

Chapter 15

The Importance of Smart Technologies in Tourism Businesses. Toward Metaverse and Tourism Data Space



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Abstract The topic of smart tourism businesses is so far under-researched. Smart tourism businesses are the critical element of the smart tourism ecosystem; however, little is known about technology adoption and data sharing to strengthen their smart approach. The chapter aims to analyze the importance of smart technologies in hospitality and catering facilities, travel agencies, cable car businesses, and sport and recreational facilities for enhancing tourist experience and performance of the business. It also analyzes data collection and sharing in tourism businesses. The chapter comprehensively analyzes the smart tourism concept from the business perspective. The chapter uses quantitative and qualitative research methods. Based on the classification of technologies on stimulating extra-sensory, hyper-personalized, and beyond-automation experiences, the chapter outlines future directions on the use of the metaverse in tourism businesses. Moreover, the research identifies that the participation of businesses in the tourism data space can reduce the barriers to data sharing among businesses.

Keywords Metaverse · Smart businesses · Smart technologies · Tourism data space

15.1 Introduction

The dynamic environment, which is related to technological development, climate change, and growing uncertainty, significantly influences tourism development. This development is conditioned by fragile natural and cultural environments that

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must be preserved, as they are the source of its growth. The concept of smart tourism development emerged as a response to changes such as climate change and growing uncertainty. This concept needs to be perceived as a philosophy of tourism development that creates opportunities for (1) better satisfying the needs of visitors with tailor-made experiential offerings, (2) creating new business models leading to the development of smart tourism businesses, and (3) more professional management of tourism destinations (Gretzel et al., 2015).

The business level of smart tourism is underpinned by access to shared data, which facilitates inter-organizational cooperation and the pooling of resources (Xiang & Fesenmaier, 2017a). It encompasses the utilization of both internal datasets and advanced technologies to enhance marketing strategies, profitability, and competitive advantage, as well as the integration of external data sources enabled through data-sharing practices (Buhalis & Leung, 2018). In this sense, it is crucial to provide information on how tourism businesses perceive smart technologies and what the barriers to their implementation are. Moreover, as smartness is not only aimed at technology adoption, it is worth examining the data collection and sharing ethos in tourism businesses. The topic of smart tourism businesses is so far under-researched. Tourism businesses are practically forgotten in the academic literature dealing with smart tourism, as they often lag behind in adopting technological innovations (Ballina, 2022).

15.2 Characteristics of Smart Tourism Businesses

The physical presence of a smart business is closely linked to the virtual environment (Gretzel, 2016). The goal of the smart approach in a business environment is (1) to enhance the visitor's experience, (2) optimize operational processes (increase work productivity and reduce employee burden), and (3) more efficient strategic management (planning and marketing) and business economics (increasing revenue and reducing costs). There are several definitions of smart tourism businesses (see, e.g., Gretzel, 2016; Jeremen et al., 2016; Li et al., 2017; Ballina, 2022; Buhalis et al., 2023b; O'Connor, 2023; Song et al., 2024). The definitions of smart businesses stress the role of smart technologies and data sharing.

Smart technologies refer to general and specific applications designed to enhance tourist experiences, create added value, and improve the competitiveness of tourism destinations and businesses (Neuhofer et al., 2015). The concept of smartness leverages the interconnectivity and interoperability of integrated technologies. These technologies collect and utilize data from diverse sources, including physical infrastructure, social networks, and other sources, and are supported by advanced analytical tools such as machine learning and artificial intelligence. The term *smart tourism technologies* is a broad and somewhat ambiguous umbrella concept that refers to a wide array of advanced technologies aimed at deepening digital connectivity. According to Gajdošík and Orelová (2020), these technologies can be categorized into four main groups: (1) technologies providing information, (2) technologies

related to data storage and management, (3) technologies supporting experience, and (4) sensing and network technologies (see Fig. 15.1).

The business dimension of smart tourism development should be grounded in a data-sharing approach that fosters collaboration and resource integration among tourism businesses (Xiang & Fesenmaier, 2017b). This involves the adoption of advanced technologies within tourism businesses to support data collection and operational processes, alongside a strategic commitment to sharing data with other stakeholders. A “smart tourism business” is characterized by its ability to seamlessly integrate internal and external applications, facilitate cloud-based data exchange, combine real-time and historical data, and operate within interconnected and interoperable system environments (Buhalis & Leung, 2018). Tourism businesses employ a range of information systems, including property management systems (PMSs), point of sale systems, sales and management systems, customer relationship management (CRM) systems, and revenue management (RM) systems. Transactional data generated by these systems should be complemented by big data derived from internal sensors, such as motion, voice, and temperature sensors in hotel rooms, or localization sensors in reception areas and restaurants, and external sensors, including those that monitor weather conditions, traffic flow, and social media content. Effective data exchange among business partners and broader stakeholders, such as transportation providers, reservation platforms, event organizers, destination management organizations, and other tourism businesses, is also essential for realizing the full potential of smart tourism systems.

However, so far, the studies on smart tourism have explored mainly the tourist perspective (e.g., Femenia-Serra et al., 2019; Gajdošík, 2020) and the destination level (e.g., Buhalis & Amaranggana, 2014; Gretzel et al., 2015) but not adequately address the business level (e.g., Ballina, 2022; Buhalis & Leung, 2018). To fulfill

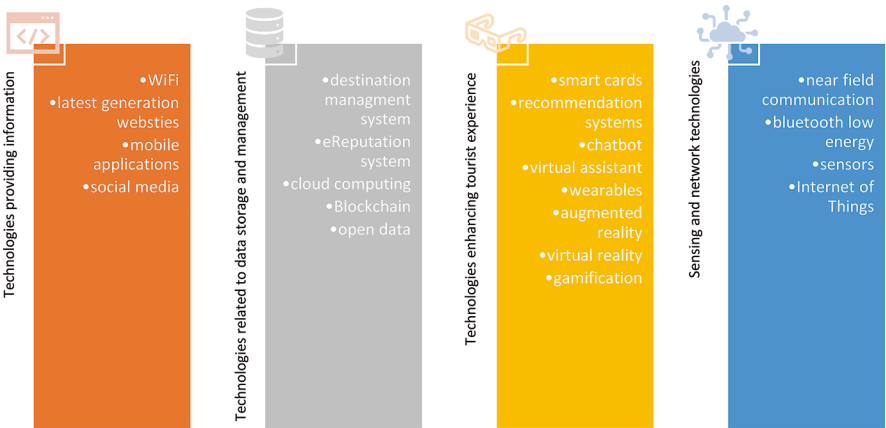


Fig. 15.1 Characteristics of smart technologies. (Source: Own elaboration based on Gajdošík and Orelová (2020))

this gap, the presented study examines the smart tourism businesses from the perspective of smart technologies and data-driven practices.

15.3 Research Methodology

The chapter aims to analyze the importance of smart technologies in hospitality and catering facilities, travel agencies, cable car businesses, cultural facilities, and sport and recreational facilities for enhancing tourist experience and performance of the business, as well as their data-sharing practices. The research sample consists of 310 tourism businesses from the Central European country - Slovakia, whose managers took part in the questionnaire survey. The managers of these tourism businesses were asked to evaluate the importance of selected smart technologies for tourist experience and the effect on business performance on a scale of 1–5 (1—lowest score and 5—highest score). Moreover, they were asked to think of barriers to technology implementation, as well as the data they collect and share about tourists and the external environment.

The survey was conducted online using the computer-assisted web interviewing (CAWI) method in the years 2021 and 2022. The CAWI method represents a dominant paradigm in data gathering in social research (Tomaselli et al., 2022). The e-mail with a link to a web survey was sent to Slovak tourism businesses. The questionnaire was adapted to the specificities of each business category. The research sample consists of 118 independent hotels, 69 restaurants, 33 travel agencies, 31 cable car businesses, 39 cultural institutions, and 20 thermal spas and aquaparks. The analysis is based on the quantitative (descriptive statistics) and qualitative (content analysis) research methods. Slovakia was chosen as a reference country, where technology adoption is at the average level of European Union countries. Therefore, the results present the typical European perspective.

15.4 Results and Discussions

Information technologies influence visitor behavior because they provide new ways of searching for information, comparing options, booking, connecting, and sharing experiences. Smart technologies positively affect business revenues and minimize their costs, for example, in terms of energy and staffing. With the help of smart technologies, it is possible to collect, exchange, and process data that serve as a basis for smart decision-making. This mainly concerns data about visitors and the external environment of businesses.

The Importance of Smart Technologies for Tourism Businesses

As the goal of the smart approach in tourism businesses is to enhance the visitor experience and optimize operational and strategic processes, the analysis is focused on determining how managers perceive the use of smart technologies. Given that different types of tourism businesses require different types of information technologies, it is appropriate to address this issue separately for each type of business. Consequently, the managers should think of the barriers to technology implementation, as well as the data sources they use.

Hotel managers identified that the greatest impact on the visitor experience is made by WiFi, the latest generations of websites, social media, and mobile applications. Also significant are online check-in, CRM system, recommendation system, virtual and augmented reality, chatbot, and online assistance (Fig. 15.2). These technologies provide tourists with current information, facilitate real-time communication with the hotel, and serve as a basis for creating a personalized product. In addition to these technologies, information systems also have a significant impact on hotel performance. From the managers' responses, it can be observed that they attach great importance to information technologies, which positively influence the environmental pillar (systems for measuring energy and waste consumption) and the economic pillar of sustainable development (RM systems, electronic reputation, and latest hotel PMS). A trend in hotel information systems is primarily the use of cloud computing and dynamic pricing. Hotel managers are gradually becoming aware of the importance of Blockchain technology for data protection, as well as wearable devices (social pillar), which guests are increasingly using. Less

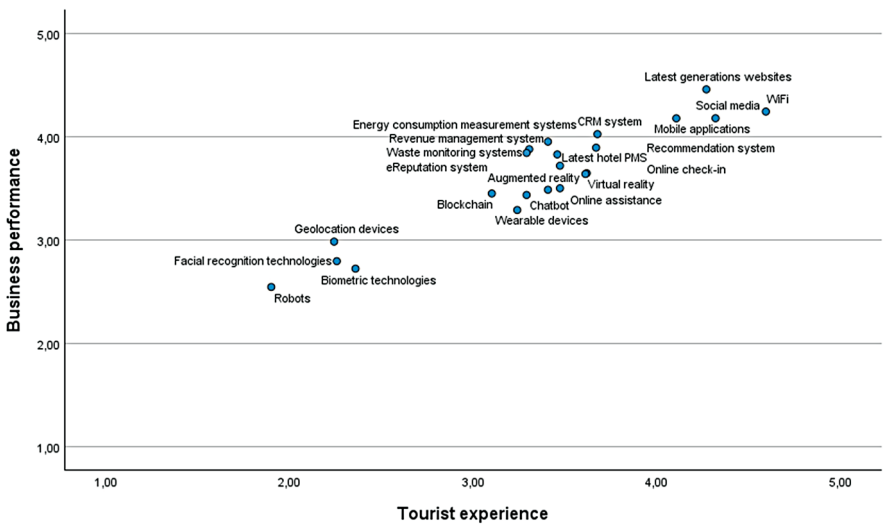


Fig. 15.2 Hotel managers' perspectives on smart technologies. (Source: Authors' own processing based on processing of the collected data)

significant are geolocation devices (e.g., beacons using BLE), which allow monitoring of guest movements within the hotel. By being able to identify the visitor's location in a specific part of the hotel, the visitor can receive personalized alerts (push notifications), enabling them to have a better experience. Technologies for facial recognition, other biometric technologies, and robots are likely to have a greater impact on the hotel industry in the future.

Restaurants utilize fewer technologies than hotels. In these businesses, the highest impact on the tourist experience is mainly from WiFi, social media, mobile applications, and the latest generations of websites, which, like in hotels, provide customers with current information (Fig. 15.3). Especially in fast food establishments, tablets are also significant, speeding up the ordering of meals and drinks. QR codes are also important for guests, as they most often allow them to choose from an electronic menu or rate the work of staff. The performance of these facilities is also influenced by the latest versions of PMSs. The latest versions of these systems should be based on cloud computing, which allows easier integration of additional systems. Together with the use of the Internet of Things, catering facilities can efficiently manage resources. These technologies actively and automatically monitor processes without the need for human intervention. The Internet of Things can monitor storage and inventory status, thereby preventing unnecessary food waste. In production, it can monitor the wear and tear of equipment and automatically report its maintenance. Other technologies are not as significant from the perspective of managers. However, robots are gradually being introduced to help minimize manual labor in production and sales, and augmented reality is being used to enhance the experience of customers waiting for food and drinks and to enhance the consumption experience.

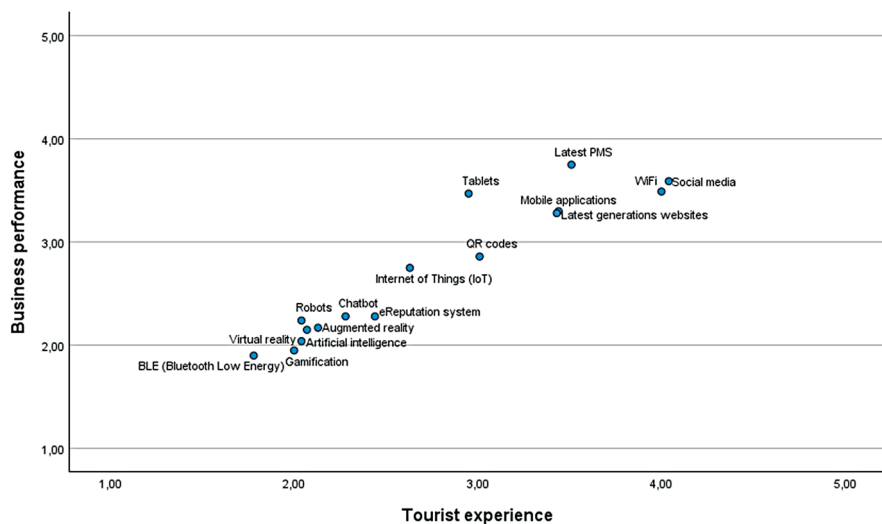


Fig. 15.3 Catering facilities managers' perspectives on smart technologies. (Source: Authors' own processing based on processing of the collected data)

In overall, managers of *travel agencies* rated the significance of smart technologies as high. From the perspective of tourist experience, the most important are the latest generations of websites, the latest PMS, WiFi in travel agency premises, social media, contactless payment, as well as mobile applications and online assistance (Fig. 15.4). These technologies also have the greatest impact on the performance of travel agencies. However, managers are aware of the need to differentiate themselves in the market. Given that tourists increasingly utilize information technologies, managers consider virtual and augmented reality to be significant in terms of both tourist experience and the performance of the travel agency. Simulating a virtual environment allows travel agencies to partially materialize the intangible product of tourism. Through virtual environments, customers can “try out” a tour by simulating images, sounds, smells, and sensations, which can help prevent potential disappointments. The performance of travel agencies is also influenced by the introduction of an electronic reputation system, as well as connections to global distribution systems (GDSs). Robots, chatbots, gamification, and 3D printing in the activities of travel agencies are not currently as significant. Although they have great potential, managers perceive their significance as below average. In the future, the impact of 3D printing can be expected, as it allows for the printing of personalized souvenirs along with a tourist guide at the destination. Such a souvenir can be an authentic alternative to mass-produced souvenirs.

Cable car businesses operate in mountain resorts, which constitute a significant part of tourism offerings in both domestic and international markets. Managers of these businesses consider the latest generation of websites, social media, WiFi, mobile applications, as well as smart cards and NFC technology to be the most important technologies (Fig. 15.5). Smart cards with integrated Near Field

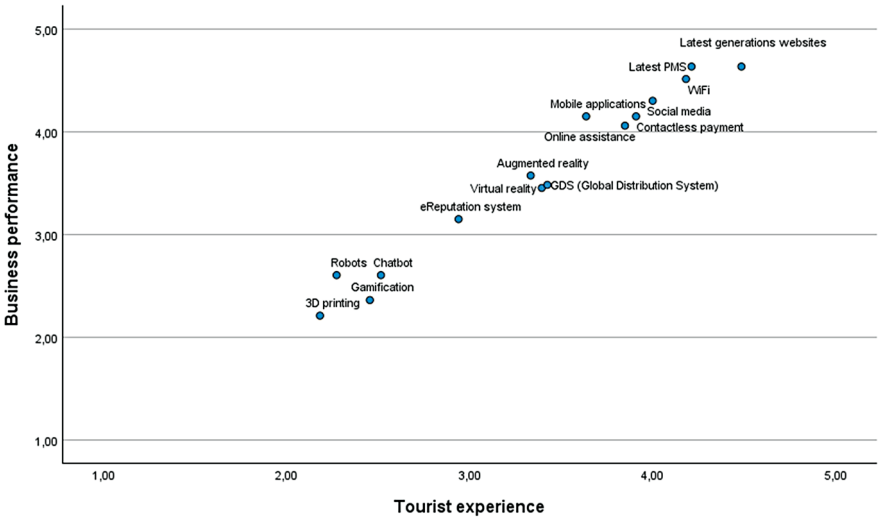


Fig. 15.4 Travel agencies managers’ perspectives on smart technologies. (Source: Authors’ own processing based on processing of the collected data)

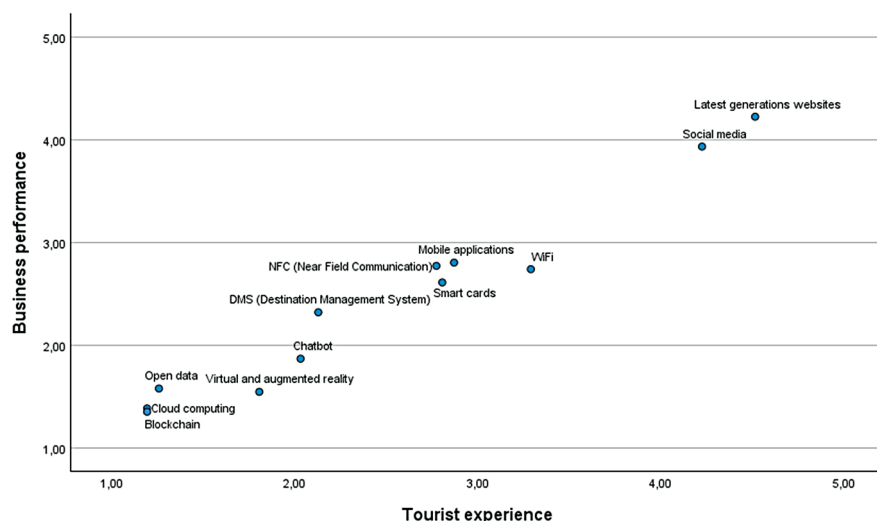


Fig. 15.5 Cable car facilities' managers' perspectives on smart technologies. (Source: Authors' own processing based on processing of the collected data)

Communication (NFC) or Radio-Frequency Identification (RFID) enable contactless payments or terminal access. They are also a good source of visitor data, as they can monitor consumption, visited attractions, and the movement of visitors around the destination. It is advantageous if cable car businesses are integrated within the destination management system. This system allows connecting stakeholders in the destination and informing them about sustainable development policies while also serving as a source of current information for visitors. Chatbots, virtual and augmented reality, open data, cloud computing, and Blockchain have less significance. An example is the use of a smart skiing helmet with integrated augmented reality technology. The helmet camera captures the surroundings on the slope and provides skiers with visual information such as altitude or speed. Additionally, the helmet is equipped with headphones and a microphone, allowing communication with friends via text, sound, or video. In the future, these benefits could be expanded to include information such as lift wait times and slope congestion.

Cultural facilities provide their services not only to residents but also to tourists. Based on the responses of managers of these facilities, information technologies have an impact on enhancing tourist experience as well as the performance of these organizations. In addition to traditional technologies significant in other types of tourism businesses, cultural facilities place great importance on QR codes, holograms, and gamification (Fig. 15.6). QR codes allow visitors of cultural facilities (such as museums or galleries) to access more information about exhibited objects by redirecting them to the facility's website, where this information is available. This way, the exhibition space is not visually cluttered with information, and visitors who wish to learn more have a simple means to obtain the desired information. Information technologies also enable addressing problems of cultural facilities

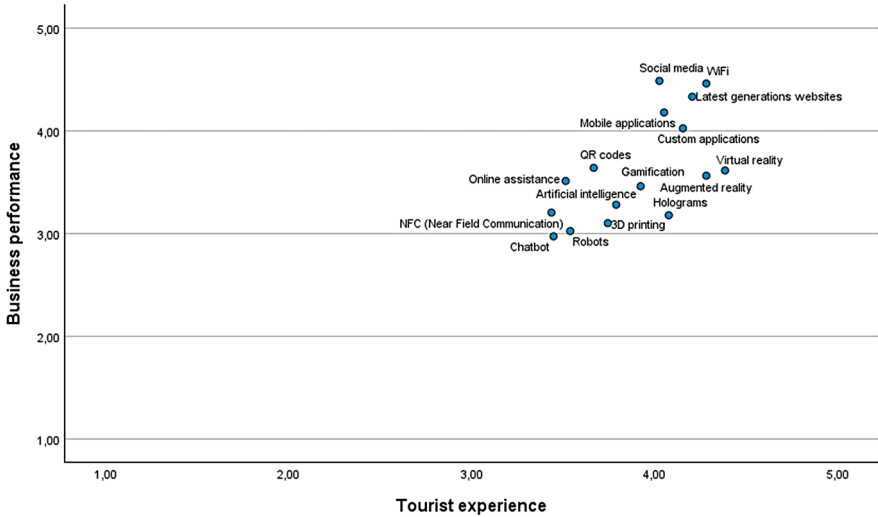


Fig. 15.6 Cultural facilities managers' perspectives on smart technologies. (Source: Authors' own processing based on processing of the collected data)

when their objects are not accessible to visitors due to space constraints or a high likelihood of their deterioration. In such cases, it is appropriate to use holograms, which create a three-dimensional image of the object based on projection. By utilizing gamification, cultural facilities have the opportunity to increase visitor engagement and build a loyal relationship with them.

The core infrastructure conditions for active leisure and recreational sports are *sports and recreational facilities*. Among the most utilized sports and recreational facilities are thermal pools and water parks. According to their managers, WiFi availability within the facility is of highest importance. Additionally, mobile applications, the latest generations of websites, electronic reputation systems, and QR codes are significant (Fig. 15.7). Managers also emphasize the importance of utilizing RFID technology, which is integrated into visitor wristbands. Such wristbands enhance safety and convenience, allowing visitors to purchase food, beverages, or souvenirs without concerns about losing money or having it stolen. Currently, less emphasis is placed on big data processing, chatbots, cloud computing, augmented and virtual reality, as well as gamification. However, these technologies have great potential to impact tourist experience and facility performance. Incorporating gaming elements into water slides, for instance, motivates visitors to revisit the facility. These gaming elements offer visitors new experiences, competition, and excitement. In some water parks, visitors can touch LED light panels embedded in the inner side of the slide, earning points, thus fostering competitiveness and new experiences. Virtual reality is also utilized during water slide rides, for example, in the Prague aquapark, where visitors can wear waterproof gear and experience the slide in a completely different environment. Similarly, augmented reality allows for the

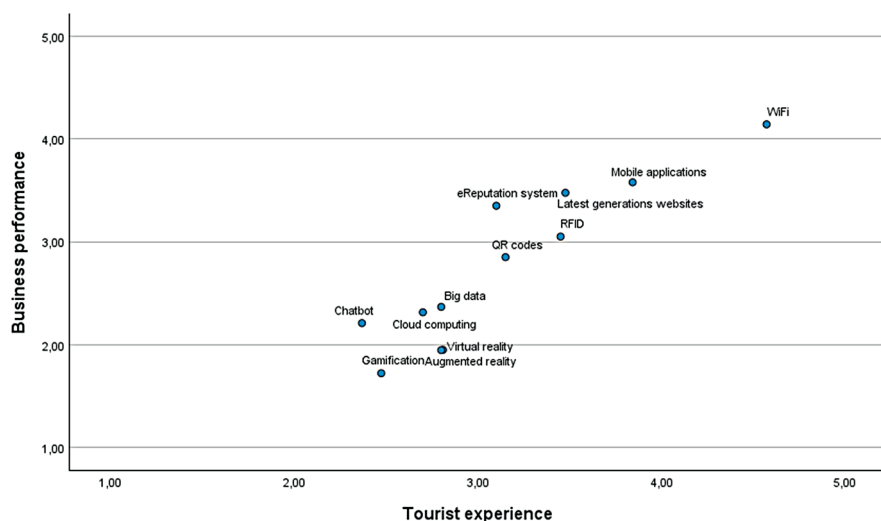


Fig. 15.7 Sports and recreational facilities managers' perspectives on smart technologies. (Source: Authors' own processing based on processing of the collected data)

Fig. 15.8 Barriers to the implementation of smart technologies in the tourism business. (Source: Authors' own processing based on processing of the collected data)



display of real rides enriched with interactive graphics. Visitors can thus see their current speed or compete simultaneously with multiple riders on the slide.

Managers of the analyzed businesses identified the financial demands of implementing such technologies as the most significant barrier to adopting smart technologies (Fig. 15.8). The initial costs for smart technologies range in the tens of thousands of euros. For example, based on the answers of restaurant managers, purchasing a robot would cost a restaurant approximately 17,000 euros. In addition to these initial financial costs, maintenance and potential repairs need to be considered. Therefore, it is often suitable to address such initial investments through leasing, where the monthly installment, including maintenance, is approximately 5000 euros. This financial challenge is particularly critical for small- and medium-sized tourism businesses, which often lack the capacity to invest in advanced technologies independently. To help lower this entry barrier, support in the form of shared digital platforms, training initiatives, or regional innovation hubs can be essential. Additionally, partnerships with universities or technology providers can offer

low-cost opportunities for experimentation and knowledge transfer, making innovation more accessible even for resource-constrained businesses.

The second most frequently mentioned barrier is fear of losing financial resources, associated with risk aversion. Managers are concerned that the technology will not yield the desired benefits, resulting in the business unnecessarily expending financial resources. This risk can be mitigated by adjusting contractual terms or conducting a thorough analysis of case studies where these technologies have been implemented.

According to managers, another barrier to the implementation of smart information technologies is the conservatism of visitors, who find the introduction of technologies in providing tourism services obstructive. Therefore, in several businesses, these technologies have begun to be introduced as “calm,” with a design that respects the customer’s perspective (Stankov et al., 2019). Within the calm design, technologies work in the background, and their operation is only visible to the customer when necessary. Due to these technologies, employees perform fewer repetitive tasks, businesses have better customer information, and they have more time to focus on customer needs. Thanks to such technologies, it is possible to continuously increase personal contact, which is important in tourism. Managers of the analyzed businesses also identified time-consumption and insufficient technology offerings as barriers. These barriers are gradually minimized through the progressive development and improvement of technologies.

Furthermore, the analyzed importance of technologies was classified based on Buhalis et al. (2019) into technologies supporting extrasensory experiences (e.g., virtual and augmented reality), technologies supporting hyper-personalized experiences (e.g., sensors, Internet of Things, and localization devices), and technologies supporting beyond-automatic experiences (e.g., chatbots, virtual assistants, and robots). Based on the identified average importance of technologies by tourism businesses, technologies supporting extrasensory experiences have the greatest significance.

For hotels, travel agencies, and cultural facilities, technologies supporting extrasensory experiences are of highest importance. Catering facilities, cable car businesses, and sports and recreational facilities prioritize hyper-personalized experiences (Table 15.1).

Based on the significance of disruptive technologies for tourism businesses, efforts to develop tourism in the metaverse can be supported. As the metaverse represents a predominantly extra-sensory paradigm, its applications are particularly relevant for hotels, cultural institutions, and tour operators, sectors in which the enhancement of sensory experiences is considered especially critical. The metaverse influences the entire spectrum of tourist behavior, spanning the pre-travel planning stage, the in-destination experience, and post-travel engagement. Within the context of smart tourism, the integration of metaverse technologies signifies a paradigm shift, enabling the creation of immersive and enriched experiences, the convergence of physical and virtual environments, and the development of innovative modes of interaction between tourists and tourism businesses. It enables tourism businesses to collaborate with other stakeholders across the entire ecosystem,

Table 15.1 The importance of disruptive technologies by tourism businesses

Type of tourism business	Extrasensory experiences	Hyper-personalized experiences	Beyond-automatic experiences
Hotels	3.56	2.48	2.79
Catering facilities	2.10	2.27	2.15
Travel agencies	3.44	2.20	2.50
Cable car businesses	1.68	2.71	1.95
Cultural facilities	3.96	3.37	3.25
Sport and recreational facilities	2.38	2.58	2.29
TOURISM BUSINESSES (mean)	3.00	2.54	2.56

Source: Authors’ own processing based on processing of the collected data

leading to an intensified visitor experience (Buhalis et al., 2023a). At the same time, tourism businesses and service providers should leverage the metaverse to create personalized virtual and physical experiences that take into account multiple avatars or user profiles (Koo et al., 2023). By encouraging potential visitors to try out products and services in the online environment of the metaverse, tourism service providers can showcase the unique features of their facilities and destinations, thereby inspiring interest in trying these products, services, and ultimately visiting the destinations in real life (Chen & Yao, 2022; Tsai, 2024). However, the metaverse technologies and their use in tourism are still in their infancy. Besides the barriers to the implementation of smart technologies, there are specific barriers to metaverse implementation. They are usage barriers (inconvenience and unclear content), value barriers (high cost of technology), risk barriers (lack of trust), traditional barriers (unpleasant experience), image barriers (difficulty to use), technology vulnerability barriers (technology anxiety), and ideological barriers (skepticism) (Sowmya et al., 2024). From a technological perspective, these barriers can be reduced by improving graphics, implementing better sensors (including touch, taste, smell, and temperature), and introducing better interactivity, more intuitive interfaces, and easier, user-friendly navigation within the virtual environment.

Data Collection and Sharing by Businesses

Smart technologies enable data collection and processing. Data on tourists are crucial for tourism businesses. Up to 77% of the analyzed businesses collect basic data about tourists (name, age, gender, and email). These data are used for demographic segmentation and contacting tourists to gather feedback and motivate them to reuse services. More than half of the analyzed businesses collect data on tourist spending as a basis for RM. Only 26% of businesses are interested in preferences (hobbies and interests), which serve as the basis for creating personalized products.

One-fourth of the businesses also collect other data, most commonly website data (Fig. 15.9). In hotels, the other data includes guest movement within the hotel and booking methods. Travel agencies collect data on the popularity of destinations. Cable car businesses collect data on the travelled distance, while thermal pools and water parks collect data on attraction popularity. Such data enable tourism businesses to predict demand for their services, optimize offerings (e.g., website content), and prepare tailored products. They also allow for injecting a dynamic element into business marketing, positively influencing their competitiveness.

Data about the external environment is also crucial. Business managers should monitor the environment in which their business operates in order to proactively adapt their decisions to changing circumstances. The analyzed businesses most commonly monitor the pricing policies of their competitors (Fig. 15.10). They also collect data on the organization of major events in their vicinity. These events positively influence the demand for business services. Up to 59% of the analyzed businesses monitor the key performance indicators of competing businesses. These typically include occupancy rates, reservations, and revenues. Sources of information include online travel agencies and GDSs. Aggregated data on accommodation and transportation reservations, event organization within the destination, and holidays and festivals in the vicinity are important data inputs for RM as they provide information on anticipated demand. To a lesser extent, tourism businesses gather data on market trends, the security situation at the destination, long-term weather forecasts, and transportation price developments. This data is stored in their internal systems. However, the smart hospitality framework requires full integration of internal and external applications, cloud-based data exchange, and access to both real-time and historical data from internal and external sources (Buhalis & Leung, 2018; Buhalis et al., 2023b).

When implementing the smart approach in tourism businesses, the exchange of data, information, and knowledge among these businesses is also crucial. Therefore, the analyzed businesses were asked to provide the main barriers to data sharing. The most significant barriers to data sharing in tourism businesses are the lack of trust, fear of data misuse, and reluctance to communicate. These barriers can be overcome by higher participation of businesses in tourism data spaces. The most important role is played by destination management organizations and event organizers. Tourism businesses generate knowledge, but they are not considered the most important stakeholders. These findings support the research of Raisi et al. (2020), who state that small- and medium-sized businesses are not central actors in knowledge sharing and rely on a limited number of hubs. For this reason, it is necessary to stimulate their cooperation and trust in order to expand the flow of knowledge and promote the smart tourism development.

The establishment of a data space within the tourism sector has the potential to foster a culture of data sharing among stakeholders (DATES, 2023). These dynamic data ecosystems enable the exchange and flow of data between diverse actors, including public authorities, tourism businesses, and tourists themselves (European Commission, 2023). As part of its broader European Data Strategy, the European Commission seeks to develop a common European tourism data space, with the

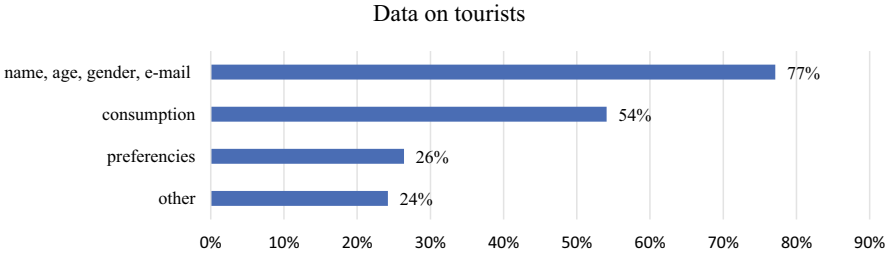


Fig. 15.9 The most important data on tourists in tourism businesses. (Source: Authors’ own processing based on processing of the collected data)

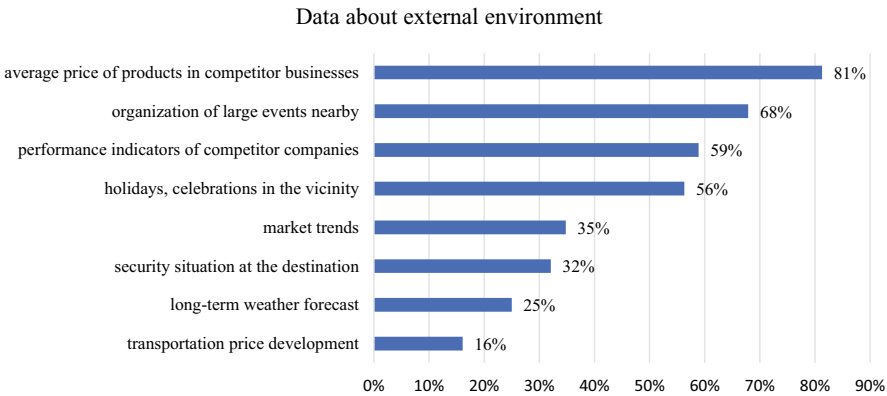


Fig. 15.10 The most important data about the external environment in tourism businesses. (Source: Authors’ own processing based on the processing of the collected data)

objective of building trust among participants, encouraging collaboration and innovation, and supporting the creation of data-driven tourism policies, services, and products (Stienmetz & Kolomoyets, 2024). A critical challenge in the implementation of such a data space concerns the effective sharing of information, underscoring the importance of establishing clear governance frameworks, defining technical standards, and ensuring equitable participation and benefit-sharing among the involved stakeholders (Ordóñez-Martínez et al., 2024). The willingness to participate in tourism data space can be improved by peer learning activities, outsourcing of data analytical skills, and establishing data monetization schemes and interoperability standards (Gajdošík & Marciš, 2025).

15.5 Conclusions

The research discusses the under-researched area of smart tourism businesses. These businesses are often overlooked in discussions about smart tourism due to their slower adoption of technological innovations (see Ballina, 2022). Different types of tourism businesses prioritize different aspects of smart technologies, with some focusing on extrasensory experiences and others on hyper-personalized ones. In this context, the metaverse presents a significant opportunity for enriching tourist experiences and bridging physical and virtual realms, particularly for hotels, cultural facilities, and tour operators. Some tourists may be resistant to the introduction of smart technologies, requiring businesses to implement them in a calm manner that respects customers’ perspectives (Stankov et al., 2019). Moreover, the metaverse is still in its infancy, and several technical advancements are needed (e.g., improving graphics, better sensors, and interactivity) to fully embrace its potential.

Furthermore, data collection, including basic demographic data and preferences, is crucial for tourism businesses. However, there is room for improvement in collecting and utilizing more detailed data for personalization. Tourism businesses face several barriers in data sharing, mainly a lack of trust, fear of data misuse, and reluctance to communicate. These barriers can be overcome by promoting the participation of businesses in the tourism data space.

The presented findings point toward the metaverse and the emerging concept of the tourism data space as key technological frameworks with significant potential to stimulate the smart tourism businesses (Fig. 15.11). The metaverse, through improved graphics, better sensors, and interactivity, offers new avenues for enhancing tourist engagement, co-creating experiences, and bridging physical and virtual

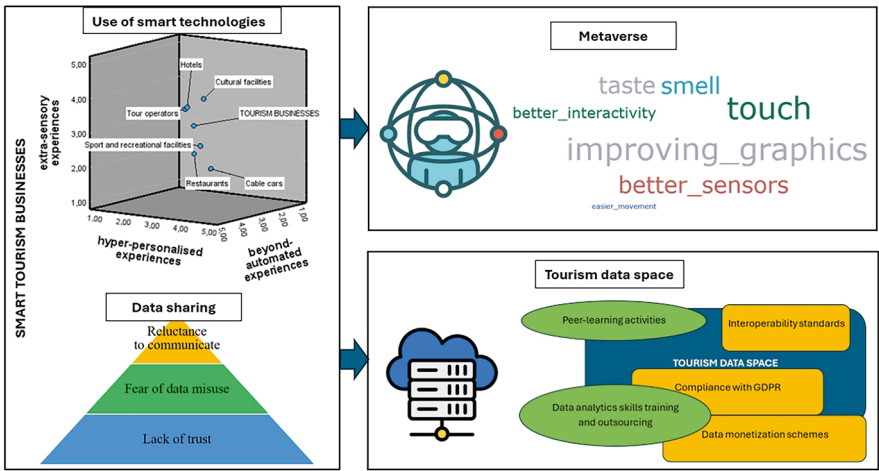


Fig. 15.11 Metaverse and tourism data space fostering smart tourism businesses. (Source: Authors’ own processing)

tourism services. Simultaneously, the development of a tourism data space fosters a structured and interoperable environment for data sharing among stakeholders. Integrating peer-learning activities and training in data analytic skills facilitates evidence-based decision-making. Together, these frameworks represent a shift toward more connected, data-driven, and experience-oriented tourism business models.

Future research should explore strategies to foster higher collaboration, trust-building, and secure data practices within the tourism sector. Investigating how participation in tourism data spaces can reduce these concerns and enhance smart tourism development is essential. Additionally, further studies should analyze the practical integration of emerging technologies like the metaverse in different types of tourism businesses, as well as the long-term effects of smart technology adoption on tourist satisfaction and business performance.

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