

Mobile Communications for Tourism&Hospitality

Subjects: Others

Contributor: Sirong Chen

As the fifth-generation (5G) mobile communication technology captures public attention, reviewing the first to fourth generations with the anticipated implications of 5G and afterward, and future research would present a useful value to the literature. This study uses a systematic content analysis methodology to provide a comprehensive and interdisciplinary review of mobile communication research in tourism and hospitality to help academic researchers and industry practitioners understand the research area. The study also analyzes the future changes that mobile communication technologies and their applications will bring to tourism and hospitality research trends and industry practices.

Keywords: mobile communication technology ; 5G ; tourism and hospitality ; interdisciplinary research ; content analysis

1. Introduction

The fifth-generation (5G) mobile communication technology era officially began in 2020. The future effect of mobile communications on hotels and tourism needs to be anticipated. Mobile communication iterates once every decade. Based on previous generations, the new generations of mobile communication systems are innovated and developed with high indicators and new features ^[1]. In the 1980s, the first generation (1G) only provided voice or messaging services. In the 1990s, the second generation (2G) had voice data and SMS facilities. The third generation (3G), which coincided with the 21st century, provided high-speed data, voice, picture, and video services. In the 2010s, the fourth generation (4G) met people's needs for dynamic information access ^[2]. For example, the representative product of the 1G era is a phone that can call within a specified area. The mobile phone of the 2G era had functions of making calls, sending messages, and low-speed internet access, whereas that of the 3G era could process images, music, and videos. The live video and online payment functions were only enabled in the 4G era. However, with the rapid growth of the number of mobile devices, data volume, and data rate ^[3], 4G fails to meet people's increased demands for speed, connection, performance, and services. Therefore, 5G mobile communication technology is important.

Compared with 4G, 5G latency is reduced by a factor of five, the number of connected devices increases by a factor of 10, and mobile data expands by a factor of 1000, while user data rates and battery life increase ^[4]. Specifically, 5G ensures an improved experience, extremely low end-to-end latency, higher capacity, high-speed data transmission, lower cost, and larger device connections ^[5]. Furthermore, 5G is user-oriented ^[6]. Users can use 5G characteristics and advantages, which means that mobile communications can become intelligent, traditional mobile service capabilities can improve, and various networks can be connected to form a unified system ^[7]. These benefits provide the public with a truly wireless world ^[4]. The application of 5G further supports various industries and fields ^[8]. For example, intelligent transportation, autonomous driving, smart city, smart agriculture, mobile healthcare, industrial automation, ultra-high-definition video live broadcast, and ultra-smooth augmented reality (AR) and virtual reality (VR) ^[9] experiences can all be realized. New technologies and features of mobile communications also bring new changes to tourism and hospitality.

Although mobile communication technology has long been used in the hotel and tourism industry, the corresponding academic research on "tourism/hospitality and technology" remained limited. For instance, Law et al. ^[10] collected mobile-related research published in the magazine *Hotel and Travel* from 2002 to 2017 based on specific dimensions from the perspectives of suppliers and consumers. Doric et al. ^[11] reviewed articles in smart tourism related to mobile technology and applications from 2012 to 2017 and divided them into the following three perspectives: consumer, technology, and provider. These previous studies provided strong support for the application of mobile communication technology in hotels and tourism from theory and practice. However, the speed of academic research differs from that of rapid technological development. In detail, previous review studies only covered the technologies until 4G and lacked analyses of 5G and its future development. Second, research was often based on articles in tourism and hospitality without reviewing those in other areas. Therefore, the present study attempts to bridge the above two knowledge gaps using content analysis, combined with the relevant literature after the emergence of 5G. Bridging these knowledge gaps can make a broader cross-disciplinary review of research from 1G to 5G mobile communications in tourism and hospitality. In particular, this

study explores the effect of each generation of mobile communication and the changes brought about in tourism and hospitality. Different from empirical studies, as a review article, the objectives of this study are threefold. First, this study aims to provide an in-depth literature review and summarize the previous research with examples of the latest applications and stakeholder acceptance of mobile communication technology in tourism and hospitality. Second, this study aims to help relevant academia and industry personnel understand the research field ^[12]. Finally, the study intends to grasp the effect of future 5G mobile communication technology and its applications on tourism and hospitality to a certain extent, rather than presenting new theories or insights in response to research gaps ^{[10][11]}. Hence, pioneering on looking backward across 1G–4G with anticipation of 5G implications and future research, this study provides important theoretical guidance and practical significance for academia and industry to conduct further research of mobile communication technology in tourism and hospitality.

2. Overview of Mobile Communication Technology Research in Hospitality and Tourism

The trend of mobile communication technology research and the background of mobile communication systems indicate the gradual increase in its influence on and role in hospitality and tourism. The number of related studies is predicted to continue to increase in the future. Meanwhile, the analysis results of the research area background, computer science, information systems, engineering, science and technology, telecommunications, transportation, and geography contribute considerably to the research on mobile communication technology in hospitality and tourism. The research in these areas generally explained or proposed a solution to a specific problem in mobile communications, which has a relevant effect on hotels and tourism ^{[13][14]}. Statistical data show that the research contributions of hospitality and tourism to mobile communication technology lag behind other fields. Therefore, the recommended approaches are strengthening research on mobile communication technology in hospitality and tourism and appropriately refer to the internet and technology.

This study also reveals the similarities and differences between the research models in hospitality and tourism and other areas. First, although methods and data source selections differ regardless of field, a certain data foundation exists as a support such that research can be more specific and scientifically presented. Furthermore, research in hospitality and tourism pays additional attention to the application of theoretical bases, whereas other areas rarely use theory or theoretical models. The possible reason for this discrepancy is that most other research areas in this study are technology applications that, unlike social science research, focus more on practical operations or are only supported by concepts. In addition, the reviewed articles frequently used technology-related theories, specifically the TAM ^[15]. Perceived usefulness and perceived ease of use are two key factors of the TAM ^[16]. Based on these two factors, the TAM is widely used to study user acceptance of technology ^[17] and is often combined with other theories in investigating the acceptance of mobile communication technology in hospitality and tourism ^[18]. Thus, this topic is studied as comprehensively and rigorously as possible. However, despite its most common use, the TAM is insufficient to cover the contents of the investigation. In summary, the present study suggests that the future related literature should pay more attention to the use of theoretical models, use theory to guide practice, and further promote the research academicity and reliability. Simultaneous initiatives are developing theoretical model frameworks that are suitable for the research of mobile communication technology in hospitality and tourism and enriching its theoretical foundations. Furthermore, the results show that research in hospitality and tourism tends to use either qualitative or quantitative methods. At this point, learning from methods in other research areas, adopting a mixture of qualitative and quantitative methods, and jointly exerting the advantages of the two research methods are recommended to provide a more solid methodological basis for the literature.

3. Effect of Each Generation of Mobile Communication Technology on Hospitality and Tourism

Exploring the functional areas and applications of each generation of mobile communication technology in hotels and tourism is an important part of this study. This exploration is an analysis of the effect of mobile communication technology on hotels and tourism and the changes they bring. This effect mainly began with 3G technology, when users can enjoy navigation aid ^[19], travel with intelligent transportation services ^[20], travel self-services ^[21], and mobile hotspot services ^[22]. Remote vision mobile devices also enable the navigation of visually impaired pedestrians ^[23]. Although many factors affect the user's willingness and intention to use mobile technology in hotels and travel environments, the use of 3G technology improves the travel experience ^[24]. Moreover, 3G technology plays a role in tourism security monitoring, tourism management, and marketing ^{[25][26]} and promotes the strategic plans and development trends of hospitality and tourism. For example, certain functions of 3G facilitate the creation of a universal network market for tourism ^[24]. Finally,

ensuring the quality and safety of mobile communication services for users and enhancing user privacy protection when using mobile technology in the hotel and tourism environment are also proposed in the 3G context ^{[14][27]}.

Compared with 3G, 4G has significantly expanded the range of functions or applications of mobile communications in hospitality and tourism. From the perspective of the continuation and improvement of 3G functions, 4G network services provide tourists with diverse video content, e-commerce, and reservation services at a faster speed, thereby improving their convenience ^[28]. In addition, at faster data transfer rates, mobile applications receive greater technical support to help hotel and travel providers in management and marketing. Lee, Hwang, and Hyun ^[29] used 4G mobile applications to collect restaurant customer information to formulate marketing plans, improve restaurant demand management, and promote customer relationships and intelligent capacity management. From the perspective of the new functional areas or applications brought by 4G, first, the Internet of things (IoT) and the IoV begin to take shape. Jing, Han, Meng, Jiang, Lin, and Chen ^[30] connected the lines, historical buildings, user tracks, and mobile applications in a scenic spot to build a convenient intelligent travel service system. Lee, Gutesa, Dimitrijevic, Zhang, Spasovic, and Singh ^[31] pointed out that connected vehicles using 4G network services can be easily plugged into an existing flow control management system without paying considerable additional funds, thereby reducing travel costs. Second, 4G provides technical support for virtual tourism and robot services in hotels and tourism. Virtual tourism is composed of considerable real-time videos, images, and information, benefiting from faster and more stable data transmission rates and larger data transmission capacity compared with 3G. Furthermore, AR, VR, mixed reality, and holographic projection technology can be used in tourism ^{[32][33]}. Second, 4G technology promotes the interaction between robots and hotel users or tourists ^[34]. Third, the expansion of mobile communication applications has a certain relationship with the development direction of tourism. In the context of its era, 4G is used in sustainable, ecological, and rural tourism. Finally, to meet the increasing user demand for high-speed travel, high-speed or railway communication technology has developed rapidly with 4G technical support ^[35].

Although the current 5G mobile communication network is still to become popular, the existing articles on 5G mobile communication in hotels and tourism indicate that 5G will create extensions and breakthroughs based on 4G. Among them, the most important is that 5G will have an effect on a macro level, compared with the changes brought by the previous generations of mobile communication technologies. A 5G network has characteristics of high speed, large broadband, high reliability, and low latency that are absent in a 4G network. These characteristics enable the IoT and IoV to truly play the role of the “Internet of Everything” in hotels and tourism. For instance, the 5G network realizes information interaction between cars, roads, people, and infrastructure, effectively improving the user’s travel traffic experience ^[36]. Alam, Ferreira, Mumtaz, Ahmad Jan, Rebelo, and Fonseca ^[37] noted that a 5G-conceived architecture enables the coordination of the IoT of smart beaches and smart transportation, realizing multiple functions of real-time beach travel monitoring, beach travel planning, vehicle tracking, and management. The 5G technology also creates new possibilities for medical travel. Specifically, smart medical devices can sense the local environment through embedded communication functions and integrated sensors and then use remote triggers in the IoT to sense or drive remote devices to generate data or operate ^[38]. These possibilities show that the management and services of medical tourism can also transcend time and space restrictions. For example, travelers can access services, such as real-time global networking of medical records or remote treatment. Furthermore, the concepts of smart cities, smart destinations, and smart travel applications break through previous presentation models and appear as new, highly coordinated models ^{[39][40][28]}. The possible effect is that the boundaries of relevant concepts in the hotel and tourism fields may gradually reduce, whereas the smaller stakeholders may have a broader definition ^[40].

4. Changes That Future Mobile Communication Technology Can Bring to Hospitality and Tourism

The effect of future mobile communication technology on hospitality and tourism is discussed to complete the second goal of this study. According to the iteration time of the mobile communication system, 2020 to 2030 is the expected 5G era.

4.1. Mode of Tourism Service Output Will Change

Current academic research is dominated by the application of new 5G technologies in the industry, that is, the effect and changes on the supply side. With the effect of the coronavirus disease 2019 (COVID-19), IoT will continue to enhance the personalized and customized service experience. Hospitality areas that are severely affected by the epidemic can apply IoT to make real-time decisions on hotel occupancy, guest dining options (e.g., outdoor dining), large events, and cruise line arrangements ^[41]. The extremely short 5G latency solves vertigo caused by the delay lag of previous VR technology and promotes the development of the VR industry. The 5G networks combined with HD, 4 k/8 k, and panoramic video technologies meet the demand of tourists to visit immersive scenic spots anytime, anywhere. Self-service devices and

robots will replace human beings to provide services to tourists, greatly improving the stability of service quality ^[42]. In addition, 5G technology will change the way people spend their time on travel. With more technology support, the money and time cost of travel is reduced and the frequency of travel spending will increase. During travel, travelers will have access to real-time services and experiences in a variety of contexts, such as smarter and more convenient transportation systems, hotels, and scenic spots. This access, in turn, makes a higher quality experience that will continue to stimulate travel demand.

4.2. Leisure Time and Leisure Quality Will Be Improved

At present, 5G is still at a primitive stage. It will take time for mass commercialization, and terminal products are relatively scarce. Therefore, for travelers, the changes they can feel at this stage are limited. However, in the long run, as the technology continues to develop and mature, the upgrade of product quality and traveler's experience brought by the technology will be more evident, and people's leisure time and leisure quality will be greatly improved. The scope and efficiency of artificial intelligence (AI) applications will increase dramatically, and productivity will also increase largely. Many jobs will be completed by robots, and people will have more leisure time and generate more demand for tourism consumption. In addition, IoT technology will be an important factor in meeting the needs of the new generation of visitors ^[39]. The IoT can have a significant effect on enhancing the value of the visitor experience. Smart tourism uses this technology to maximize information analysis and integration and to achieve convenient information exchange between users. However, the high level of information sharing also highlights the concerns of cybersecurity. Since the beginning of mobile technology being used in tourism and hospitality, user security and privacy protection have been gaining attention and are constantly being optimized and upgraded. Thus, research on cybersecurity issues will continue to accompany the application and development of mobile communication technology in the tourism and hospitality field. Visitors can feel the support of 5G technology during the whole process of travel, including ultra-high-definition video that provides a cinema-like visual feast anytime, anywhere during the fragmented waiting time of travel and the ability to interact with friends and family through social platforms while waiting in line at restaurants.

4.3. Application Scenarios for 5G Technology Will Be More Diverse

The fifth generation has enabled mobile communication technologies to become more connected to other industries and will have a wider range of applications in tourism and hospitality. We can expect to see the use of technology in venues other than hotels and scenic spots. On the one hand, this technology can help the overall digital upgrade of tourism; on the other hand, smart technology is likely to create more amazing cultural and tourism experiences, with VR/AR, AI, and human-computer interaction breaking through the limitations of the original tourism experience. Specifically, with the integration of 5G networks into tourism intelligent transportation, 5G enhances the safety and reliability of tourism transportation systems, improves operational efficiency, and builds new modes of travel, such as driverless vehicles. Thus, travelers can be largely freed from the complexities of road environments and travel route planning, and travel service providers may reduce their investment in travel transportation. Fifth-generation mobile communication technology will also greatly enhance the comprehensive management capabilities of scenic spots. Moreover, safety emergency management and terminal monitoring based on 5G networks can help scenic spots achieve real-time monitoring, feedback, and handling of emergencies. The emergence of virtual tourism has also greatly enriched the supply of online tourism products, allowing people to travel without leaving home through online live streaming and remote interpretation, meeting the emerging market demand. Furthermore, IoT, AI, VR/AR, and other technologies in hotels ensure hygiene and cleanliness at every touchpoint in a hotel ^[42]. Some hotels are working to create emerging technologies, including the IoT, to respond to changing service evasions and customers' desire for social distance ^[41]. Interactive self-service technology in restaurants enhances customer experience ^[43]. The use of 5G technology in museums will improve online working and ticket booking services for museums, helping to develop digital museums and promote history and culture ^[44].

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