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The City as a Service: Unlocking the Potential of Augmented Reality in Tourism and Hospitality

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Abstract: This chapter explores the profound transformation that augmented reality (AR) is bringing to the tourism and hospitality industry, conceptualizing cities as dynamic service ecosystems. At a time when digital technologies are constantly redefining urban experiences, AR is emerging as a central tool that is reshaping tourist interactions in urban spaces. The chapter focuses on the potential of AR to enhance visitor engagement through immersive and personalized experiences that blend harmoniously with the urban fabric. AR applications, ranging from interactive historical narratives to real-time navigation tools, offer diverse opportunities to enrich the tourism and hospitality sectors. The discourse also encompasses the practical use of AR in various hospitality settings, such as hotels and restaurants, highlighting the ways in which these innovations can enhance the guest experience. Furthermore, the chapter addresses the challenges and considerations associated with the adoption of AR technologies, including privacy issues and infrastructure requirements. Finally, this research highlights the importance of adopting AR as a transformative force that redefines cities as service-oriented hubs. This convergence of technology and hospitality paves the way for a new paradigm in urban tourism.

1. Introduction

Augmented reality (AR) technology is catalyzing a transformative change in the tourism and hospitality industry. The adoption of AR by these sectors is enabling them to provide customers with immersive experiences, enhanced entertainment and increased satisfaction. As urban tourism evolves, the concept of “City as a Service” has emerged, facilitating an easy and personalized relationship between tourists and the city. To better understand this relationship, the chapter explores how AR can realize the potential of the City as a Service in the context of tourism and hospitality.

The integration of AR in tourism coincides with broader technological advances in the industry, such as the use of smartphones, sensors, virtual reality, artificial intelligence, and big data. These technologies collectively contribute to increased interconnectivity and enriched visitor experiences, as discussed by Koo et al. (2019). The role of virtual and augmented reality applications in enabling virtual visits to destinations was particularly highlighted during the COVID-19 pandemic, providing safer alternatives for travelers, as noted by Mohanty et al. (2020).

In the tourism and hospitality industry, the incorporation of AR is seen as a critical step in enhancing the visitor experience. AR applications that create interactive and immersive experiences for tourists are recognized as key to unlocking the potential of destinations. This has led to the development of “smart destinations” that utilize innovative solutions, including dimensional services of the Smart City Wheel, to become more attractive, competitive, and hospitable (Boes et al., 2016). The innovative use of such services has been associated with increased tourist satisfaction and a greater likelihood of recommending these services to others.

The importance of AR has been particularly highlighted during the COVID-19 pandemic, sparking discussions about sustainable tourism and guiding the industry towards more

sustainable solutions through these technologies (Ben Youssef, 2020; Chang et al., 2020; Zeqiri et al., 2020; Ben Youssef and Zeqiri, 2022; Zeqiri, 2023; Craemer et al., 2023). AR has enabled virtual exploration of destinations, historical sites, and cultural landmarks, allowing people to engage with travel destinations from the comfort of their homes. This has not only maintained engagement with travel enthusiasts, but also reduced the environmental impact associated with physical travel.

As the tourism and hospitality industry continues to evolve, understanding the impact of service marketing strategies on its growth and development is essential (Pholphirul et al., 2021). A focus on how AR is transforming tourism experiences, especially in urban environments, and its impact on the hospitality industry is essential.

The chapter aims to introduce the concept of “The City as a Service” and how AR can be used to provide tourists with a more engaging and interactive experience. It discusses the various applications of AR in the industry, including virtual tours, interactive maps, and gamification, while addressing the challenges and opportunities they present.

The chapter is organized as follows: Section 2 introduces key concepts and definitions. Section 3 discusses the revolution of the City as a Service concept in tourism and hospitality through AR. Section 4 discusses the main challenges associated with the use of AR in urban tourism activities. Section 5 concludes with the main findings and recommendations derived from the chapter.

2. Main concepts and definitions

Digital technologies are considered General Purpose Technologies (GPTs)¹ that have the ability to impact entire economies and societies on a global scale. These technologies are

¹ GPTs are defined as “a single generic technology, recognizable as such over its whole lifetime, that initially has much scope for improvement and eventually comes to be widely used, to have many uses, and to have many spillover effects” (Lipsey et al., 2005, p. 98).

not made to serve one individual or one purpose (Ben Youssef, 2020), their impact is huge, and they need the right direction to show their potential to solve economic, social, and environmental problems.

Digitization involves the use of digital technologies and data, as well as interconnections that lead to new activities or changes in existing activities (OECD, 2019). Digital transformation is then *“a process that aims to improve an entity by causing significant changes in its properties through combinations of information, computing, communication and connectivity technologies”* (Vial, 2019). Digital transformation has generated a fierce debate among policymakers, economists, and industry leaders about its economic and societal implications (Dahmani, 2021).

On the other hand, the concept of Industry 4.0 refers to a new phase of the industrial revolution related to interconnectivity, automation, machine learning and real-time data processing. Industry 4.0 has been defined *“as a new stage of industrial maturity of product companies, based on the connectivity provided by the Industrial Internet of Things, where companies’ products and processes are interconnected and integrated to generate high value for both customers and businesses’ internal processes”* (Frank et al., 2019, p. 343). Industry 4.0, with its core technologies such as artificial intelligence, Internet of Things, robots, 3D printing, and virtual and augmented reality, is transforming the tourism and hospitality industry.

AR has created new opportunities for travelers and the hospitality industry in recent years. Travelers can share and exchange information and opinions with other travelers in large networks and receive more personalized services and benefits, such as navigation to specific locations (Kounavis et al., 2012). AR involves synchronizing real and virtual objects, combining real and virtual objects in a real environment, and enabling real-time and 3D interaction (van Krevelen and Poelman, 2010). There are different types of

augmented reality technologies (Nayyar et al., 2018). In marker-based AR, readers can sense visual markers and use a camera to scan physical images; markerless or GPS-based AR provides precise location data. Projection-based AR allows artificial light to be projected onto the surface of the real world, while superimposition-based AR allows an augmented view to replace the original view of the object partially or completely.

According to Joia and Kuhl (2019), a smart city is an innovative urban area that applies a holistic approach, integrating ICT and other methods to improve competitiveness, urban operations, and quality of life, while considering social, economic, and environmental factors. This definition is consistent with the idea that intelligent technologies are used to manage smart cities to improve the effectiveness and quality of services provided to residents (Chamoso et al., 2018). Smart city functions are becoming more commonplace as cities around the world adopt these technologies to improve services and quality of life for their citizens.

3. Revolutionizing the City as a Service for tourism and hospitality with augmented reality

AR has been recognized as a technology with the potential to significantly impact the tourism industry. The use of AR in tourism has been the subject of growing interest and discussion, particularly in relation to enhancing the tourist experience at cultural heritage sites (Jung et al., 2018). AR has been identified as a technology that can provide tourists with personalized content and services tailored to their specific needs, thereby enhancing the tourism experience. As the technology continues to evolve, the potential for AR in tourism is limitless, promising a future where travelers can explore the world in ways never before imagined. Embracing this technological revolution is not only beneficial for tourists, but also for destinations looking to thrive in the competitive global tourism

market. Its potential to transform the travel experience is huge, leading to a different way of experiencing travel and tourism activities.

AR has the ability to predict future urban changes, simplify them, and facilitate naturalistic interactions with the environment (Zeqiri et al., 2024). Thus, haptic feedback and audio displays can be combined with AR to provide a more engaging and immersive experience for visitors exploring urban environments (Wei et al., 2014; Ren et al., 2018). In addition to standard sightseeing, AR can also be used in urban tourism to inform visitors about disasters, integrate with social media, and create recommendation systems (Sasaki and Yamamoto, 2021). Below, we present some of the applications of AR in city tourism activities, as shown in Figure 1.

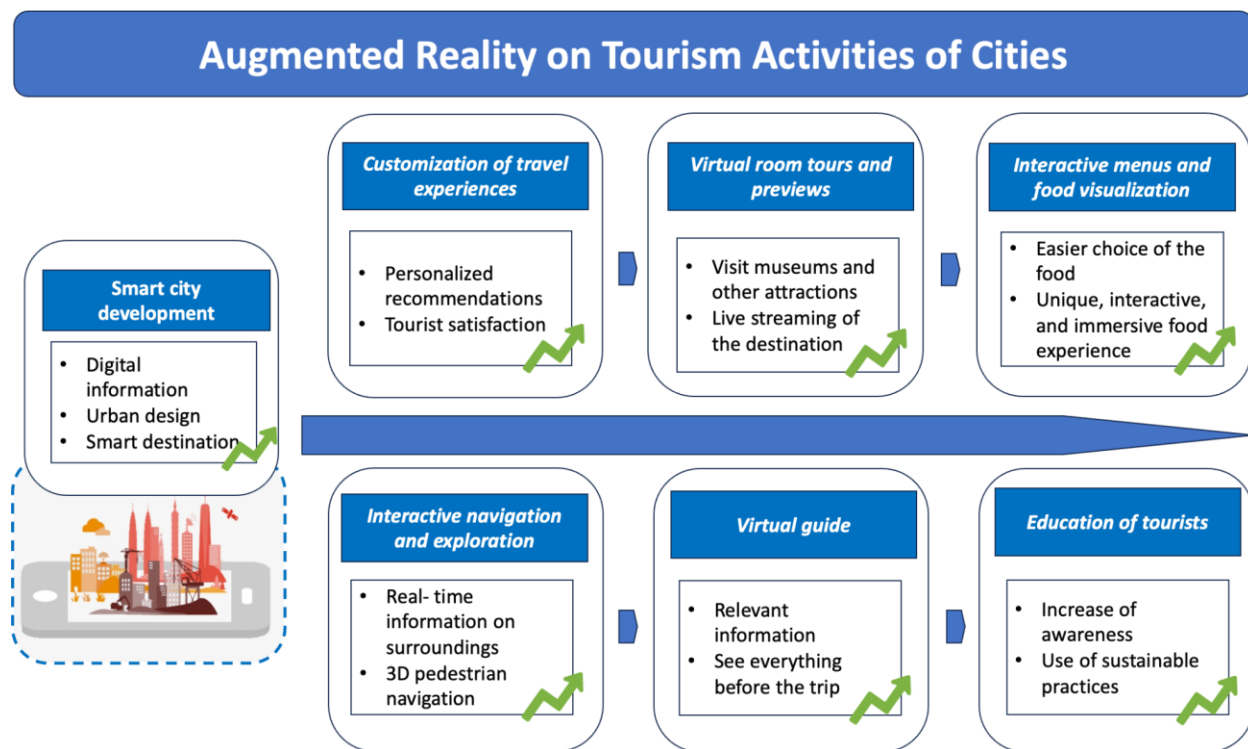


Figure 1. City as a Service using augmented reality for tourism activities

AR can be used for building recognition, information augmentation, location-based games, and urban planning, contributing to the development of smart cities (Wu et al.,

2021; Xu et al., 2021). AR can help people with mild memory problems or cognitive decline navigate urban areas by presenting information directly on their smartphones (Seifert & Schlomann, 2021). It can also overlay digital information on the real-world environment, creating mixed reality and augmenting useful information in cities (Rovira et al., 2020). When AR is complemented by embodied intelligent agents, it holds promise for supporting design evaluation and collaboration within design teams, helping to design the urban places to make them more attractive to tourists. Smart cities lead to more customized services for tourists.

AR enables the customization of travel experiences based on individual preferences. The customer experience is the combination of all the cues and touch points with an organization that create an overall experience. Tourists can use AR applications to customize their itineraries, receive personalized recommendations, and discover hidden attractions. This technology offers tourism organizations the opportunity to provide a wealth of travel information in a variety of ways, enhancing the overall travel experience. In addition, personalized AR tools can address the needs of tourists with special requirements, thereby improving accessibility in tourism. This level of personalization contributes to a more satisfying and memorable trip and influences the intention to use AR applications in a travel context in the future.

Indeed, virtual room tours and previews have become increasingly important in the tourism industry, especially in the context of the COVID-19 pandemic (Ben Youssef et al., 2022). In addition to being a new trend, the use of virtual tours is a practical tactic for maintaining economic stability in the midst of the pandemic (Zeqiri, 2023; Djunarto et al., 2022). One of the newest marketing strategies during the COVID-19 pandemic was the use of virtual tours to keep potential visitors interested in visiting tourist destinations once the situation has stabilized. In the post-COVID era, the tourism industry has indeed explored new avenues of development, such as virtual tourism and live-streaming

tourism, to revitalize the industry with the help of the Internet and innovative technologies. Moreover, virtual reality has been found to influence tourism consumers' attitudes and behavioral intentions, particularly during the pre-purchase and post-purchase phases of their journey (McLean & Barhorst, 2021). The use of virtual tours in cities is key for tourism activities, as it enhances the consumer experience and leads to innovative solutions.

Interactive menus and food visualization can significantly enhance the tourism experience, especially in the context of food tourism. The use of AR for interactive menus and food visualization offers new and innovative menus along with novel and participatory services to provide a unique, interactive and immersive food experience (Gómez-Rico et al., 2021). This is in line with the idea of moving discourses away from dominant concepts of visualism towards non-representational forms of knowledge in food tourism. Furthermore, the use of interactive digital menus has been highlighted as a means of explaining unfamiliar menu items, especially relevant for foreign travelers, thus overcoming communication barriers between diners and waiters (Labus & Jelovac, 2022). Food visualization and digital menus enhance the tourist experience, as people may be unfamiliar with the food of the city they are visiting. Seeing the food, the ingredients and the details can help them to make an easier decision about what to choose. Moreover, this is very important for over tourism cities, which face several challenges in providing timely service to tourists, especially during the tourist season.

AR enables interactive navigation and exploration for tourists. With AR-enabled devices, visitors can receive real-time information about their surroundings, historical landmarks, and points of interest. AR is also being used for navigation, which is considered one of the most exciting use cases for AR (Mahapatra et al., 2023). AR has been used for 3D pedestrian navigation, personalized tourist information, and on-site validation of utility infrastructure in the context of 3D city models (Ellul & Altenbuchner, 2014). With the

help of AR navigation, tourists can more easily explore the cities they are visiting. Since they are in a foreign place, the ability to explore and navigate through AR is crucial. This enhances the overall experience by providing contextual information and fostering a deeper connection between tourists and the destination.

AR acts as a virtual guide, overlaying relevant information on the physical environment. Tourists can access details about historical sites, cultural significance, and local attractions simply by pointing their devices at specific locations. This case was greatly enhanced during the COVID-19 pandemic. People could virtually visit museums and other destinations. With this development, tourists can see everything before deciding to physically visit the destination. This not only enriches the travel experience, but also empowers tourists with knowledge, fostering a greater appreciation for the destination.

AR has the potential to educate tourists about local culture and sustainable practices through virtual experiences. Visitors can use AR to witness historical events, explore cultural traditions, and engage in interactive learning experiences to learn about the historical side of the city they are visiting. Moreover, as a new technology (Ben Youssef et al., 2020), AR has the potential to enhance the tourist experience and act towards tourism sustainability (Mohanty et al., 2020). Several indications of the importance of the sustainability aspect can be seen in the AR applications. The educational aspect enhances the overall trip by promoting a deeper understanding of the destination's heritage and the importance of environmental issues.

The shift towards digital experiences in tourism has indeed led to the popularity of travel live streaming, virtual tours, and virtual experiences, indicating a transformative power in the tourism sector (Szabo, 2022). AR is indeed changing tourism planning and consumer requirements, with 3D visualizations, simulators, virtual tours, and previews playing an important role in effective planning. However, the adoption of AR in tourism

is influenced by various factors, including travelers' motivations, cultural differences, and long-term orientation. On the other hand, cities will be able to better manage over tourism and various other challenges thanks to new technologies that allow personalization of services and increase tourist satisfaction.

4. Challenges and barriers to adoption

AR has been recognized as a technology with the potential to enhance the tourism experience by providing personalized content and services tailored to the specific needs of tourists (Kounavis et al., 2012). However, the adoption of AR in the tourism context faces several challenges and barriers. These challenges vary from country to country and city to city and range from technological challenges to understanding the technology used. Below, as shown in Figure 2, some of the challenges faced in the adoption of AR in the tourism activities of cities are discussed.

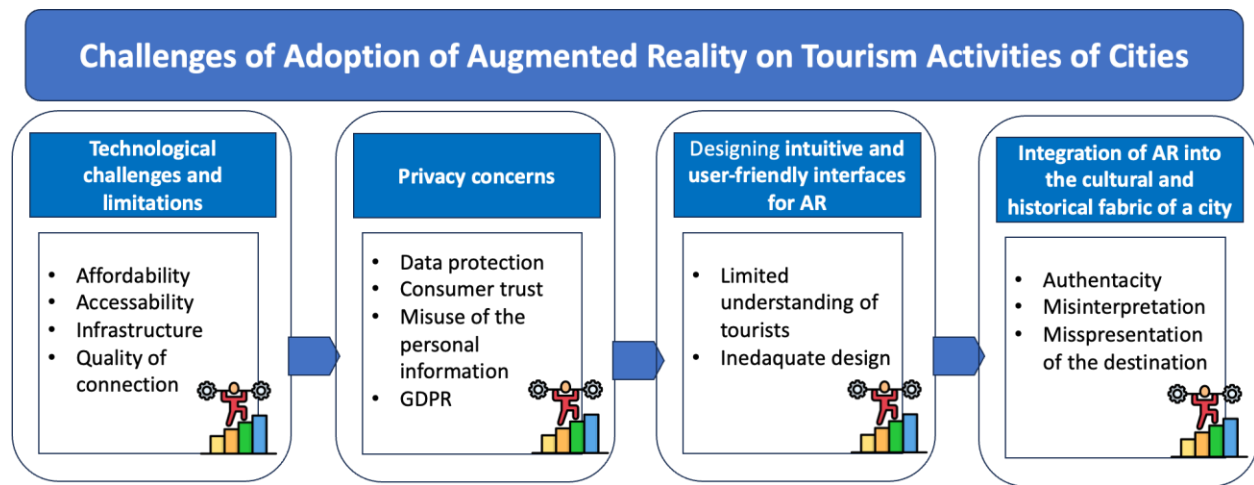


Figure 2. Challenges of Adoption of Augmented Reality on Tourism Activities of Cities

The technological challenges and limitations associated with implementing AR in tourism are often faced by multiple cities. AR relies heavily on hardware devices such as smartphones, tablets, and AR glasses. The effectiveness of AR experiences is limited by the capabilities of these devices. Limited processing power, battery life, and display

resolution can hinder the seamless integration of AR into tourism activities. In addition, the affordability and accessibility of AR-enabled devices are barriers to widespread adoption, limiting the reach of AR-enhanced tourism experiences. Therefore, the use of AR in tourism requires addressing issues related to the development and implementation of AR applications, including the need for user-friendly interfaces and seamlessly integrated devices (Özkul & Kumlu, 2019). On the other hand, the success of AR in tourism activities depends on a robust and high-speed network infrastructure. Real-time data streaming, location-based services, and seamless content delivery require a stable and fast internet connection. In many cities, especially in developing regions, inadequate network infrastructure can lead to lagging AR experiences, which detracts from the intended immersive nature of the technology.

Privacy concerns in the context of AR in tourism are an important issue that needs to be addressed in the context of smart cities (Alfouzan, 2022). The use of AR in smart tourism destinations raises concerns about the privacy of tourists' information, as the availability of big data to destinations and service providers may lead to privacy concerns (Zeqiri et al., 2021; Ben Youssef et al., 2021), affecting the sustainability and economic benefits of smart tourism destinations (Afolabi et al., 2021). Furthermore, the use of AR face filters has raised explicit privacy issues, but research suggests that privacy concerns may not necessarily negatively affect AR use, reflecting a potential "privacy paradox" (Cowan et al., 2021). The integration of AR in tourism requires comprehensive and context-specific research to ensure that tourists are making beneficial privacy choices, highlighting the need for privacy protection in the tourism industry (Tussyadiah et al., 2018). On the other hand, AR often involves the capture and processing of real-world images and data, which raises privacy concerns. Users may be reluctant to use AR applications due to concerns about misuse of personal information or intrusive data collection. Striking a balance

between providing personalized AR experiences and respecting user privacy is a critical challenge for developers and policymakers.

Designing intuitive and user-friendly interfaces for AR applications is challenging. At the same time, our understanding of user acceptance of AR in a tourism context is limited (Dieck & Jung, 2015). Balancing information overlays without overwhelming users, providing clear navigation cues, and ensuring a seamless transition between the real and augmented worlds requires careful consideration. Inadequate knowledge of how to use the technology can be an issue, as it may lead to a lack of intention to use AR. Poor design can lead to user frustration and hinder the adoption of AR in tourism activities.

Successfully integrating AR into the cultural and historical fabric of a city requires careful content curation. Aligning AR experiences with the authenticity of the destination, avoiding cultural insensitivity, and catering to diverse visitor profiles are complex challenges. Failure to strike this balance can lead to misinterpretation and misrepresentation, undermining the educational and immersive aspects of AR in tourism. AR applications often seek to overlay digital content onto physical environments. One of the challenges is maintaining the authenticity and integrity of historic sites and cultural landmarks. Striking a balance between innovation and preservation is critical to avoid diluting the true cultural and historical essence of the city. Overcoming the aforementioned technological barriers and constraints is critical to ensuring successful and widespread integration. The promotion of public safety concerns and compliance with local regulations can be barriers to the widespread implementation of augmented reality applications in the tourism industry. Only by carefully weighing these challenges can cities fully reap the benefits of AR while preserving their rich cultural and historical heritage and enhancing the visitor experience.

5. Conclusions and recommendations

5.1. Conclusions

This chapter explores the transformative impact of Augmented Reality (AR) on the travel and hospitality industry, with a particular focus on the idea of “City as a Service”. AR represents a significant technological advancement that enhances the visitor experience and drives the development of “smart” destinations. The integration of AR is particularly relevant in the context of the COVID-19 pandemic, offering virtual alternatives that maintain engagement while mitigating environmental impact. This is consistent with the broader trajectory of technological advancement.

The potential for AR in the tourism sector is vast, offering immersive and interactive experiences that redefine engagement. The innovative concept of “The City as a Service” is brought to life through AR, exemplified by creative applications such as the dimensions of the Smart City Wheel. These applications not only enhance the attractiveness and competitiveness of destinations, but also significantly increase visitor satisfaction. Additionally, AR fosters discussions on green travel strategies, aligning tourism with environmental sustainability.

The chapter highlights various AR applications in tourism, including virtual tours, interactive maps, gamification, and personalization, all of which contribute to a more tailored and memorable travel experience. During the pandemic, AR played a critical role by providing virtual room tours, interactive menus, and enhanced navigation and exploration to address pandemic-related challenges.

Despite its benefits, the adoption of AR in tourism is not without its challenges. Seamless integration is often hindered by technological limitations, particularly in terms of network infrastructure and device capabilities. Other concerns include user interface

design, privacy issues, and user acceptance. Successful AR implementation requires a delicate balance between innovation and preserving cultural and historical authenticity. Overcoming these challenges is essential for widespread adoption, ensuring that AR enhances rather than detracts from the unique experiences that cities offer.

Understanding and overcoming these obstacles is critical for destinations looking to thrive and compete in the global marketplace, especially as the tourism and hospitality sectors continue to evolve. The successful integration of AR could redefine the travel and hospitality landscape, offering unprecedented experiences while promoting sustainable and innovative tourism practices.

5.2. Recommendations

Based on the findings of this chapter, a number of recommendations emerge, each of which addresses specific aspects of AR in the context of tourism. Primarily, it is imperative that governments and relevant entities invest significantly in improving the technological infrastructure. This includes not only the widespread provision of AR-enabled devices, but also the establishment of robust Internet connectivity. The essence of delivering an uninterrupted augmented reality experience lies in the strength of the network infrastructure, which is critical to overcoming technological barriers such as latency issues. This will significantly improve the effectiveness of AR in travel-related applications.

Furthermore, there is a need to adopt regulatory measures that promote both the accessibility and affordability of AR-enabled devices. By addressing the challenge of limited device accessibility, the reach of AR-enhanced tourism experiences will be broadened, thereby promoting inclusivity and making these novel experiences available to a wider demographic.

Another key recommendation involves the formulation and implementation of a comprehensive privacy framework specifically tailored to augmented reality tourism applications. Addressing privacy concerns is a critical step in ensuring user trust. The development of prudent policies, coupled with effective enforcement mechanisms, is essential to ensure responsible data management and thereby reduce the likelihood of privacy breaches.

Finally, the establishment of guidelines for user-friendly interfaces in AR applications is crucial. These guidelines should aim to ensure a seamless and enjoyable user experience. To facilitate widespread adoption, the issue of design complexity must be addressed. By implementing clear standards, developers will be empowered to create interfaces that not only enhance the user experience, but also maintain simplicity and clarity to avoid overwhelming users.

References

Afolabi, O., Ozturen, A., & İlkan, M. (2021). Effects of privacy concern, risk, and information control in a smart tourism destination. *Economic Research-Ekonomiska Istraživanja*, 34(1), 3119-3138. <https://doi.org/10.1080/1331677x.2020.1867215>

Alfouzan, F. (2022). Augmented reality (AR) and cyber-security for smart cities—a systematic literature review. *Sensors*, 22(7), 2792. <https://doi.org/10.3390/s22072792>

Ben Youssef. (2020). How Can Industry 4.0 Contribute to Combatting Climate Change? *Revue D'Économie Industrielle*. Retrieved from <https://doi.org/10.4000/rei.8911>

Ben Youssef, A., & Zeqiri, A. (2022). Hospitality industry 4.0 and climate change. *Circular Economy and Sustainability*, 2(3), 1043–1063. <https://doi.org/10.1007/s43615-021-00141-x>

Ben Youssef, A., Dahmani, M., & Zeqiri, A. (2021). Do e-skills enhance use of e-services in the hospitality industry? A conditional mixed-process approach. *International Journal of Data and Network Science*, 5(4), 519–530. <https://doi.org/10.5267/j.ijdns.2021.8.015>

Ben Youssef, A., Redžepagić, S., & Zeqiri, A. (2022). The key changes to the hospitality business model under COVID-19. *Strategic Management*, 27(4), 55–64. <https://doi.org/10.5937/straman2200015y>

Ben Youssef, A., Zeqiri, A., & Dedaj B. (2020). Short and long run effects of COVID-19 on the hospitality industry and the potential effects on jet fuel markets. *IAEE Energy Forum*.

Boes, K., Buhalis, D., & Inversini, A. (2016). Smart tourism destinations: ecosystems for tourism destination competitiveness. *International Journal of Tourism Cities*, 2(2), 108-124. <https://doi.org/10.1108/ijtc-12-2015-0032>

Chamoso, P., González-Briones, A., Rodríguez, S., & Corchado, J. (2018). Tendencies of technologies and platforms in smart cities: a state-of-the-art review. *Wireless Communications and Mobile Computing*, 2018, 1-17. <https://doi.org/10.1155/2018/3086854>

Chang, C., McAleer, M., & Ramos, V. (2020). A charter for sustainable tourism after covid-19. *Sustainability*, 12(9), 3671. <https://doi.org/10.3390/su12093671>

Cowan, K., Javornik, A., & Jiang, P. (2021). Privacy concerns when using augmented reality face filters? Explaining why and when use avoidance occurs. *Psychology and Marketing*, 38(10), 1799-1813. <https://doi.org/10.1002/mar.21576>

Cranmer, E. E., tom Dieck, M. C., & Jung, T. (2023). The role of Augmented Reality for Sustainable Development: Evidence from cultural heritage tourism. *Tourism Management Perspectives*, 49, 101196. <https://doi.org/10.1016/j.tmp.2023.101196>

Dahmani, M. (2021). Determinants of the Digital Divide among French Higher Education Teachers. *South Asian Journal of Social Studies and Economics*, 10–28. <https://doi.org/10.9734/sajsse/2021/v12i330305>

Dieck, M., & Jung, T. (2015). A theoretical model of mobile augmented reality acceptance in urban heritage tourism. *Current Issues in Tourism*, 21(2), 154-174. <https://doi.org/10.1080/13683500.2015.1070801>

Djunarto, D., Subiyantoro, H., Sutrisno, S., & Lusia, V. (2022). Utilization of virtual tours as an effort to improve the Indonesian tourism sector in the new normal era. Retrieved from <https://doi.org/10.4108/eai.16-4-2022.2319716>

Ellul, C., & Altenbuchner, J. (2014). Investigating approaches to improving rendering performance of 3D city models on mobile devices. *Geo-Spatial Information Science*, 17(2), 73-84. <https://doi.org/10.1080/10095020.2013.866620>

Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341–351. <https://doi.org/10.1016/j.techfore.2019.01.014>

Gómez-Rico, M., Collado, A., Vijande, M., & Bilgihan, A. (2021). Motivations, self-congruity, and restaurant innovativeness as antecedents of a creative-food tourism experience: The moderating effect of first-time and repeat tourists. *British Food Journal*, 124(2), 406-429. <https://doi.org/10.1108/bfj-03-2021-0271>

Joia, L., & Kuhl, A. (2019). Smart city for development: A conceptual model for developing countries. Retrieved from https://doi.org/10.1007/978-3-030-19115-3_17

Jung, T., Lee, H., Chung, N., & Dieck, M. (2018). Cross-cultural differences in adopting mobile augmented reality at cultural heritage tourism sites. *International Journal of Contemporary Hospitality Management*, 30(3), 1621-1645. <https://doi.org/10.1108/ijchm-02-2017-0084>

Koo, C., Filho, L., & Buhalis, D. (2019). Guest editorial. *Tourism Review*, 74(1), 1-4. <https://doi.org/10.1108/tr-02-2019-208>

Kounavis, C., Kasimati, A., & Zamani, E. (2012). Enhancing the tourism experience through mobile augmented reality: Challenges and prospects. *International Journal of Engineering Business Management*, 4, 10. <https://doi.org/10.5772/51644>

Labus, P., & Jelovac, D. (2022). Restaurants: Applying an extended technology acceptance model. *Acta Turistica*, 34(1), 51-82. <https://doi.org/10.22598/at/2022.34.1.51>

Mahapatra, T., Tsiamitros, N., Rohr, A., Kailashnath, K., & Pipelidis, G. (2023). Pedestrian augmented reality navigator. *Sensors*, 23(4), 1816. <https://doi.org/10.3390/s23041816>

McLean, G., & Barhorst, J. (2021). Living the experience before you go . . . but did it meet expectations? The role of virtual reality during hotel bookings. *Journal of Travel Research*, 61(6), 1233-1251. <https://doi.org/10.1177/00472875211028313>

Mohanty, P., Hassan, A., & Ekis, E. (2020). Augmented reality for relaunching tourism post-COVID-19: Socially distant, virtually connected. *Worldwide Hospitality and Tourism Themes*, 12(6), 753-760. <https://doi.org/10.1108/whatt-07-2020-0073>

Nayyar, A., Mahapatra, B., Le, D. N., & Suseendran, G. (2018). Virtual reality (VR) and augmented reality (AR) technologies for tourism and hospitality industry. *International Journal of Engineering and Technology (UAE)*. <https://doi.org/10.14419/ijet.v7i2.21.11858>

OECD. (2019). *Going Digital: Shaping Policies, Improving Lives*. Retrieved from <https://doi.org/10.1787/9789264312012-en>

Özkul, E., & Kumlu, S. (2019). Augmented reality applications in tourism. *International Journal of Contemporary Tourism Research*. Retrieved from <https://doi.org/10.30625/ijctr.62519>

Pholphirul, P., Rukumnuaykit, P., Charoenrat, T., Kwanyou, A., & Srijamdee, K. (2021). Service marketing strategies and performances of tourism and hospitality enterprises: Implications from a small border province in Thailand. *Asia Pacific Journal of Marketing and Logistics*, 34(5), 887-905. <https://doi.org/10.1108/apjml-01-2021-0064>

Ren, G., Wei, S., O'Neill, E., & Chen, F. (2018). Towards the design of effective haptic and audio displays for augmented reality and mixed reality applications. *Advances in Multimedia*, 2018, 1-11. <https://doi.org/10.1155/2018/4517150>

Rovira, A., Schieck, A., Blume, P., & Julier, S. (2020). Guidance and surroundings awareness in outdoor handheld augmented reality. *Plos One*, 15(3), e0230518. <https://doi.org/10.1371/journal.pone.0230518>

Sasaki, R., & Yamamoto, K. (2021). Sightseeing navigation system from normal times to disaster outbreak times within urban tourist areas in Japan. *Applied Sciences*, 11(10), 4609. <https://doi.org/10.3390/app11104609>

Seifert, A., & Schlomann, A. (2021). The use of virtual and augmented reality by older adults: Potentials and challenges. *Frontiers in Virtual Reality*, 2. <https://doi.org/10.3389/frvir.2021.639718>

Szabo, R. (2022). COVID-19 as a transformative power in the inbound tourism of Japan. *Events and Tourism Review*, 5(2), 16-29. <https://doi.org/10.18060/26534>

Tussyadiah, I., Li, S., & Miller, G. (2018). Privacy protection in tourism: Where we are and where we should be heading for. In *The Routledge Handbook of Tourism Cities* (pp. 278-290). Routledge. https://doi.org/10.1007/978-3-030-05940-8_22

Van Krevelen, D. W. F., & Poelman, R. (2010). A survey of augmented reality technologies, applications and limitations. *International Journal of Virtual Reality*.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118-144.

Wei, S., Ren, G., & O'Neill, E. (2014). Haptic and audio displays for augmented reality tourism applications. *Proceedings of the IEEE Haptics Symposium 2014*. <https://doi.org/10.1109/haptics.2014.6775503>

Wu, Y., Che, W., & Huang, B. (2021). An improved 3D registration method of mobile augmented reality for urban built environment. *International Journal of Computer Games Technology*, 2021, 1-8. <https://doi.org/10.1155/2021/8810991>

Xu, Z., Qi, M., Wu, Y., Hao, X., & Yang, Y. (2021). City information modeling: State of the art. *Applied Sciences*, 11(19), 9333. <https://doi.org/10.3390/app11199333>

Zeqiri, A. (2023). Virtual tourism as a substitute for physical tourism during the COVID-19 pandemic. *Environmental Economics and Policy Studies*. <https://doi.org/10.1007/s10018-023-00382-0>

Zeqiri, A., Dahmani, M., & Ben Youssef, A. (2021). Determinants of the use of e-services in the hospitality industry in Kosovo. *International Journal of Data and Network Science*, 5(4), 369–382. <https://doi.org/10.5267/j.ijdns.2021.5.006>

Zeqiri, A., Dahmani, M., & Ben Youssef, A. (2020). Digitalization of the tourism industry: What are the impacts of the new wave of technologies? *Balkan Economic Review*, 2, 63-82.

Zeqiri, A., Dahmani, M., & Ben Youssef, A. (2024). Integrating augmented reality in urban development: Towards sustainable smart cities. In *Encyclopedia for Smart Cities*. Springer. Forthcoming.