. Smart application is not only for Internet usage but also for any aspect like ticketing, hotel booking, or tour plan booking (Ince & Samatova, 2020). Technology-enabled smart applications in various sectors can attract tourists (Dorcic et al., 2019). For example, hiring a car or even a bicycle through a smart application system can attract many travelers to a particular destination. Especially in China, the traveling option is vast. There are numerous destinations. Destination-based smart applications can promote the tourism industry in China.

Smart Tourism Destinations

"Nobody can be a true hero unless he has been on the Great Wall"- this is a prevalent quote that indicates the necessity to visit such an excellent tourist destination. Whether the destination that is the great wall in China is smart tourism destination or not. Well, as per the observation of the authors, the answer is complicated. That is why making the destination equipped (Lamsfus et al., 2014) with modern technology and apps may further enhance the interest of the travelers. Also, The Forbidden City and the Imperial Palace in Beijing could be further digitalized. For example: if specific attraction-based Apps (Gretzel et al., 2015) could be internationally available to use with a common currency (Boes et al., 2015) like USD or RMB, then people will be able to book for many attractions. In the city of Xi'an in China, the terracotta army has been recently attracted a lot internationally. However, this is located far away from the capital and even far away from the city. As a result, sometimes the travelers face difficulty (Bodkhe et al., 2019) to visit that particular

destination. If there are any digitalized benefits to overcome these problems, more and more people will visit the terracotta army. A smart tourism destination means developing the specific attraction (Wise & Heidari, 2019) and ensuring all the relevant facilities. Summer Palace is another popular destination that is just 15 km away from Beijing. To enjoy this destination, tourists have smart information (Gretzel et al., 2016) via various Chinese and international Apps. These architecturally attractive tourist attractions should be promoted (Desdemoustier et al., 2019) with smart tourism facilities.

Smart Municipalities in Tourism

Smart Municipalities in Tourism's components and dimensions are a contemporary phenomenon (Ceglia et al., 2020). In the recent literature, scholars discussed smart energy efficiency to attract more customers (Ayaz & Akay, 2020), tourism as a smart information transfer globally, the technologies to build smart cities, and the benefits, solving the social and economic complications by building and maintaining smart Municipalities and so on. Besides, information and communication technology can integrate social and community development (Neumann et al., 2019). The tourists receive a positive image about a particular region that might be discussed on various social media (Urrutia-Azcona et al., 2020). In this way, more and more people come to know the tourism development with modern technology. The Chinese government continuously improves various municipal areas' overall image (Kadeřábková & Jetmar, 2010). As an example: digitalized maps for tourists to find a specific destination, voice translator device in various places, digital help desk in various places of interests such as in the airport or in front of big shopping complexes are successful inclusion of smart technologies (Sandoval-Almazan et al., 2015) in the tourism industry in China.

Conclusion

When considering the most influential factors affecting the global tourism industry over the last two decades, two terms stand out: modern technologies (He et al., 2018; Tussyadiah, 2020) and Chinese tourists (Chen & Huang, 2017; Wu et al., 2020). Though emerging technology continues to drive the evolution of the global tourism industry, the Chinese tourist sector has captured global destinations' interest. Smart tourism technology's rapid progression creates new possibilities for tourism growth. More travel destinations are using smart technology to draw more visitors and enhance their travel experience. Travel experience satisfaction has a positive impact on both visitors' enjoyment and intent to return, and it is strongly linked to tourism technologies. Outbound Chinese travelers have increased dramatically, and modern technology devices, platforms, structures, and networks have

continued to shape industry environments, accelerating tourism growth at an exponential pace.

Technology's rapid progression has radically altered the way Chinese visitors travel around the world. The influx of Chinese visitors has prompted service providers and resorts to implement cutting-edge technologies (e.g. mobile payment). These two movements have modified tourism habits, encouraged infrastructure growth, and energized an unprecedented wave of technological creativity, transforming communication and travel experiences for tourists in a global society. With technology-enabled creativity evolving alongside the industry both at home and abroad, the subject of digital technology and technology-mediated Chinese tourists can flourish. On the cusp of the third decade of the twenty-first century, the global tourism market, as well as the global scholarly and technical class, are currently confronted with unparalleled obstacles as well as exciting prospects. Nonetheless, the emergence of new technologies and tourism and the activation of an increasingly globalized civil society will remain a constant theme to which the Chinese tourism industry, scholarly and technical culture, and others will continue to contribute.

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