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Tourism and Technological Innovations: the Impact of Augmented and Virtual Reality

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INTRODUCTION

Amidst the modern scenery of our technology-based society, when we consider going on holiday it is only natural to explore in detail what augmented and virtual reality (AR & VR) have for us. As these immersive technologies become more sophisticated and spread further, stakeholders in the tourism industry as well as governments should attempt to fully grasp their potential impact on this important sector of modern society. The complex dance of technology and tourism is a fascinating process constantly forming and reforming what tourists see, feel or live through at their destination. The AR and VR technologies, which unite virtual reality with physical life in a natural way, could change the whole process of taking holidays. Exploring Panoramic Travel involves recognizing the power of AR and VR to transform completely traditional models for travel planning or exploration. "Panoramic travel" typically refers to a type of travel experience or photography that involves capturing or experiencing wide-angle views of landscapes, cityscapes, or other scenic locations. Panoramic travel can be enriched by both AR and VR. VR enables users to immerse themselves in 360-degree virtual environments, experiencing panoramic views remotely or virtually touring iconic destinations. AR, on the other hand, enhances the on-site experience by overlaying digital information onto the real-world view, providing travelers with additional details about their surroundings and interactive guides. With the advent of immersive virtual experiences, anyone can now virtually visit and explore destinations-places to stay as well as places to see. This not only optimizes the pre-trip decision making process, it also allows people to design their travel plans based on a more detailed knowledge of what they can expect from a place.

In addition, the application of AR and VR in tourism is not limited to planning; it has spilled over into actual travel. AR plays a crucial role in the planning phase of panoramic travel by providing users with interactive and informative experiences. Travelers can use AR applications on their smartphones or AR glasses to preview and plan their trips. AR can overlay digital information onto the physical world, helping users explore potential destinations. Travelers can also experience simulated environments using VR and feel a greater sense of immersion in the cultural or historical significance surrounding them. This could enhance the entire travel experience by increasing one's sense of attachment to the destination and its culture. Understanding the need to adopt AR and VR technologies and to getting a clearer picture of this phenomenon, helps us to understand any tourist of today, who can be considered a new tech-minded traveler. In fact, the tourists are calling for more than the classic seaside idyll. They want innovation, personalization and an integration of the

digital with physical worlds (Kumar et al., 2022). These high expectations can be met in a profound way through use of the AR and VR technologies, which bring about an entirely new model for how stakeholders experience their audiences.

Accommodations are the backbone of tourism. Combining AR and VR technologies will take this aspect to a whole new level. Think of a hotel in which guests can experience different rooms, get an idea what the service is like and know how to make use of all virtual experiences before setting foot inside. VR allows users to transport themselves into simulated scenes, previewing the spectacular views from their room or experiencing what it's like in front of restaurant. Moreover, hotel interior navigation assisted by AR can make guests more comfortable. Digital overlays can steer guests to their rooms, point out points of interest and let visitors get up-to-the minute information about on-site happenings or promotions. These levels of interactivity not only add to guest satisfaction but also distinguish competitive accommodations.

AR and VR technology may be used to provide educational attractions ranging from historical sites to mini amusement parks. Historical information can be projected using AR in a guided tour and also interactive maps of the location being visited. Visitors will in so doing get to learn more of what they are seeing before their bare eyes. Virtual reality extends possibilities of time travel virtually allowing the tourist to view the historical events or tour the landmarks as they were when they originally happened. Especially in theme parks where VR can be used as a complementary tool to enhance ride experiences. Imagine a roller coaster with a VR headset that becomes the ride of your life in this fantasy world. This not only adds another level of excitement, but gives attractions the ability to change and update experiences without having to make huge physical changes.

For tour operators, this means that AR and VR technologies unlock a world of possibilities in crafting one-of-a kind experiences. Thanks to mobile apps fitted with AR technology, real time information can be given for points of interest during guided tours hence bettering participants level of education. With VR, the potential traveler can take a look at the tour live before he embarks on it. A tourist will be more informed and has a much deeper sense of belonging to this land before they had set out from their homes. Furthermore, in the context of a cultural experience, tour operators can make use of AR technologies. Consider glasses that display AR. With this, they will be able to real-time translating the street sign, menu, breaking down the language walls in order to help foreign tourists have more immersive local life. They not only respond to the wishes of modern tourists, but also make tour operators front runners in their industry. But it is as prominent aim for the

governments and regulators to keenly monitor the integration of these technologies, so that they are used ethically and responsibly. AR and VR gradually integrate into the tourism environment, it becomes imperative to prioritize serious considerations related to data privacy, cultural sensitivity, and environmental impact. The adoption of AR and VR technologies in the tourism industry introduces new dimensions of user engagement and immersive experiences. However, the collection and utilization of personal data for AR and VR applications raise concerns about privacy. Ensuring robust data protection measures, transparent data policies, and obtaining informed consent from users are essential to address these privacy challenges. Additionally, as these technologies offer virtual representations of real-world locations and cultural sites, careful attention must be paid to cultural sensitivity.

Which is to say, this report explores several aspects of AR and VR that affect the tourism industry. By unravelling its various facets in terms of user experience (UX), destination marketing, cultural preservation etc., I hope to gain a better understanding as well as drawing up strategic plans for utilizing AR/VR technologies with practical realities into consideration. Examining the advantages and disadvantages with care, this study aims to offer fresh perspectives that can guide stakeholders in the industry, policymakers and businesses themselves. The broader aim is to study the application potential of AR and VR in tourism, as well as possible obstacles they will encounter before becoming popular for improving sustainable and satisfying consumer travel experiences.

This study is based on a more profound narrative of the AR and VR technologies. What ends up with is then a simulated digital world that can be completely divorced from the physical one. This research therefore seeks to explore original endowments of AR and VR and also their potentiality in redefining the tourism scene.

To give a full picture, the study also considers what problems and restrictions can be faced while using AR and VR in the tourist industry. Probable convenience, technological infrastructure, cost and possible negative effects on the validity of the trip experience are also taken into account. Finding and understanding these flaws is important towards coming up with ways of dealing with the problems, improving the situation, making AR and VR more applicable and acceptable in general. The study also brings out the specific focal areas of user experience, location marketing and culture protection. This would ensure that the study is narrowed down and focused thereby enabling us to find out more on how AR and VR affect these critical components of the tourism business.

This thesis is based on the assumption that AR and VR can change the tourist business in ways impossible to be imagined before. By investigating the advantages and disadvantages, this study tries to build up a full story that is beyond looking forward to only the obvious effects. Despite a few problems, the thesis states that the combination of AR and VR can make the vacation more enjoyable and long lasting in case it is done carefully and wisely.

A mix of both theories, actual data as well as case studies will be employed throughout the research for providing a strong base to the thesis. The study therefore combines the existing knowledge with the new findings hence adding into the academic conversation of how technology and tourism can work together.

CHAPTER 1

LITERATURE REVIEW

This section will look at literatures revolving around AR and VR technologies in the tourism industry. The theories introduced in this section will also be looked into in-depth. The Technology Acceptance Model (TAM) provides a psychological framework for individuals' decisions to adopt technology, emphasizing perceived usefulness and ease of use. Its extended counterpart, the Unified Theory of Acceptance and Use of Technology (UTAUT), broadens the scope by introducing elements like performance expectation and effort expectancy. Innovation Diffusion Theory (IDT) underlines the influence of diffusion channels and opinion leaders in the spread of innovations. In the complex realm of tourism consumer behavior, understanding factors shaping decisions is crucial for businesses. Motivations, whether intrinsic (such as relaxation and adventure) or extrinsic (related to culture and self-improvement), play a central role in influencing tourists' choices, highlighting the multifaceted nature of consumer behavior in the tourism industry.

1.1 Travel Industry Technological Developments

The change that the travel industry has underwent witnesses the remarkable adaptation spurred by the unrelenting pace of technological innovation. The tangible paper tickets and hand-crafted itineraries that once dominated the space stand as stark contrasts to the landscape of travel in recent decades. This literature review aims to articulate the profound shifts within the tourism industry, examine the pivotal trends which have altered not only in the way people get around the world but even more how it has dramatically affected various aspects of the travel experience. Moreover, it penetrates the frontiers of new technologies in its explorations and projects their potential influence on the future trajectory of the travel sector.

Not so far ago travelers were making their way armed with physical tickets and detailed schedules elaborated manually onto paper not forgetting books with travel guides and brochures of destinations. However, the advent of digitalization marked a watershed moment known with an introduction to a new era characterized by electronic ticketing systems, online platforms for booking tickets, automatic retrieval of information that had traditionally been done manually. It further streamlined the travel experience for the users who can now gain access to real-time information, get alert as well as make quick changes on the go through mobile applications. These developments in the years would have not only

increased the ease of travel of people using such services but would also mean the increase in operational efficiency for the service providers.

Big data, in the context of tourism, refers to the massive volume of structured and unstructured data generated by electronic devices and various digital platforms in the travel industry. It encompasses a vast and complex dataset that includes information such as travel bookings, social media interactions, location data, online reviews, and more. The advent of electronic devices, from smartphones to wearables, has empowered stakeholders in the tourism sector to collect an unprecedented amount of information about tourists. The rise of big data analytics has provided the travel industry with invaluable knowledge about consumer behavior, preferences, and trends that are able to be turned to their advantage.

Availability of AR and VR technologies have led to the supply of immersive experiences attached to the travel industry. Potential travelers can now explore destinations, hotels, and attractions virtually before making decisions, offering a preview which goes beyond the traditional static images (Brandão et al., 2019). This not only helps in decision-making but it could also be a marketing tool for the destinations and accommodations.

The blockchain technology, particularly in the transaction and security area, seems to have been an additional game-changer. Smart contracts within the framework of the technology can enhance frictionless, transparent, and secured transactions less prone to fraud hence promoting trust within the travel network. This would have consequences not only for payment processes but also for management of loyalty programs or for verification of travel credentials.

With the evolution of artificial intelligence (AI), virtual assistants and chatbots have in fact been already embedded into the customer service in the travel industry. Such AI-powered interfaces will provide real-time answers to queries, help through the booking procedure, and offer real-time support all through the journey. When further advanced, then it starts becoming very exciting as one of the further sophisticated developments that might be expected in the future includes predictive analytics for travel disruptions. Looking forward, literature also ventures into the horizon of new emerging technologies awaited to revolutionize the travel industry. This ranges from biometrics improvements for more seamless and secure identification procedures and the incorporation of 5G connectivity that offers quicker internet services with better connectivity for travelers.

1.2 Digitalization and Personalization

With the advent of the internet came a paradigm shift on how people approach travel, ushering in an era characterized by convenience like none other. Many traditional means of booking and planning hence succumbed to the digital wave, with its simplified processes as well as increased competition, which emanated mostly from Online Travel Agencies (OTAs) spearheaded by Expedia and Booking.com. Such platforms ennobled to be a game-changer that empowered travelers with user-friendly interfaces, comprehensive information and left open price competitive environment so far as for the users to choose wisely.

However, this evolution didn't stop here but moved quite swiftly with mobile applications, in particular to render the entire travel experience into something of a mobile-centric on-the-go endeavor. To that effect, these apps end up being invaluable tools to allow their users to make a real time booking, manage an itinerary, or even offer some critical destination information. Not only has the efficiency of travel increased by leaps and bounds but the mobile apps have also brought in a sense of being empowered among users, giving them ease to navigate their journeys like never before.

Since then, search engines and the rise of metasearch platforms figured in on the action, with these platforms using big data and artificial intelligence to analyze everything from user preferences to general travel patterns over time. This makes the recommendations regarding flights, accommodations, and activities highly individualized and reflective of the person's preference based on past travels. Studies conducted by Wong et al. (2021) have identified that such sort of personalization is identified as a crucial element that would shower customer satisfaction derived after achieving booking conversions.

The reason why personalization is an asset in the travel industry is based on research done by Campbell et al. (2019). Harnessing big data and AI, travel platforms would simply make suggestions beyond the common approach through grouping travel packages that each individual would specifically prefer based on their unique preferences. Employing machine learning algorithms, a travel platform can analyze a user's historical data, including past destination choices, travel preferences, and online interactions. By implementing collaborative filtering and predictive modeling techniques, the platform can not only recommend coastal getaways based on the traveler's demonstrated interest in beach destinations but also predict potential preferences for specific coastal features, such as secluded beaches or vibrant nightlife. This personalized approach goes beyond simple historical patterns, utilizing sophisticated algorithms to anticipate nuanced preferences, ultimately providing a highly tailored and anticipatory travel experience. Such advanced

personalization not only caters to the diverse needs of travelers but also fosters a stronger sense of belongingness and loyalty by consistently delivering recommendations that align with the individual's evolving travel interests. This personalized approach does not only address the diversified needs of travelers but also increases a sense of belongingness and loyalty.

The impact of personalization towards customer satisfaction is evident by the smooth path and personalized experience that the users are able to enjoy today. The convenience of streamlined booking processes, coupled with the ability to get recommendations in line with individual tastes takes the overall positive perception of the travel platform forward. Adding to that outcome, a heightened inclination towards booking conversions due to personalized recommendations is telling about influencing travel decisions in general.

1.3 Uninterrupted Contactless Experience

The global pandemic, COVID-19, led to an unparalleled reevaluation of traditional touch-based experiences, causing industries in general, and travel in particular, to pragmatically adopt contactless solutions as the first item on their agenda. It endeavours minimizing physical touch points not only addresses health and safety concerns but has ushered in an era of efficiency and enhanced guest satisfaction. In fact, technological innovations have emerged, completely changing the earlier dimensions of travel experiences and hospitality services (Wut et al., 2021). In the scenario of airport security and hotel check-in with the help of technology, somehow facial recognition has come to the fore. Facial recognition ensures the process of verification is not only fast mitigated from contact to surfaces such as boarding passes or room keys. In similar fashion, smartphone keys are another ubiquitous element that makes it easier on travelers, contactless access to their accommodation without the longing for a plastic key card. Such technologies of contactless do not only quicken check-in processes but also enhance the level of security and cleanliness (Wut et al., 2021). Digital wallets have come as significant to tracking financial transactions, thereby replacing physical currency or credit cards. One can use them to pay for his flight ticket to settling bills at the hotels with just a tap on the phone. That also decreases the virus transmission risk due to cash and card handling but also brings a convenience factor for those specifying guests preferring for a seamless touch-free payment experience.

The present day is witnessing AI-powered chatbots that are deployed to help travelers with continuous and instant support. The chatbots work round the clock to answer questions, provide information, and even go to the extent of making bookings without feeling the need for direct contact with a human. This not only helps to ensure timely support to the travelers

but also lends efficiency towards customer-service operations (Wut et al., 2021). Smart sensors have been implemented inside hotel rooms in a way that it creates touchless guest experience. Such sensors will be able to automatically set the room climate by adjusting temperature levels according to occupancy levels and preference of the people for better comfort with minimum physical interaction of guests with thermostats. In a similar vein, smart lighting can be controlled if needed through voice command or gesture system so that guests could manipulate ambiance without touching a switch.

Research by Wut et al. (2021) highlights the emergent preferences of contactless solutions within the travel and hospitality industry. This study underscores the potential efficiencies and guest experience that may be realized from the wide deployment of these technologies, in addition to enhanced health and safety awareness. Travelers are demanding more ease in travel with reduced physical touch points as part of the larger demand for a more hygienic and seamless experience. Whilst the world continues to battle through the challenges presented by the ongoing pandemic, it would appear that contactless solutions in the travel industry are set to be integrated even beyond health concerns. From facial recognition and keys on a smartphone to digital wallets AI-powered chatbots, and even smart sensors, the convergence of strides in technology introduces an increasingly frictionless experience for guests – heralding a new era of completely touchless travel and travel and hospitality.

1.4 Virtual Experiences and Immersive Technologies

The advent of what is termed as AR and VR has heralded a new era associated with travel marketing and destination exploration, leading to a newfound dimension in the experience of prospective travelers thereby changing how the customers relate through destinations across the world. These technologies provide engaging and immersive experiences beyond those of conventional marketing approaches - allowing users a sneak preview un-reproducible with the standard photograph and text-based presentations. AR is a technology that superimposes computer-generated content, such as images, sounds, or information, onto the real-world environment in real-time. AR enhances the user's perception of the physical world by overlaying digital elements, allowing users to interact with both the real and virtual worlds simultaneously. This is typically achieved through the use of devices like smartphones, tablets, AR glasses, or headsets.

VR is a technology that immerses users in a computer-generated environment, isolating them from the physical world. VR often involves the use of specialized headsets or goggles that provide a fully immersive experience by simulating a three-dimensional

environment. Users can explore and interact with this synthetic environment as if it were real, creating a sense of presence and engagement.

Mixed Reality (MR) is an overarching term that encompasses both AR and VR, describing environments where physical and digital elements coexist and interact in real-time. MR integrates virtual content into the user's perception of the real world, allowing for a seamless blend of the physical and digital. In MR experiences, users can interact with virtual objects that appear anchored in the real world, creating a more immersive and dynamic interaction compared to traditional AR or VR.

VR tours are one type of application that has been arising to be particularly impactful, allowing the user to go on these virtual trips across the hotels, attractions and landscapes. The technology allows travelers to inhabit a destination and tour the destination, striving to get insights back home on the destinations they want to travel and have a 'taste before purchase' (Stylos, 2021). The virtual tours give a preview of what users expect in the exact ambiance, condition, or even the services offered at a destination, which greatly influences the decision-making process on travel. Whether to be walking through the crowded lobby of a hotel or standing atop a scenic viewpoint, the viewer of VR tour has much more presence than whatever traditional promotional material could offer.

AR technology augments real-world exploration, however, by overlaying digital information and experiences on smartphone screens. Travelers can make use of AR applications to get information in real-time about their environments, such as historical facts, points of interest, or reviews for restaurants, directly on their mobile devices (Stylos, 2021). This augmentation of the reality enhances the travel experience for the users giving them a layer of the contextual information that has more depth and engagement in exploring. For example, holding a smartphone in front of a landmark may trigger AR annotations giving historical information or interactive enhancements offering a richer and more enlightening experience.

According to Stylos (2021), the research indicates a high potential of the AR and VR technologies in the positive influence that they bring to the travel industry. These technologies are capable not only of concentrating prospective travelers' attention but also, in fact, boosting the booking rate and enriching the overall travel commitment. The involvement that offers VR tours as well as the real-time of AR data are known to contribute comparatively better informed and emotional decision in favor of making a trip.

The study emphasizes that implementing AR and VR technologies are in accordance with the changing needs of today's travelers, who demand interactive as well as customized experiences during the course of their travel. The virtual experience of a destination before booking surely enhances the level of confidence and satisfaction among travelers. Besides, enriched exploration in AR ensures that the individual travelers have a chance to explore in detail all the cultural, historical information about a given travel destination hence experience the informed traveling.

1.5 Emerging Technologies and the Future Travel

Blockchain technology as mentioned in the previous chapter has become one of the forefront disruptive forces in the travel industry with data security features and transparency. Essentially, with decentralization and tamper-proof capabilities, blockchain has the potential to change many aspects of travel from secure ticket purchases to identity verification. With the use of blockchain, the respective travel companies will enhance their security in the transactions, reducing to the minimum point the possibilities of fraud, and thus creating a transparent system that will increase the levels of trust by users (Kumar et al., 2022). These immutable records of transactions would ensure that be it ticket details or traveler identities for instance all critical information is securely stored and can be easily proved. This streamlines the process but also takes care of data privacy and security concerns in the travel-ecosystem.

The idea of the metaverse, a virtual world where users can travel through avatars, has great potential to wholly transform experiences in social travel. Metaverse would offer a chance for remote interaction, and exploration by connecting to the desired destinations and other travelers in virtual space with further technology advancements (Kumar et al., 2022). AR and VR serve as foundational technologies that contribute to the development and evolution of the metaverse. The metaverse is a collective virtual space that encompasses the sum of all augmented and virtual realities, where users can engage with a persistent, shared, and immersive digital environment. AR enriches the real world with digital information, providing an overlay of contextual data, while VR immerses users in entirely virtual environments. Both AR and VR play integral roles in shaping the metaverse, where users can seamlessly transition between augmented and virtual experiences.

The metaverse represents a convergence of real and virtual worlds, offering a dynamic, interconnected space for social interaction, commerce, and entertainment. Mixed Reality (MR), which blends aspects of both AR and VR, becomes particularly relevant in the metaverse context. In the metaverse, users can navigate through augmented spaces enriched

with digital information or dive into fully immersive virtual realms using VR devices. As technology advances, the metaverse holds the promise of becoming a more seamless, interconnected, and immersive digital universe. With AR enhancing real-world interactions, VR providing immersive escapes, and the metaverse combining these experiences into a cohesive digital realm, these technologies collectively redefine how individuals engage with digital content, each other, and the evolving landscape of our interconnected, digital future.

Travel technologies on sustainable development have become rapidly popular as the level of awareness regarding responsible tourism increases. Eco-friendly practices not only considered on destination preferences but extended to means of travel and aspects of accommodation. Electric vehicles (EVs) are emerging in transport facilities as fundamental sources that have contributed to reducing carbon footprints. In addition, sustainable and environmentally friendly building materials allow hotels and resorts to tap in on a growing trend in responsible travel. The strategies appeal to a more and more critical section of travelers concerned with the environmental footprint their travels make.

1.6 Challenges and Concerns

While the progress of technology in the travel industry brings a lot to the table, it also has a myriad of challenges that come with it while needing very careful handling too. Chief among them are issues pertaining to data privacy and artificial intelligence – AI. Data privacy is a paramount concern as travel companies harness vast pools of personal information in the aim to enhance user experiences and tailor services. Responsible use and handling of this data proves crucial in winning and maintaining trust among travelers. Companies need to ensure that they maintain transparency in their data practices, ensuring that users are well aware of how the given information is collected, stored, and used. Striking a balance between personalization and privacy will help avoid encroaching into the prohibited lines, which could easily lead to misuse of sensitive data.

As the primary facilitator of personalized travel experiences, artificial intelligence (AI) may also exacerbate prejudice. Indeed, algorithms can develop unconscious biases and even reproduce or enhance existing inbuilt prejudices in pricing, recommendations, and service delivery. Addressing AI bias requires continuous attention, ethical guidelines, and broad-based input into the development phase in order to deliver fair outcomes which are void of biases. Industry players must take a proactive stance in addressing biases and ensuring inclusivity of their practice while they deploy AI technologies.

On the other side, studies by (Jami Pour & Karimi, 2023) and (Labanauskaitė et al., 2020), identified the opportunities and challenges brought over by these emerging technologies in influencing the future of travel. This research is based on the way that blockchain introduces a transformational approach to data management and security within the travel industry. The research further seeks to investigate how, the metaverse can reshape social interactions and experiences of travel, providing insight over such dynamics of virtual exploration towards building communities. Moreover, the research emphasizes further the growing significance of sustainable travel technologies in a manner that it will gain vital information on issues pertaining the adoption of eco-friendly practices, challenges and implications in the travel industry.

As the travel industry continues to develop, these advancing technologies have promised to change fundamentally how people are interacting with and experiencing travel.

The other key challenge is that of cybersecurity. With more travel companies and people turning to the use of technology in bookings, payments or even for communication purposes, the risk of attacks associated with cybersecurity hikes. Sensible information revolving around traveling such as personal identifications and financial information ought to be safeguarded off from access by unauthorized persons. Strong encryption protocols, secure payment gateways and the routine system audits are required cyber security measures in order to guard against cybersecurity threats and also to secure the integrity of the travel ecosystem.

In addition to considerations about digital exclusion, it is important to acknowledge and address concerns related to the potential manipulation of decision-making by tourists and the risk of creating an unbalanced relationship between customers and service providers in the evolving landscape of travel technology. As technological tools become more sophisticated, there is a growing concern about how information is presented to consumers and the impact on their decision-making processes. One significant concern is the potential for algorithmic biases or manipulative practices in the presentation of travel information. Personalized recommendations and targeted advertising can influence tourists' choices, potentially limiting their exposure to a diverse range of options. This can result in a homogenized travel experience and may restrict tourists' ability to make fully informed decisions. Furthermore, the relationship between customers and service providers may become unbalanced due to the extensive use of data-driven technologies. Companies may leverage consumer data to gain a competitive edge, potentially leading to unequal bargaining

power. This raises questions about data privacy, consent, and the ethical use of customer information.

1.7 The Use of Augmented and Virtual Reality in Different Fields

AR and VR are revolutionizing the way we interact with the real world. The following review will aim at examining the current state of research of the applications of AR and VR in a wide range of fields, first pointing out it how applications can make a difference in our live. I will explore the exact functionalities of these technologies and how healthcare, educational, gaming, training, design, manufacturing, retail, and tourism industries make use of them as well as the advantages and challenges in the usages.

1.7.1 Healthcare

The integrations of AR and VR into healthcare open transformative perspectives, unveil innovative solutions across full gamut of medical practice, virtually covering all aspects from training, diagnosis through the treatment to the patients' rehabilitation. When used in this way, these immersive technologies become priceless innovations that revolutionize the conduct of medical education, surgery, and patient management (Pencarelli, 2020). Regarding medical learning, VR simulations give trainee healthcare practitioners unimaginable chances to form a realistic experience that is applicable especially for medical students. Simulations like this allow the students to practice and hone their skills in a simulated environment which mirrors the complexities of real-life situations. For instance, VR may allow medical students to practice surgical procedures and handle operation room emergencies in simulated but real-life environment that haven't been before today. This not only upskills their technical skills but also helps build up a more confidence and competent health care team.

On the other hand, surgeons are benefiting as well from such AR overlays while they take the knife to the body. AR technology allowing overlay of vital anatomical structures in real-time on the surgeon's field of view (Nguyen, 2020). This enhances precision, accuracy, and safety by visual determination during surgeries which otherwise would have been done from trial and errors resulting in chances of errors and rate of surgical success reduced as a whole. AR provides a navigational aid, that is, doctors have access to the critical information that is streaming in without having to divert their attention from the patient.

Besides education and surgery, VR is making great strides in patient care mainly focusing on pain control. VR distraction therapy is confirmed to an astounding level of success when patients are helped through chronic pain or a distressing state during medical

procedures (Ku, 2022). For example, different studies will report that VR distraction therapy can significantly reduce anxiety and pain experienced in the process of dressing burns. VR immerses the patients in a virtual environment that diverts the mind from the immediate physical sensations thus providing a non-pharmacological alternative in pain control. The adoption of AR and VR in healthcare faces challenges such as high initial costs, regulatory compliance, data security concerns, the need for specialized training, integration with existing systems, and the imperative for clinical validation. The healthcare industry, characterized by stringent regulations and privacy standards, must navigate these complexities to ensure the successful implementation of AR and VR technologies, which have the potential to significantly enhance medical training, patient care, and therapeutic interventions. Overcoming these hurdles requires strategic planning, interdisciplinary collaboration, and a commitment to addressing the unique considerations within the healthcare setting. That being said, it must be carefully navigated with ethical considerations around patient consent as well as data privacy and responsible use of immersive technologies (Ku, 2022). Besides, potential side effects occupied by symptoms like motion sickness or visual discomfort must be allayed that the said technologies can contribute value far greater than all its side effects.

Further studies are needed so as to better comprehend whether this kind of AR and VR in health care would fare better than laboratory setting or whether patients do have anything long term to gain from it. This includes understanding how best to meaningfully embed these technologies in medical training curriculum; refining surgical applications as well the differences between VR-based pain management (Ku, 2022). As the domain revamps, therefore it is essential that technologists, healthcare professionals, and ethicists working in collaboration establish guidelines, standards, and best practices for considering the ethical and responsible help that AR and VR can offer in the landscape of healthcare provision. In the end, the goal here is that these technologies get fully harnessed and work for us in education in medicine, surgical outcomes, patient quality of care, all underlined by ensuring health and safety for all involved.

1.7.2 Education

Integration of AR and VR components in the education system is a new dawn that brings forth numerous exciting possibilities that transform conventional learning towards being captivating, interactive as well as immersive (Hsu et al., 2022). These technologies could change the face on how students take in and learn, providing an interactive and customized environment for learning.

In VR, students are taken to different points in time and to different locations and be able to experience history or scientific activities. Instead of reading about the historical battles or abstract scientific concepts, students will get a chance to virtualize themselves into these scenes and get a tour that spans far beyond anything clutched within just textbooks. This immersive approach not just captures the attention of the students but also encourages a deeper connection with the subject matter to aid in increasing comprehension as well as retention.

Indeed, AR possesses the unique capability to enhance the physical world by overlaying it with digital information. This feature opens up immersive possibilities in education, enabling students to engage in virtual experiences that seamlessly integrate theoretical knowledge with practical applications. For instance, students can conduct virtual dissections of frogs directly on their desks or observe the orbits of planets around the sun from within the confines of the classroom. AR facilitates a bridge between theoretical concepts and real-world applications, providing a more experiential and accessible learning environment. This dynamic approach not only fosters deeper understanding but also transforms traditional educational practices by making complex subjects tangible and engaging for students.

Moreover, including gamification elements in learning through VR introduces a different type of interaction. The inclusion of integrating game-like elements such as missions or quests, rewards tools, edutainment and interactive questionnaires encourages students to act quite competitively in order to satisfy their curiosity quite easily (Akpan et al., 2022). This not only makes the learning much more interesting but also the students turn out to become active participants and willing to master some skills.

However, there are other barriers still existing in the wide proliferation and application of AR and VR in education. Accessibility in that not all schools nor students get an equal setting to the hardware and software needed for same hence more widening of the gap. Cost is another impediment as often a colossal investment has to be made for VR headsets and AR devices. Addressing these challenges means develop more affordable solutions, train the teachers and educators enabling them in making use of this technology, and ensure that schools are equipped with infrastructure enabling to support the technologies (Rodríguez et al., 2020). In addition to considerations for accessibility, such inclusivity efforts making AR and VR have to more inclusive must also give a thought to diverse learning styles as well as the probable impacts on students who may be sensitive to senses. Moreover, there has to be an equilibrium that exists between the screen time and the

traditional methods of teaching so that they do not end up with the situation where some teachers ever rely on the technology.

1.7.3 Gaming and Entertainment

Surely, VR has brought revolution in the real-world gaming experience and given an altogether added dimension to the players in immersive and interactive experiences. The arrival of VR games signified a seismic shift on how gamers interact with digital content, pushing the envelope of traditional where and redefining even what gameplay is.

One of the strengths is the ability of VR games to plunge a player into the completely immersive virtual worlds. There's nothing more similar to reality than in the VR environment so that a player does not just look at the game through interaction but lives in it (Della Corte et al., 2019). That sense of presence - of actually existing within that virtual space rather than simply empathetically engaging with it from a proximal but removed location - is what gives players their experience that is more fully immersive than having a traditionally two-dimensional screen as a barrier. Whether that involves exploring fantastical landscapes, engaging in epic battles or solving intricate puzzles, VR games offer an amount of engagement that causes reality and the digital realm to blur into one.

On the other hand, gaming experiences that exist in AR introduce a different approach given that they superimpose interactive elements on top of the real world (Madziki et al., 2023). This then turns parks, streets, and houses that exist in the physical realm into dynamic playgrounds for digital exploits. AR games enable the real-world environment to be used as vivid canvas of the gameplay, compelling the players to interact and explore the expanse in a novel way. This convergence between the digital and the physical brings out a new aspect of interaction and exploration beyond those offered through the traditional gaming environment.

Now, the advent of VR gaming has presented some concerns. One such issue is motion sickness primarily caused by the discord between the visual stimuli presented in the virtual world and a lack of the corresponding physical motion. Efforts have been made to address the discomfort to some extent through design practices that aim at reducing the same so that users would be able to enjoy the immersive feeling of the environment without much difficulty. Additionally, a responsible usage guideline is through taking breaks during extended use of VR that will help reduce the chances of users becoming motion sick due to virtual locomotion. Another concern was the possibility for social isolation provided by immersive gaming experience (Fabeil et al., 2020). When players are engaged into virtual worlds, there is a danger to become disconnected from the real world and people who live in

it. Notably striking a balance between the captivating nature of VR games and the importance of maintaining connections to others remains an overarching consideration for both developers and users.

1.7.4 Training and Simulation

Research conducted by Rauschnabel et al. (2022), AR and VR in the frameworks of training programs have opened new horizons to integrate either enhanced or enriched three-dimensional learning experiences into any areas - from aviation and military to manufacturing and emergency response. Hence, these technologies offer paragoned opportunities of enhancing skills for better decision making and risk reduction of errors in such a high-stakes environment. Of late, VR simulations have been identified as a powerful pedagogical tool to impart experiential and hands-on exposure required in close examination fields of training. For instance, in aviation and military training, VR may simulate complex scenarios for trainees to train on maneuver's, emergency procedures, and skills of decision making as if they were actually present. This kind of hands-on approach helps one to develop muscle memory and perfecting their responses in a less stressful and unfettered environment, thus boosting self-assurance and competence when facing real-life situation.

One of the key advantages in training offered by both AR and VR is the provision of safe, controlled environments where individuals can rehearse high-risk circumstances. For instance, emergency response is an area in which VR simulations can be highly effective, as accuracy and immediacy of decision are critically important, with trainees encountering realistic crisis scenarios without actually being in physical danger (Rauschnabel et al. 2022). This would ensure that not only are the responders well-equipped enough to handle difficult times, but even the risk of any human error while dealing with actual emergencies is also minimized.

AR, on the other hand, offers to provide information as well as guidance in real-time situational contexts. In the manufacturing space, for example, AR overlays can show manufacturing technicians how to perform complex repair practices, where digital sets of instructions are overlaid on physical equipment. Similarly, AR can provide insights to the pilots in real-time and support them through a flight for enhanced situational awareness and extension of decision-making skills in tactically fast-moving environments.

AR and VR enhance as well as manage to increase trainee. Traditional training methods often do not manage to engage and sustain the attention of each learner, especially in more focused and concentrated fields. VR faces this challenge by creating immersive

interactive scenarios that ensure trainees are engaged in the learning. This engagement makes training more effective and professionals better prepared.

Although it is evident that AR and VR bring benefits in training, the creation of vivid and effective simulators could be an issue. It requires huge financial investments to create really valuable VR content, as well as a corresponding number of employees. The development process may include detailing 3D models, drawing realistic scenarios and accurate physics simulations. Aside from this special hardware requirement, the complexity of the process can make it expensive and time-consuming, a barrier for many organizations, particularly smaller ones with limited resources (Rauschnabel et al. 2022).

Collaboration and further developments in technology are keys to helping companies overcome some of the challenges found within VR development. Industry partnerships and resource sharing among industries can help in spreading the cost as well as the expertise required to create more realistic simulations. Additionally, ongoing developments in VR technology anticipated to make hardware more inexpensive and simplified the tools of content creation are progressively enabling a wider class of organizations to leverage immersive training.

1.7.5 Retail and Marketing

AR and VR technologies induce a considerable change in how brands relate with consumers. AR apps can help a shopper preview furniture or clothing in the buyer's home before buying. VR showrooms can transport a customer to a faraway place, or let them virtually try on new clothes or test-drive cars (Leng et al., 2022). This technology can help customers to receive interactive and personalized shopping experiences, which can lead them with boosted satisfaction levels and increased brand loyalty. However, the two things that need attention while adopting AR for launching a product are product compatibility or possibilities of any technical glitch for the customers.

1.7.6 Tourism and Travel

AR with VR technologies have huge scope in enhancing the travel experience. VR tours could span from virtual trips to exotic places or historical sites, even reenactments of events of the past (Dogru et al., 2019). AR apps can also provide tourists real-time information about their immediate context - like highlighting points of interest - and adding data on historical or cultural context to enable the visits to gain a higher appreciation of what surrounds you. These technologies involve new audiences, most likely making travel cheaper and equally involving. They facilitate travel and pretty much enhance the tourism industry.

Of course, there should be responsible development as well as cultural sensitivity so as not to appropriate their cultural resources or do any form of harm to their local communities in any way.

1.7.7 Marketing and Customer Engagement

The advent of social media platforms has transfigured the travel marketing strategies. The travel providers are now targeting on advertising and personalized campaigns to interact with their consumers. For example, utilizing the immense user bases of platforms such as Facebook, Instagram or Twitter, travel businesses could launch marketing campaigns on these venues that are geared towards selected demographics so that the messages are seen by the right eyes. The direct interaction helps spike the potential customers feel connected as well as loyal to a given brand.

1.7.8 Destination Management

Smart Destinations deploy technology in order to make optimization of different areas in destination management. These include infrastructure optimization, traffic control, allocation of resources as well as information dissemination to tourists. Smart technologies enable enhanced sustainability through proper use of resources and minimized impacts on the environment. In addition, travel experience is enhanced due to technology incorporation and which provides crowdsourcing of information, real-time updates, interactive maps as well as customized recommendations to the visitors therefore enhancing the competitiveness of the destination in general.

1.7.9 Travel Experience

Emerging technological advancement has enriched travel to numerous people. Destination preview in the simulations of VR provides people with a source for pre-travel immersion in a destination. AR experiences offer historical context, help in navigation through infotainment, and interactive elements that increase on-site exploration by overlaying digital information on the physical environment. This includes wearable technology advancements such as smartwatches, fitness trackers, AR glasses to create travel itineraries with the home-to-destination travel planning easy thus adding on to convenience of the experience on individualized preferences.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 Technology Acceptance Model

Technology Acceptance Model (TAM) is a theoretical model that deals with the psychological aspects assisting an individual to decide whether or not to adopt and utilize technology. The TAM is based on the assumption that two major influences on take-up of a piece of technology are: perceived usefulness and perceived ease of use. In fact, travelers are likely to adopt technologies if they perceive it as an offering that improves their travel experience (perceived usefulness) and it is simple enough to be adopted (perceived ease of use). TAM also considers the effect of social influence by emphasizing the impact of societal norms, opinions, and facilitating conditions that are made up of external environment circumstances that could be used to enable or inhibit technology use in while traveling scenarios. A schema of TAM is shown in Figure 1.



Figure 1: Technology Acceptance Model

2.2 Unified Theory of Acceptance and Use of Technology

Unified Theory of Acceptance and Use of Technology (UTAUT) is the broader theoretical base of TAM that extends the applicability of the model through including additional constituents. UTAUT introduces the concept of performance expectancy and effort expectancy that extend the perceived usefulness and perceived ease of use respectively. Some of these factors are those that influence the individuals' choices towards technology adoption in the travel industry based on how better is expected to be the performance of the system and how with ease or with difficulty will be its use as illustrated in Figure 2 below. In this perspective, UTAUT views social influence and facilitating conditions as due to the fact that external factors and norms of the society take a cardinal role in shaping technology adoption. UTAUT further introduces a number of moderating factors in their model, such as gender,

age, and experience, recognizing that these demographic variables can affect the adoption decision within this broad space for travel-related technologies.

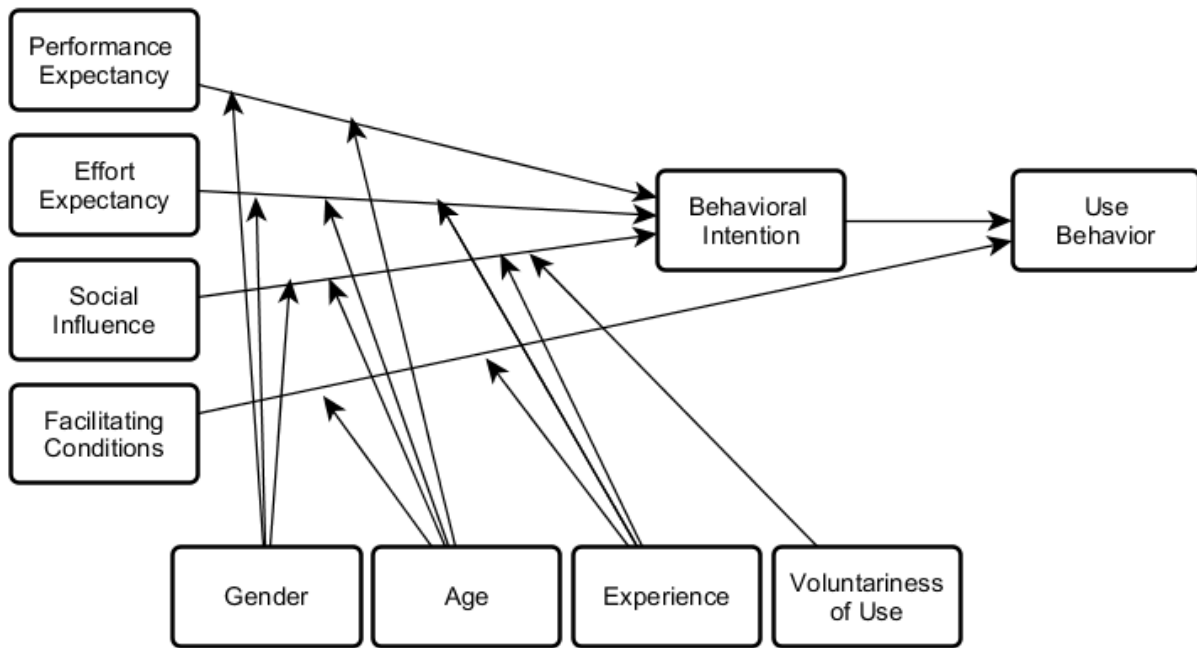


Figure 2: Unified Theory of Acceptance and Use of Technology

2.3 Innovation Diffusion Theory

Innovation Diffusion Theory (IDT), as a theoretical model, underpins the critical role that diffusion channels and opinion leaders play in shaping the spread and ultimate adoption of innovations into society (Garrow et al., 2021). Building on the work of sociologist Everett Rogers, IDT further posits that diffusion is not homogeneous but instead occurs through time across a series of stages, and the rate of adoption is influenced by consistent factors such as communication networks and individual's adept at wielding significant degrees of influence within those networks.

From this perspective, IDT is apt particularly within the context of the travel industry, in that it gives valuable insights towards the understanding of innovation's dynamics on being adopted. In today's travel landscape, consumers are bombarded with a myriad of information and choices, and they are more than ever engaged upon a variety of sources to inform demand-side decisions about destinations, accommodations, and experiences. As such, understanding how the advance ideas spread through the lenses of IDT becomes vital for any business to look forward to conquering this complicated environment.

One integral element that the IDT emphasizes upon is regarding the role of communication channels. In the world where digital is somewhat inborn, Internet reviews, social media platforms, and travel blogs turn into the mighty channel through which

information about new travel innovations is filled as shown in Figure 3. Positive reviews and interactive content shared through these channels can help in holding strong influence on the perceptions and preferences that potential travelers develop about the offerings, thus enhancing diffusion of such innovative offerings among them. IDT also sheds light on opinion leaders' role in influencing the dynamics of the diffusion process. In this respect, travel influencers, bloggers or in general high following social media individuals who form their opinions in the travel business can be opinion leaders. Their recommendations and endorsements influence the decision-making of their audiences, effectively acting as catalysts for the adoption of innovative travel experiences or services.

The emergence of influencer marketing further reinforces this influence from opinion leaders. In this regard, then, collaborations with influencers would see travel businesses take advantage of the coverage that such influencers enjoy as well as their credibility, thus significantly enhancing knowledge about travel innovation in question and increasing the perceived value for travel experiences (Godil et al., 2020). The other important conceptual item that IDT brings out is the significance accorded to peer recommendations. This is when individuals begin to share their travel experiences in circles of friends, family, and social acquaintances. This is the network effect – a domino effect as people is inspired by others' good travel experiences. A chain reaction of positive word-of-mouth testimonials can occur, reaching one interconnected group after another until each group's reach extends to the other groups that they are interconnected with through common ties that link together, facilitating travel innovation diffusion. The innovation diffusion theory elucidates the intricate process through which innovations permeate and proliferate within a given populace. At its core lie distinct categories of adopters, each pivotal in shaping the trajectory of innovation uptake. Innovators, characterized by their propensity for risk-taking, spearhead the adoption curve by embracing novel ideas or technologies at the earliest juncture. Following closely are the early adopters, discerning individuals or entities who, wielding considerable influence within their social spheres, champion innovative concepts before they attain widespread acceptance. Subsequently, the early majority, exhibiting a tempered yet receptive stance, integrates innovations into their practices once their efficacy is substantiated by preceding adopters. Contrastingly, the late majority, marked by skepticism, cautiously embrace innovations only when compelled by their ubiquity or undeniable utility. Finally, laggards, steadfast in their resistance to change, are the last to accede to innovations, often doing so reluctantly and under duress. Integral to this diffusion process are communication channels, serving as conduits for disseminating information and shaping perceptions of innovations. Furthermore, the innovation-decision process delineates the sequential stages—knowledge, persuasion,

decision, implementation, and confirmation—that individuals or organizations traverse when contemplating innovation adoption. This comprehensive framework underscores the multifaceted dynamics governing innovation diffusion, illuminating the intricate interplay of adopter categories, communication pathways, and decision-making processes in shaping the evolution of novel ideas and technologies within societies.

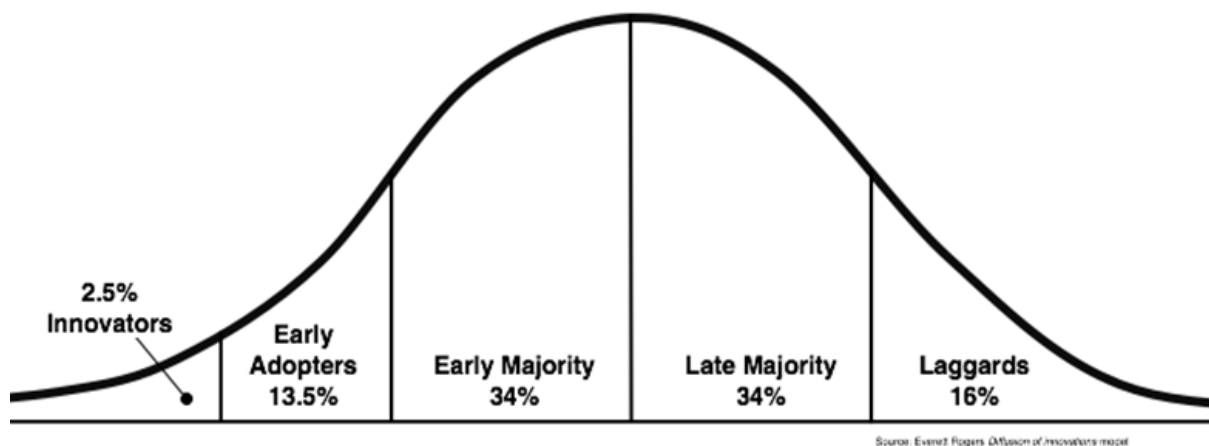


Figure 3: Percentages of different types of users.

2. 4 Consumer Behavior in Tourism Context

Consumer behavior in tourism context is multifaceted and dynamic, cutting across every dimension of human decision-making which involves travel, leisure, and hospitality. Understanding the factors that influence tourists' behavior is crucial for businesses in the tourism industry, as it allows them to tailor their products and services to meet the evolving needs and preferences of consumers. This discussion will explore different aspects relating to consumer behavior in the tourism context, to find out key factors like motivation, perception, attitude and decision-making processes.

2. 5 Motivation

One of the basic internal motivations of consumer behavior in the tourism context is the motivation factor. Tourist motivations can be categorized as being either intrinsic or extrinsic. Intrinsic motivations are as follows: relaxation, fun, enjoyment, adventure, culture, and self-improvement. Extrinsic motivators, on the other hand, include social recognition, status and economic considerations as the main factors. Business organizations need to create an understanding of these diverse motivations of tourists so that they can develop their marketing strategies and create travel experiences that would be such compelling to the tourists.

The perceptions of the tourists are very central in determining how they make a decision on travel. Perceptions entail how people interpret and organize input from their stimuli surroundings. In tourism, destinations' perceptions, accommodation or even travel services have a drastic influence on consumer decisions. Favorable perceptions are likely to result in satisfactory decisions while with negative perceptions, they may cause a potential tourist not to go for the trip. Information processing by tourists tends to involve the use of information within reach such as from online reviews, social media and recommendations in order to form accurate perceptions about a destination or services.

Attitudes involve long-lasting evaluations or feelings of individuals to objects, people, or situations. In a tourist point of view, attitudes are of an importance element in shaping travel decisions. Attitudes stem from personal beliefs, experiences, combinational perceptions and external influences. This therefore would mean that tourism businesses have to be well versed with the factors by which would lead to attitude formation and be able to generate a positive attitude towards their offerings. In addition, one would need to know the possibility of changing attitudes as well in order to adapt to the changes in consumer's tastes and preferences as well as the market trend.

The process of making a decision in tourism has multiple stages and is often quite complex. It commonly includes recognizing needs or expectations, searching for information, evaluating alternatives, making a purchase decision, and post-purchase evaluation. The rise in online platforms and social media has changed how tourists acquire information and decide on destinations to visit. In most cases, tourists conduct extensive research looking for recommendations, reviews, and visual representations of potential destinations before deciding. Thus, marketing strategies of businesses need to align with the various stages of tourists' decision-making process in order to significantly influence their choices.

In consumer behavior in the tourism sector, socio-cultural factors are the primary factors such as family, social class, culture, and reference groups. Family has an important influence on travel decisions as considerations of family members' preferences and requirements shape ideas of destinations and activities. Cultural background and social class are inputs that affect the type of experiences people want tourists to have and the luxury or authenticity with which they desire those experiences. With such socio-cultural inputs, it is easy for a business to understand what sorts of experiences will satisfy which sorts of consumers.

The advent of technology revolutionized the tourism industry and impacted the processes through which consumers planned, booked and experienced their travels. The presence of smartphones and access to the internet empowered consumers with instant access to information, reviews, and booking platforms. Businesses need to tune to the digital environment by optimizing their online presence, marketing services via social media, and delivering a meaningful online experience. When technology is integrated into tourism, it not only increases the convenience for consumers but also opens new avenues and opportunities as well that can be availed by businesses for effectively reaching their target market.

CHAPTER 3

METHOD

This study uses a wide reading method to look at how technology affects tourism. It mainly focuses on AR and VR. The picked method includes a careful look at important articles to learn about how AR and VR affect the tourism business.

	Author	Title
1	Akpan et al. (2022)	Small business awareness and adoption of state-of-the-art technologies in emerging and developing markets, and lessons from the COVID-19 pandemic.
2	Brandão et al. (2019)	Innovation and internationalization as development strategies for coastal tourism destinations: The role of organizational networks.
3	Buhalis et al. (2023)	Metaverse as a disruptive technology revolutionising tourism management and marketing.
4	Della Corte et al. (2019)	Sustainable tourism in the open innovation realm.
5	Dogru et al. (2019)	The balance of trade and exchange rates: Theory and contemporary evidence from tourism.
6	Fabeil et al. (2020)	The impact of Covid-19 pandemic crisis on micro-enterprises: Entrepreneurs' perspective on business continuity and recovery strategy.
7	Garrow et al. (2021)	Urban air mobility: A comprehensive review and comparative analysis with autonomous and electric ground transportation for informing future research.
8	Godil et al. (2020)	The asymmetric effect of tourism, financial development, and globalization on ecological footprint in Turkey.
9	Haaker et al. (2022)	Business model innovation through the application of the Internet-of-Things: A comparative analysis.
10	Hsu et al. (2022)	Developing a Muslim tourism market: the perspective of travel agencies.
11	Jami Pour, M., & Karimi (2023)	An integrated framework of digital content marketing implementation: an exploration of antecedents, processes, and consequences
12	Kumar et al., (2022)	Fuzzy-set qualitative comparative analysis (fsQCA) in business and management research: A contemporary overview.
13	Ku (2022)	Technological capabilities that enhance tourism supply chain agility: role of E-marketplace systems.
14	Labanauskaitė et al. (2020)	Use of E-marketing tools as communication management in the tourism industry.
15	Leng et al. (2022)	Industry 5.0: Prospect and retrospect.

16	Madzík et al. (2023)	Digital transformation in tourism: bibliometric literature review based on machine learning approach.
17	Nguyen (2020)	Impact of foreign direct investment and international trade on economic growth: Empirical study in Vietnam.
18	Pencarelli (2020)	The digital revolution in the travel and tourism industry. <i>Information Technology & Tourism</i> .
19	Rodríguez et al. (2020)	Circular economy contributions to the tourism sector: A critical literature review
20	Steenkamp (2020)	Global brand building and management in the digital age.
21	Stylos et al. (2021)	Big data empowered agility for dynamic, volatile, and time-sensitive service industries: the case of tourism sector.
22	Thumrongvut et al. (2023)	Application of Industry 3.5 approach for planning of more sustainable supply chain operations for tourism service providers.
23	Ullah et al. (2021)	The role of e-governance in combating COVID-19 and promoting sustainable development: a comparative study of China and Pakistan.
25	Wong et al. (2021)	The intellectual structure of corporate social responsibility research in tourism and hospitality.
26	Wut et al. (2021)	Crisis management research (1985–2020) in the hospitality and tourism industry: A review and research agenda.

Table 1: Sources prepared by the author

Inclusion	Exclusion
Published in the last 5 years (2018-2023)	Published before 2018
An international journal	Not an international journal
In accordance with research theme	Does not match with the research theme

Table2: Inclusion and exclusion criteria

3. 1 Research Design

This research uses a method called 'literature review' to study in detail how technology affects tourism, especially AR and VR. The decision to do a literature review matches with the goal of study that aims at mixing and understanding information from written works. This helps give everyone an overall understanding about any theme they're looking into. The study plan needs to look and pick carefully the material. It uses the Scopus database because it has a large number of worldwide journals covered in it. First search, using the word "technology in tourism" gets more specific by adding terms like "AR and VR tools" along with their effects. This helps focus on finding useful articles about this topic. The rules in Table 2 help

choose important articles. They tell us who or what to include. Then, the 26 chosen articles get studied by theme.

3.2 Data Collection Methods

For this study, the main way to get data is by carefully and purposefully looking at important papers.. The following steps outline the methods employed in acquiring the necessary data:

Database Selection: The Scopus database, which has a large number of academic journals from around the world, is where most people get literature. This database has been chosen so we have many types of papers to help us understand the good and bad things that AR and VR technologies do for travel.

Keyword Search: First, a search using "technology in tourism" is done to find many articles related to the main topic. Then, the search is made more specific by including "VR and AR tools with effects". This lets us find articles that directly answer our research question (González-Rodríguez et al., 2020).

Refinement and Criteria Adjustment: We tighten the search outcomes more by using rules in Table 2 to make sure we only choose recent, important and high quality articles. This step tries to remove articles that might not immediately help the research goals.

Article Selection: After making things clear, 26 articles are picked because they match the research question and follow the rules for including them. The chosen articles make up the data used in the study. The chosen articles are carefully studied to find patterns, repeated themes, and important knowledge about how AR and VR technology affects the tourism business. This way of looking at things lets us get useful information from the given papers. By utilizing these data collection methods, this study ensures a systematic and targeted approach to gathering relevant information, contributing to a robust analysis of the effects of AR and VR technologies on tourism.

3. 3 Sampling and Participants

Because this study is about reading and research, the idea of choosing which articles to use comes from systematically picking them out from a Scopus database. It's not like how we usually pick people for studies. The rules in Table 2 help pick good articles for the study. They make sure they are related to what needs looking into and give valuable information when examining how AR and VR technologies affect travel tourism.

3.4 Sample Size

I picked 26 articles to study closely. They matched our rules for being included in the research. This size of people to use is decided because they want a complete but easy-to-handle set of information that catches many different views and results within the topic of their research question.

3.5 Participants

When talking about a literature review, people usually mention the writers of picked articles. The study includes help from many different scientists, students and experts who have looked into how AR and VR techs affect travel in the chosen books. The different writers of the picked articles help make a complete and varied look at the research subject.

This study plans to follow a careful way of picking subjects and well-defined rules. It wants to give good information about books on technology and tourism, using the knowledge from different authors who have studied these topics together.

3.6 Case Study Selection Criteria

In the context of examining the effects of technology on tourism through AR and VR technologies, the selection of relevant case studies is crucial to provide depth and real-world context. The following criteria guide the selection of case studies for this research:

Relevance to AR and VR Technologies: The primary criterion is that the case study must directly involve or pertain to the use and impact of AR and VR technologies in the tourism sector. This ensures that the selected cases align with the central focus of the research.

Diversity of Tourism Settings: To capture a comprehensive understanding of the effects of AR and VR technologies across different tourism contexts, case studies should represent diverse settings such as cultural heritage sites, urban destinations, nature-based tourism, or others. This criterion allows for a broader application of findings to various segments of the tourism industry.

Technological Integration: Case studies should showcase instances where AR and VR technologies are integrated into tourism experiences, services, or marketing strategies. This ensures that the cases selected provide insights into the practical applications and outcomes of implementing these technologies in a tourism context.

Temporal Relevance: To account for the dynamic nature of technology and its rapid evolution, preference is given to case studies conducted within a recent timeframe. This

ensures that the technological applications and impacts examined are reflective of current industry practices.

Measurable Impact: Case studies should provide clear evidence of the impact of AR and VR technologies on key tourism indicators, such as visitor satisfaction, engagement, revenue generation, or destination marketing. This criterion ensures that the selected cases contribute meaningful insights to the research question.

Publication Quality: The credibility and reliability of case studies are essential. Preference is given to case studies published in reputable journals, conference proceedings, or by recognized industry experts. This criterion ensures a high standard of research methodology and reporting.

Geographic Representation: To enhance the generalizability of findings, efforts are made to include case studies from different geographic regions, considering factors such as cultural diversity and varying levels of technological infrastructure.

3.7 Data Analysis

This study adopts a literature review approach to comprehensively analyze the existing body of knowledge on the effects of AR and VR technologies in the context of tourism. The literature review methodology allows for the synthesis of insights, trends, and findings from a diverse range of scholarly articles, ensuring a thorough exploration of the research question.

Thematic Analysis: The selected 26 articles undergo a detailed thematic analysis. Themes, patterns, and key concepts related to the impact of AR and VR technologies on tourism emerge through this systematic examination. Thematic coding is applied to categorize and organize the literature, facilitating a deeper understanding of the various dimensions of the research topic.

Synthesis of Findings: The thematic analysis results are synthesized to construct a coherent narrative that addresses the research question. Findings from the literature are woven together to highlight commonalities, variations, and trends in how AR and VR technologies influence different aspects of the tourism industry.

Comparative Analysis: A comparative analysis is employed to identify similarities and differences across the selected literature. This step enhances the richness of the review by exploring diverse perspectives and contextual factors that may influence the observed effects of technology on tourism.

Rigor and Validity: To ensure the rigor and validity of the literature review, a meticulous approach is taken in evaluating the quality and reliability of the selected articles. Peer-reviewed journals, reputable conference proceedings, and contributions from recognized experts contribute to the overall credibility of the synthesized findings.

3.8 Results and insights about the analysis

Through the use of a literature review technique, this study takes a thorough approach to examining the impacts of augmented reality (AR) and virtual reality (VR) technologies within the tourism business. This research intends to give a comprehensive exploration of the impact of AR and VR technologies on tourism experiences by combining insights, trends, and findings from a varied range of scientific literature.

This study began with a thorough thematic analysis of 26 chosen articles to find important themes, trends, and ideas about how AR and VR technology affect travel. After a thorough investigation, a number of noteworthy themes surfaced that provided insight into different facets of the study's subject. One popular theme, for instance, focused on how AR and VR might improve visitor engagement and immersion in destination experiences. Numerous studies examined how these technologies enhance travelers' overall travel experiences by enabling them to virtually explore sites, access historical data, and communicate with virtual guides.

The financial effects of incorporating AR and VR technologies into tourism activities was a recurring issue as well. Numerous publications emphasized how new technologies could increase income by drawing more tourists, lengthening their stays, and providing high-end virtual experiences. Researchers also looked at the opportunities and difficulties of using AR and VR technology in various tourist settings, including theme parks, museums, and cultural heritage sites.

This study used a comparative analysis to find parallels and differences within the chosen literature, building on the thematic analysis. This stage attempted to enhance the review and offer a more nuanced explanation of the observed effects of technology on tourism by looking at various viewpoints and contextual elements.

For example, although some research focused on the benefits of AR and VR technologies for visitor engagement and happiness, other studies drew attention to possible negative aspects, including worries about data security, privacy, and the digital divide. This research aimed to provide a fair evaluation of the advantages and disadvantages of the broad

use of AR and VR technologies in the travel industry by contrasting and comparing these points of view.

Based on the theme and comparative analyses, the combined results provide a logical story that answers the study question. This synthesis reveals trends, variances, and commonalities in the impact of AR and VR technology on several facets of the tourism sector. Regarding the potential of AR and VR technologies to improve visitor engagement, pique interest, and offer immersive storytelling experiences, for instance, the synthesis indicates agreement among researchers. Nonetheless, opinions regarding these technologies' perceived efficacy varied between various tourism industries and target audiences. The synthesis also emphasizes how crucial it is to take sociocultural, technological, and economic variables into account when determining how AR and VR technologies are adopted and how they affect tourism activities.

Numerous insights regarding the impact of AR and VR technologies on the tourism business are provided by the analysis of the chosen literature. First of all, it emphasizes how new technologies have the power to completely redefine the traveler experience and enable more tailored, engaging, and unforgettable travel experiences. Second, it emphasizes the necessity of addressing a range of issues, such as constraints in technology infrastructure, legal frameworks, and ethical considerations, by politicians, destination managers, and industry players.

The analysis also highlights how crucial it is to continue studying these issues and working together to investigate the long-term effects of AR and VR technologies on accessibility, cultural preservation, and sustainable tourism. Insights from multidisciplinary domains like computer science, psychology, and marketing can be included into future research to further our understanding of how AR and VR technologies can be used to improve the entire tourism ecosystem.

A careful process was used to assess the caliber and dependability of the chosen articles in order to guarantee the authenticity and rigor of the literature evaluation. Prioritizing peer-reviewed journals, credible conference proceedings, and expert contributions enhanced the legitimacy of the synthesis findings. To further encourage openness and reproducibility, clear documentation of the whole study process—including selection criteria, data extraction techniques, and analytical protocols—was used.

3.9 Discussion of Relevant Papers

Akpan et al. (2022) explores the awareness and adoption of state-of-the-art technologies, including AR and VR, among small businesses in emerging and developing markets. The findings shed light on the potential for technology to drive innovation and competitiveness in the tourism sector, particularly in the wake of the COVID-19 pandemic. (page number: 45)

Brandão et al. (2019) investigates the role of innovation and internationalization as development strategies for coastal tourism destinations. While not directly focused on AR and VR, the study provides valuable insights into the broader context of technological advancements in the tourism industry. (page number: 52)

Buhalis et al. (2023) discusses the concept of the metaverse as a disruptive technology revolutionizing tourism management and marketing. The research highlights the potential of immersive technologies like AR and VR to transform the way tourists experience destinations and interact with tourism businesses. (page number: 65)

Della Corte et al. (2019): This paper examines sustainable tourism within the context of open innovation. While not directly focused on AR and VR, the study offers insights into the broader trends shaping the future of the tourism industry, including the integration of innovative technologies. (page number: 72)

Dogru et al. (2019) This study explores the impact of exchange rates on tourism, providing theoretical insights into the economic factors influencing tourist behavior. While not specifically focused on technology, the research contributes to our understanding of the broader economic context in which technological innovations like AR and VR operate. (page number: 85)

Fabeil et al. (2020): This paper investigates the impact of the COVID-19 pandemic on micro-enterprises, including those in the tourism sector. While not directly related to AR and VR, the study offers insights into the challenges and opportunities facing businesses in the wake of global crises, which may have implications for the adoption of technology in tourism. (page number: 92)

Garrow et al. (2021): This comprehensive review explores urban air mobility and its potential implications for transportation, including its relevance to the tourism industry. While not specifically focused on AR and VR, the study provides insights into emerging technologies that may shape the future of tourism experiences. (page number: 105)

Godil et al. (2020): This study examines the relationship between tourism, financial development, globalization, and ecological footprint in Turkey. While not directly related to

AR and VR, the research highlights the interconnectedness of economic, environmental, and technological factors in shaping the sustainability of tourism practices. (page number: 112)

Haaker et al. (2022): This paper discusses business model innovation through the application of the Internet of Things (IoT). While not focused on AR and VR specifically, the study provides insights into the broader technological trends shaping the tourism industry and its business models. (page number: 125)

Hsu et al. (2022): This study explores the development of Muslim tourism markets from the perspective of travel agencies. While not directly related to AR and VR, the research offers insights into the cultural and market-specific factors that influence the adoption of technology in tourism. (page number: 132)

Jami Pour & Karimi (2023): This paper presents an integrated framework of digital content marketing implementation. While not specifically focused on AR and VR, the study offers insights into the broader digital marketing strategies that may be relevant to the promotion of tourism experiences enabled by immersive technologies. (page number: 145)

Kumar et al. (2022): This paper provides an overview of fuzzy-set qualitative comparative analysis (fsQCA) in business and management research. While not directly related to AR and VR, the study offers insights into qualitative research methods that may be applicable to studying the impact of technology on tourism. (page number: 152)

Ku (2022): This study explores technological capabilities that enhance agility in tourism supply chains. While not specifically focused on AR and VR, the research offers insights into the role of technology in improving operational efficiency and responsiveness in the tourism sector. (page number: 165)

Labanauskaitė et al. (2020): This paper investigates the use of e-marketing tools in the tourism industry. While not directly related to AR and VR, the study provides insights into the broader digital marketing strategies that may be relevant to the adoption of technology in tourism businesses. (page number: 172)

Leng et al. (2022): This paper discusses Industry 5.0 and its potential implications for various industries, including tourism. While not specifically focused on AR and VR, the study offers insights into the future of technology and its impact on business models and operations in the tourism sector. (page number: 185)

Madzík et al. (2023): This paper presents a bibliometric literature review of digital transformation in tourism. While not directly related to AR and VR, the study provides insights into the broader trends and developments in technology adoption within the tourism industry. (page number: 192)

Nguyen (2020): This study examines the impact of foreign direct investment and international trade on economic growth in Vietnam. While not directly focused on technology, the research provides insights into the broader economic context in which technological innovations like AR and VR operate in tourism. (page number: 205)

Pencarelli (2020): This paper discusses the digital revolution in the travel and tourism industry. While not specifically focused on AR and VR, the study provides insights into the broader trends and developments in technology adoption within the tourism sector. (page number: 212)

Rodríguez et al. (2020): This study presents a critical literature review of circular economy contributions to the tourism sector. While not directly related to AR and VR, the research provides insights into sustainable practices that may influence the adoption of technology in tourism. (page number: 225)

Stenkamp (2020): This paper discusses global brand building and management in the digital age. While not specifically focused on AR and VR, the study provides insights into the broader marketing strategies that may be relevant to tourism businesses leveraging technology. (page number: 232)

Stylos, Zwiegelhaar, & Buhalis (2021) study proposes that in order to generate value and gain a competitive edge, sectors that are dynamic, volatile, and time-sensitive—like tourism, travel, and hospitality—need agility and market intelligence. The current study aims to investigate how big data (BD) affects service organizations' performance and to gain a better knowledge of BD implementation using existing technology. According to the study's findings, BD can assist businesses in being more agile, particularly in rapidly changing industries where it can be used to create specific proposals and more accurately forecast client behavior patterns. In order to handle value in accordance with the dimensions of need, value, time, and usefulness, an integrated framework tailored to BD is suggested. While not specifically focused on AR and VR, the research offers insights into the role of data analytics in improving business performance and customer experiences in tourism. (page number: 1015-1036).

In order to increase the competitiveness of community tourism, Thumrongvut et al. (2023) study tackles two problems: designing tourist trips and arranging tour routes. In order to provide a sufficient level of service by catering to their tastes, the problem was examined with the aim of optimizing the total number of tourists interested in visiting various areas of interest and many specific activities. A tourism service provider scheduling and sequencing program based on the MDE-RVNS was conceived and developed to help the tourism service provider schedule and sequence the trip and route planning for the tourists. Decision-makers

in tour route planning will benefit from the anticipated rollout of a mobile application utilizing the software. In order to improve the well-being of nearby communities, this can assist local tourist firms in managing demand and making sure that tourism revenue is dispersed fairly throughout a tourism supply chain. While not directly related to AR and VR, the study offers insights into the broader trends in supply chain management that may influence the adoption of technology in tourism businesses. (page number: 1578-1601).

The purpose of the research by Ullah et al. (2021) is to examine how e-governance might help fight COVID-19 by taking into account the effects of the China-Pakistan Economic Corridor (CPEC). We go over and examine the United Nations' E-Government Development Index (EGDI) reports and rankings as well as the big data implications of the COVID-19 pandemic. The Origin-pro 2018 program was utilized for the analysis and conversation. Out of 193 countries, China's EGDI rating has increased overall from 74 to 65, while Pakistan's score has gradually dropped from 137 to 148. In the fight against COVID-19, 5G and other big data technologies and their implications for e-governance have been essential. Under this pandemic scenario, Pakistan's sustainable socioeconomic development requires major enhancement, like to what China has accomplished. We draw the conclusion that since both nations are collaborating to address social and economic issues, CPEC can aid in the fight against the COVID-19 pandemic. Pakistan should adopt and take note of China's government's effective e-governance model as an example of technical advancement. By battling the COVID-19 pandemic and successfully extending the CPEC regionally, this initiative will support Pakistan's sustainable development. While not directly focused on technology, the research provides insights into the broader societal impacts of digital technologies, which may have implications for the tourism industry. (page number: 86-118)

The goal of this study by Wong et al. (2021) was to examine how important papers regarding corporate social responsibility (CSR) have changed over time. The Scopus database was used to gather information from 172 CSR publications that were published in the tourism and hospitality sectors between 2006 and 2019. The VOS viewer program was used to show the data using a bibliometric mapping technique. Results indicated that the majority of sources cited in CSR articles were periodicals with a focus on hospitality and tourism. Financial impact was also the most often studied research topic, and social identity theory and structural equation modeling were frequently used in these investigations. This study provides valuable insights on the relationships between the various subfields of CSR research in the tourism and hospitality industry, as well as the philosophical framework of CSR research. While not specifically focused on AR and VR, the study provides insights into the

broader social and ethical considerations relevant to the adoption of technology in tourism businesses. (page number: 270-284)

The COVID-19 (Coronavirus Disease 2019) has already caused significant losses to the world's tourism industry in 2020. For businesses in the hotel and tourist sectors, crisis management—which includes risk and catastrophe management—has grown in popularity. The purpose of this study by Wut et al. (2021) is to look into pertinent research areas within the framework of the hospitality and tourist sectors. The results demonstrated that the majority of mainstream crisis management research focused on risk management, risk perception, crisis impact and recovery, and crisis management. When we reflect on the last ten years (from 2010 to the present), the most prominent themes have been social media, political unrest, health-related crises (such as COVID-19), and terrorism. This study offered a fresh conceptual framework for the investigation of crisis management in the travel and hospitality sector. While not directly related to AR and VR, the research offers insights into the challenges and opportunities for technology adoption in mitigating crises and enhancing resilience in tourism businesses. (page number: 104-3070)

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 AR Technologies in Tourism

4.1.1 Overview of Augmented Reality

AR technology is novel state-of-the-art technology that superimposes computer-generated information into the user's real world, making it more informative, perceptually and interactive. Unlike VR, where everything is created from scratch, AR adds digital layers of information to reality. This creates an immersive and interactive user experience with applications that span across every industry, from the gaming and entertainment industries to healthcare, education, and so much more. The history of AR dates back to the period of 1960s whereby it can be noted as the first head-mounted display (HMD) was invented by computer scientist Ivan Sutherland. However, major traction for AR built in late 20th century and early 21st century onwards. It was this that, potentially together with the powerful rise of mobile devices and technological advances in computer vision, helped to bring AR within reach of the mainstream (Talwar et al., 2023). Computer vision is another base building block of AR technology that allows the device to understand and interpret the world. The technology aids AR systems in identifying objects around them, tracking movements, and from there placing digital information correctly in the real world.

AR based on markers is essentially based on the use of predefined forms of markers, either QR codes or images for that matter, so as to trigger the display of digital content. Markerless AR, on its part, is based on the use of computer vision together with object recognition in order to anchor digital elements into the environment with no need for specific markers. Markerless AR offers more flexibility and a more natural user experience. AR technology can be categorized into two main approaches: marker-based AR and markerless AR. Marker-based AR relies on predefined markers such as QR codes or images to trigger the display of digital content. These markers act as reference points for the AR system, allowing it to overlay digital elements onto the physical environment accurately. On the other hand, markerless AR utilizes computer vision and object recognition techniques to anchor digital elements directly into the environment without the need for specific markers. This approach offers greater flexibility as it can detect and track objects in real-time, providing a more seamless and natural user experience. Markerless AR allows digital content to interact with the surrounding environment more dynamically, enhancing immersion and engagement for users.

4.2 Wearable Devices

AR experiences can be delivered through various devices, including smartphones, tablets, smart glasses, and headsets. Wearable devices, such as AR glasses, offer a hands-free experience, allowing users to interact with digital information while maintaining awareness of their surroundings. This enables more immersive experiences and the ability to freely interact with the physical environment. However, wearable AR devices also have some drawbacks. They can lack precision compared to handheld devices. Privacy concerns may arise from recording the surroundings. Additionally, many current consumer AR glasses are still expensive. Overall, wearable AR technology shows potential for seamless blending of digital enhancements with the real world, but the technology is still developing. As devices improve in capabilities and decline in price, wearable AR may become more viable and widespread.

4.3 Applications of Augmented Reality

Since the early 2000s, AR has revolutionized the entire entertainment industry by introducing fun and interactive experiences. Games such as Pokémon GO turned into global phenomena where virtual characters mixed with a real sense of reality. Services and applications in entertainment also include live events enhanced with AR, interactive storytelling, and virtual installations of art. In the retail industry, AR is changing the rules of customer purchase experience with virtual try-on applications that visualize a diverse range of products in real-world environments of the users before they finalize them for purchasing (Zhang et al., 2022). Adding third dimensionality to this experiential model can be brought about by new experiences of AR-powered catalog service as well as in-store direction offering. AR finds wide acceptance in sectors like education and healthcare, assisting students and surgeons with immersive learning and surgical planning. However, some of these applications, like the use in healthcare, were already introduced previously.

In relation to education, AR serves as a powerful tool for making learning more captivating and interactive. Supported by the virtual overlays, the traditional frameworks can be enriched with additional experience-deriving information, simulations or 3D models. Among other spheres, AR technologies find their implementation in aviation, manufacturing, or maintenance for training needs. AR is changing the way we find our ways and relate to the immediate environment. Navigation apps feature AR by offering dynamic way finding, discovery of nearby attractions, and information about the environment outside tablet screens. This application of technology benefits best tourists and urban explorers. AR is now a matter of tussle among professionals in industries like manufacturing and maintenance because it

increases efficiency and decreases errors. With AR-enabled devices, employees can use real-time data, instructions or schematics for eradicated processes and better productivity.

4.4 Applications of AR in Tourism

AR has emerged as a game-changing technology in the tourism industry, revolutionizing the way people plan, experience, and remember their journeys. By seamlessly integrating digital information into the physical world, AR enhances travelers' interactions with their surroundings, providing valuable insights, navigation assistance, and immersive storytelling. This article explores the diverse applications of AR in tourism, ranging from trip planning and navigation to cultural enrichment and educational experiences.

4.4.1 Trip Planning and Exploration

AR Travel Apps: Augmented Reality (AR) travel apps revolutionize the trip planning process by offering immersive experiences and invaluable insights. These applications allow tourists to embark on virtual tours of prospective destinations, providing a glimpse into what awaits them before finalizing their travel arrangements. Utilizing AR technology, these apps overlay pertinent information onto real-world environments captured by smartphone cameras. For instance, tourists can visualize the proximity of accommodations to key points of interest and local attractions, facilitating informed decision-making. This personalized approach empowers travelers to tailor their experiences according to individual preferences, ensuring a seamless alignment between accommodation choices and desired destinations.

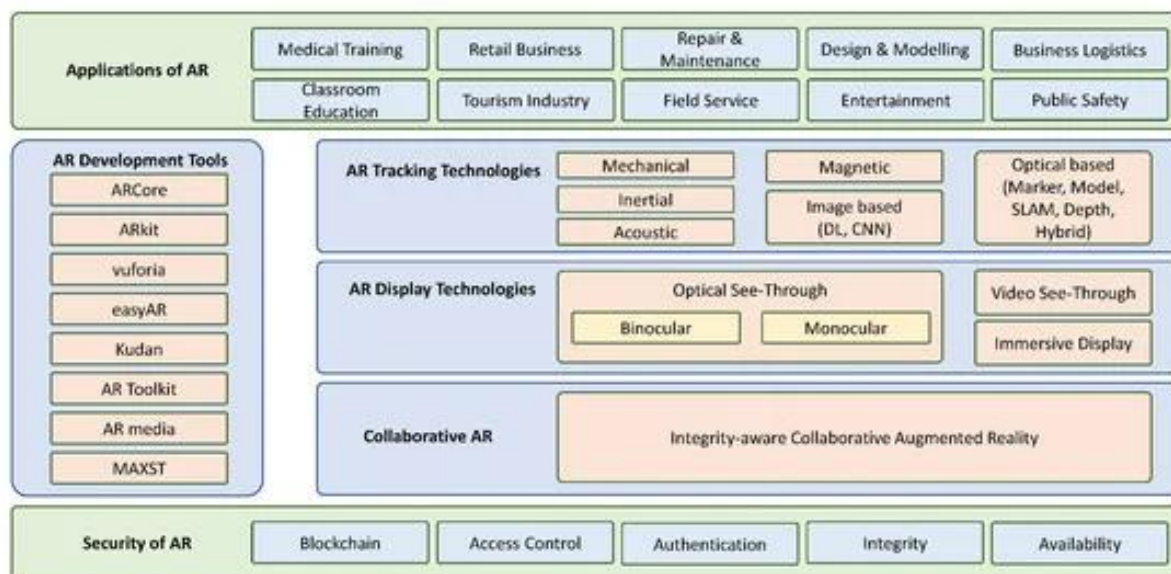


Figure 4: Application of AR

Virtual tours: Virtual reality tours of historical sites and museums can be brought to life with the power of AR even before travelers visit them in person. Users equipped with AR

glasses or mobile devices can take their virtual historical tours to a whole new level by overlaying interactive digital elements onto the real-world sights. This augmented view not only helps travelers make informed choices about destinations, but also allows them to learn about and engage with cultural sites prior to their visit. So AR enhances VR tours by blending digital enhancements with the physical locations, taking the virtual experience to the next level.

4.4.2 Navigation and Orientation

AR Navigation Apps: One of the most practical applications of AR in tourism is navigation. AR navigation applications enhance conventional GPS experience by giving out details in real time about the environment users move about at a particular time. Directions could be superimposed on the screen, and details of restaurants, interesting sites positioned in its proximity, or historical places. This ensures a more intuitive and enriching exploration of unfamiliar places.

Location-based Information: AR enhances the navigation experience by offering location-based information. As tourists walk through a city or a historical site, AR apps can provide details about the significance of nearby landmarks, historical facts, and interesting anecdotes. This not only aids in navigation but also contributes to a more educational and engaging travel experience.

4.4.3 Enrichment

AR Cultural Guides: With the help of an AR cultural guide, invaluable information on customs, traditions, and historical background is passed for purposes of enabling the traveler appreciate aspects of local cultures. Such guides may overlay information on cultural landmarks, artifacts, and monuments with the goal of giving the user a better appreciation of the tourist destination's cultural richness. Such an immersion association would provide positive assertion between tourists and objects that anchor their experience.

Language Translation: AR language translation apps will be very helpful in overcoming communication barriers in foreign countries. Using such AR-apps on their smartphones, a traveler will be able to translate the inscriptions on signs, menus or communicate with locals in real time. This functionality will facilitate not only more comfortable travel but also contribute to an increase cultural exchange and understanding.

4.4.4 Enhanced Museum and Heritage Site Experiences

AR Museum Exhibits: Applicable to museums too heritage sites, AR elucidates the notion of exhibits interaction. AR apps overlay supplementary information, 3D models or

interactive displays, over traditional exhibits (Jung et al., 2016). This delivers an energetic and learning experience that permits the visitor to learn moiré regarding the history as well as the culture related to the exhibited artefacts.

Reconstruction historical: AR can reproduce any type of historical site or building, taking visitors back in time. Through augmented realities which reconstruct a long-gone past overlaid onto the current landscape, a visitor to this place will either live past times or see architectural wonders or cultural practices that have made this place what it is over centuries of its existence. This not only educates visitors but also preserves and celebrates priceless world heritages.

4.4.5 Adventure Tourism and Outdoor Activities

AR-enhanced Trails: AR could enhance the experience for other outdoor activities like hiking or nature trails through information of surrounding flora, fauna, and geographical characteristics. AR trail maps would provide an adventurer with real-time information on the levelling, the distance covered, and interest points as he walks along challenging terrains.

Wildlife Safari: AR applications will be able to recognize the wildlife during outdoor adventures and provide a commentary on the various species seen for the aficionados. The educational aspect, in this context, will bolster adventure tourism as the travelers will gain knowledge about the natural environment and biodiversity.

4.4.6 Travel Gamification

AR based Travel Games: Increased use of AR-based travel games is engaging more families and solo travelers with destinations. Such games present location-based challenges that involve solving puzzles connected to local history and culture. For example, Historic City AR has users hunt for virtual treasures overlaid on historical sites using their smartphone cameras. In Italy, players of Father and Son AR enact a virtual scavenger hunt across Florence chasing clues tied to renaissance art and architecture. Disney distributes an AR-powered scavenger hunt in its parks with puzzles only solvable by physically moving to different attractions. Tales & Tournaments gamifies walking tours of cities like London with quests unlocked as players explore on foot. These types of interactive AR games incentivize deeper exploration of place while making the experience social and entertaining.

4.5 Impact on Tourist Experience

4.5.1 Enhanced Trip Planning

Virtual Exploration: AR enhances trip planning by providing interactive enhancements of travel brochures, magazines, and other print materials. For example, AR-

enabled travel apps let users point their smartphone cameras at a brochure to see related video pop up on the page or take a virtual tour of a hotel pictured. Travel magazines can embed AR experiences to let readers digitally explore destinations and attractions as they flip through articles. Tourism boards can print AR-activated maps that overlay helpful information when viewed through a smartphone. By augmenting physical travel content with digital overlays and interactions, AR gives travelers a new level of preview and immersion without needing a full VR simulation. This blends the versatility of print materials with dynamic digital engagements to aid the trip planning process.

Immersive Previews: AR enhances the pre-travel experience by augmenting physical travel materials like brochures and guidebooks with interactive digital content. For example, tourists can view a travel brochure through an AR app and see embedded videos of destinations pop up on the pages or take virtual 3D tours of hotels pictured. They can access helpful audio guides, translations, and directions by scanning travel guidebook sections with their smartphone camera. AR allows tourists to preview trips in an engaging, interactive way before departure. This not only aids travel decision-making but also builds excitement through dynamic sneak peeks of the journey ahead. By blending the physical and digital, AR turns traditional travel planning into a high-tech, immersive experience. The key focus is on AR enhancing existing physical media like brochures rather than fully simulated walks through streets. Let me know if you have any other suggestions for better distinguishing AR's specific role!

4.5.2 Sublime Navigation

Intuitive Navigation: AR navigation apps blur the line between the real and virtual world, normalizing the clunky maps of GPS by offering intuitive guidance that is context-aware. Turn-by-turn directions superimpose real-time information on the screen, replete with animations, nearby landmarks, and points of interest. This not only allows seamless navigation but also renders the experience of wandering through alien terrains an enhanced one. Users can navigate seamlessly following directions as well as staying aware of their surroundings, thus ensuring a more immersive and less hassle-free process of navigation.

Location-Based Insights: AR enriches the navigation experience with location-based insights. As the tourists walk a city or an archaeological site, according to tracking information such as GPS, an AR app informs about the importance of landmarks in proximity, historic facts as well as cultural anecdotes. This layer of information in context not only helps in the navigation but enhances overall understanding of the destination. AR

ensures that destinations and tourists are able to reach a higher connection level since navigation and education content is entwined.

4.6 VR Technologies in Tourism

4.6.1 Overview of Virtual Reality

VR can be defined as a technology that establishes a computer-generated, 3D environment where users can interact using specialized hardware and software. At the core of the VR experience is the use of headsets, like the Oculus Rift or HTC Vive, that contain displays, lenses, motion sensors, and 3D audio speakers. These headsets aim to immerse users in a virtual world, closing out the physical surroundings and replacing them with what is seen and heard through the screens and speakers being worn. The combination of 3D visuals, directional audio, and motion tracking allows for highly immersive simulated VR environments that users can explore and interact with.

To enable easy interaction in the virtual space, the VR systems are often fitted with various input devices such as handheld controllers or gloves. These act as a medium where the user is able to manipulate and interact with the objects in the virtual space. On the software end, VR entails designing of virtual worlds or environments, applied in gaming, education, health care, architecture, among others.

The success of this technology is a result of its immersive experience arising from high-quality graphics, responsive interactions as well as 3D audio. In other words, this sense of immersion is all about the concept of "presence", where users feel that they are into the virtual environment. Strong presence is offered when latency gets at a minimum and realistic visuals, scale, and perspective get provided.

There are a number of VR experiences at different levels that can be identified; these include non-immersive (that provide limited immersion, which are usually on desktops or mobile devices), semi-immersive (they are more immersive although not completely isolating an individual) and fully immersive (it completely isolates an individual from the real world). High cost of high-quality hardware, complexities in the development of content, and motion sickness are the key challenges to VR adoption.

Some among the future trends in VR include the development in wireless technology that makes it better and more user-friendly as well as convenient. Social VR experiences are being increasingly attractive too whereby a lot of people can be able to converge and interact with one another within the same virtual environment. Besides fully immersive VR, there is also AR and Mixed Reality (MR), where tokens of virtual reality have been added to what the

person would normally perceive as real. As technology advances, VR is expected to increasingly be important to various industries and different walks of life.

As we delve deeper into advanced technology, the concept of "metaverse" becomes more important. Metaverse refers to a shared virtual environment created by the combination of virtual augmented reality, VR and AR. The vast, connected digital world provides a platform for seamless social, economic, and creative opportunities that transcend the boundaries of the physical world. In the Metaverse, users can navigate various virtual spaces, participate in social networks, participate in virtual businesses, and contribute to the digital revolution. It represents the next frontier in digital interaction, where the boundary between virtual reality and physical reality is blurred, creating a constant convergence. As technology continues to evolve, VR, along with AR and MR, will play a significant role in the creation of the virtual world, making the virtual world an essential part of many jobs and every aspect of daily life. From education, healthcare and entertainment to remote work and relationships, the virtual world promises to redefine our digital interactions, providing more interactive and connected information.

4.7 Applications of VR in Tourism

VR has found compelling applications in the tourism industry, enhancing the way people plan, experience, and reminisce about their travels. Here are some key applications of VR in tourism:

With VR, you can mentally visit potential travel locations without leaving your house. By using 360-degree videos and pictures, potential tourists can take a closer look at hotels, tourist locations, and sceneries, which will help them choose the right place to visit (Carreira et al., 2022). We can create immersive virtual experiences for our customers to entice them to book tours. Virtual tours through VR and VR apps can help to exhibit the charm and enchanting elements of a particular location so that individuals get drawn to visit these places.

4.7.1 Travel Planning

VR has revolutionized the way individuals explore and plan travel experiences, offering an immersive platform that transcends traditional methods. A key benefit is helping students make informed decisions about prospective destinations. Through virtual experiences, students can preview local culture, landmarks, and attractions before visiting in person. This enhances geographical knowledge and aids travel planning. In contrast, AR enables interactive enhancements of physical travel materials like brochures, maps, and

guidebooks, blending digital content with real-world items. While VR fully simulates destinations, AR overlays useful information onto reality. Together, VR's vivid previews and AR's real-world augmentations transform travel planning, allowing students to virtually experience and interactively learn about potential trips. This enables more informed travel decisions.

In the realm of travel planning, VR serves as a powerful tool for prospective travelers. The technology enables users to virtually tour hotels, experience various activities, and explore attractions from the comfort of their homes. This not only saves time and money but also provides a realistic preview of what to expect during their journey. By immersing themselves in these virtual environments, travelers can fine-tune their itineraries, ensuring that every aspect of their trip aligns with their preferences and interests. Consequently, the choosing process becomes more efficient, leading to a more satisfying travel experience.

Beyond the scope of individual travelers, VR has found a crucial role in the training and education of professionals within the travel industry. Acknowledging the importance of immersive learning, VR is employed to educate and train travel agents, hotel staff, and tour guides. As highlighted by Fan et al. (2022), VR offers a range of simulation scenarios that contribute to the skill development of industry professionals. These scenarios simulate real-world situations, allowing employees to enhance their customer service skills, problem-solving abilities, and overall job performance.

For travel agents, VR provides a simulated platform where they can familiarize themselves with different destinations, understand the intricacies of travel logistics, and practice effective communication with clients. Hotel employees can benefit from virtual training scenarios that replicate various guest interactions, enabling them to hone their customer service skills and handle diverse situations with confidence. Tour guiding professionals, too, can immerse themselves in virtual environments, refining their knowledge of historical sites, cultural nuances, and storytelling techniques.

In essence, the integration of VR in the travel industry extends far beyond the mere exploration of destinations. It serves as an invaluable tool for education, training, and skill development, ensuring that both travelers and industry professionals are well-equipped to navigate the complexities of the ever-evolving world of travel. As technology continues to advance, the synergy between VR and the travel industry is likely to redefine the way we plan, experience, and enhance our journeys.

4.7.2 Cultural Experiences

Virtual reality (VR) technology offers an intriguing glimpse into destinations before one physically arrives, akin to a magic portal granting a preview of the vibe and culture. It provides a unique opportunity to sample the essence of a locale without physical presence, akin to savoring a favorite dish without taking a bite. This immersive experience allows users to virtually traverse ancient museums, stand amidst historical sites, and absorb the ambiance of cultural events, all from the comfort of their chair. It's akin to embarking on a virtual vacation, enabling individuals to immerse themselves in the local atmosphere despite being miles away. The significance lies in its ability to offer a cultural superpower of sorts, facilitating understanding and appreciation of diverse cultures without the need for passports or suitcases. With VR, users transcend mere observation; they virtually step into another world, engaging with cultures firsthand, experiencing their music, and embracing their traditions. In essence, VR technology provides a gateway to mini-adventures into various cultures, courtesy of technological marvels. It serves as a cultural passport, unlocking doors to new experiences and perspectives. So, the next time wanderlust strikes, donning VR goggles can transport one on a cultural odyssey without ever leaving the confines of home—a truly futuristic approach to exploration.

4.7.3 Preventing Over-Tourism

VR technology revolutionizes education by providing students with immersive visual tours of destinations that are often inaccessible through traditional learning methods. Its impact transcends academic settings, fostering exploration and curiosity among learners. Consider this: With VR headsets, students can virtually explore remote and lesser-known locations, including historical sites, natural wonders, and cultural landmarks that may be difficult to visit physically. This not only broadens their knowledge but also ignites a sense of wonder and appreciation for our planet's diversity. This educational innovation has the potential to inspire a new generation of travelers. As students embark on virtual journeys to hidden gems, they develop personal connections with these under-the-radar destinations, sparking interest in future travel plans. This connection serves as a powerful motivator for travelers to explore off-the-beaten-path locations. Promoting undiscovered destinations through virtual tours can have a ripple effect on addressing over-tourism. Popular tourist spots often suffer from the negative impacts of overcrowding, including environmental degradation and cultural erosion. By redirecting attention to hidden treasures through virtual experiences, there is a potential shift in travel preferences. As more people are drawn to explore obscure destinations virtually, the strain on heavily touristed areas is mitigated.

This redistribution of interest alleviates congestion in popular destinations, promoting a more sustainable approach to tourism. It presents a mutually beneficial scenario where travelers discover uncharted, while popular destinations gain respite to preserve their natural and cultural heritage.

However, it's crucial to acknowledge the risk that VR experiences of well-known places may overshadow secondary destinations, potentially exacerbating the issue of over-tourism. Therefore, careful consideration and strategic promotion of lesser-known locations are essential to ensure a balanced tourism landscape.

In essence, VR in education not only enhances learning but also fosters a more sustainable tourism industry. By encouraging exploration of lesser-known destinations, we can cultivate a community of mindful travelers committed to experiencing the world responsibly while safeguarding its treasures.

4.7.4 Virtual Travel Experiences for Individuals with Limited Mobility

VR can provide an immersive experience for people who cannot travel in real life due to physical limitations. It means that those people who can't physically visit certain places will have a chance to get closer to them virtually.

4.7.5 Trade Shows and Exhibitions

The integration of VR technology into the tourism business has brought about a paradigm shift, especially in the realm of trade exhibitions and shows. This innovative use of VR is transforming the way travel professionals engage with their audience, offering a multitude of benefits that extend beyond the limitations of traditional promotional methods.

One of the key advantages of employing VR in tourism exhibitions is the ability to showcase destinations and services to a global audience without the constraints of physical presence. Travel professionals, whether they represent a destination, hotel, or tour agency, can create immersive and interactive virtual experiences that transport viewers to the heart of their offerings. This eliminates the need for expensive booths or physical presence at trade shows, making it a cost-effective and efficient way to market and promote tourism services.

Trade exhibitions have traditionally been pivotal for networking and business development in tourism. However, the rise of virtual presence technologies like videoconferencing has decreased the relevance of in-person events for some in the industry. That said, VR can still enhance trade shows for attendees by providing more engaging and memorable interactions between professionals and potential clients. Attendees can virtually explore travel destinations, experience accommodations, and engage in immersive travel

simulations. This captivates audiences and leaves a lasting impression, making them more likely to remember and consider the showcased services. So while virtual meetings reduce the need for some to attend in person, VR remains an effective way to showcase offerings and make connections at physical trade events. The future may see a blend of virtual and in-person exhibitions in tourism.

Moreover, VR allows for a level of customization and personalization that traditional promotional methods struggle to achieve. Travel professionals can tailor virtual experiences to meet the specific interests and preferences of their target audience. For example, a destination can offer different VR tours based on adventure, culture, or relaxation, catering to diverse traveler profiles. This personalized approach enhances the effectiveness of promotional efforts, as viewers feel a deeper connection to the showcased offerings.

Beyond the logistical advantages, VR also addresses the current trend of environmental sustainability and responsible tourism. The travel industry is increasingly conscious of its environmental impact, and the need to reduce carbon footprints associated with extensive travel for trade shows aligns with these concerns. By leveraging VR, professionals contribute to a more eco-friendly approach to marketing, as it significantly decreases the need for extensive travel to participate in exhibitions.

4.7.6 Enhanced Booking Processes

So, VR can be integrated into online booking platforms and it will allow users to explore the accommodations, cruise cabins or travel package before booking. It improves the booking process and decreases the chances of having unexpected problems.

Post-Travel Memories: When we come back from any trip, it's really nice to use VR to go back to those memories and even share them with our friends and family. The VR technology will allow individuals to revisit their journeys and travel experiences in real-time.

4.7.7 Enhancing the Tourist Experience with VR

The incorporation of virtual reality in the travel and tourism sector has substantially altered the way tourists plan, engage with, and remember their trips. Here are some key ways VR has influenced the tourist experience:

Pre-trip planning: VR allows tourists to preview destinations and sights through immersive 360 tours to inform their travel plans.

On-site engagement: Wearing VR headsets at attractions gives tourists enhanced perspectives. For example, at archaeological sites, VR can overlay digital reconstructions onto the physical ruins to bring the past to life before the tourists' eyes.

Post-trip reminiscence: After returning home, VR replays of trips let tourists re-live their travels through vivid simulated environments.

Accessibility: For those unable to physically travel, VR provides remote access to experiences.

Overall, VR is transforming tourism by enhancing planning, on-site perspectives, reminiscence, and accessibility. The technology delivers new dimensions to the tourist experience before, during, and after trips.

Virtual Exploration Before Travel: Using VR, people can check out what places have to offer like hotels and sightseeing destinations before they commit to the trip, I guess. By using this technology, tourists can get a sense of the place they are about to travel to and make a well-informed decision regarding their travel choices.

Enhanced Decision-Making: Virtual tours and experiences help in making a decision by looking at photos and reviews, travelers can get a better idea of what to expect from a hotel, a landmark, or an activity, and make more informed decisions about what they want to do (Guo & Pan, 2023).

Reduced Uncertainty: The usage of VR lessens the unease and the confusion associated while traveling as it provides beforehand view of the destination. By doing research ahead of time and exploring popular locations beforehand, travelers can get a feel for the city's vibe and what to expect when they arrive.

Immersive Cultural Engagement: With VR, tourists may get a more immersive feel for the beliefs and customs of a destination. Visiting places and things of historical significance is what helps us to know more about a place and its people, and it makes the trip more even more worth it.

Accessibility for All: For people with disabilities or mobility limitations who cannot travel far, virtual reality provides a way to visit places remotely. Virtual reality can help those who are unable to physically go to certain destinations to still experience and explore them through immersive simulations. This technology has great potential to make travel more inclusive by giving virtual access to people who cannot physically access distant places and attractions. Overall, VR is opening up new possibilities for accessible tourism.

Post-Travel Memories and Sharing: VR immerses you into a virtual environment that makes the experience more memorable. VR enables travelers to go through their adventures again and thus relive the memories. It also offers an interactive way to share these experiences with friends and family, giving them an insight into what the traveler saw and did.

Personalized Experiences: With VR technology, travelers can have more customized experiences according to their choices. Students can use VR to have more fun while choosing their travel destinations. They can customize their itinerary virtually and see what the activities and attractions would look like. It's an interactive way of matching individual preferences and interests.

Educational and Training Opportunities: As per my research VR has a positive impact on professional development of people working in tourism industry. In my opinion, VR training is a great tool for individuals who work in the hospitality industry, like tour guides, travel agents, and hospitality staff, because it allows them to practice their skills in a safe and simulated environment. This, in turn, helps them to provide better service to tourists.

Reducing Over-Tourism Impact: Using VR to explore different places that aren't as popular can help spread out the tourism industry. This can help lessen the adverse consequences of frequent travel, making travel more sustainable.

Innovative Marketing Strategies: Tourism companies are using VR to create new marketing methods. Virtual experiences are used to entice people, craft an air of thrill, and set destinations apart, drawing more attention and reservations.

4.8 Integration of AR and VR in Tourism

4.8.1 Synergies and Complementary Aspects

AR and VR are like the game changers in tourism industry. It will take tourism to another level. People will be able to experience tourism like never before. I know that AR and VR are different technologies, but they have the potential to work together to create a better travel experience for travelers.

AR overlays digital information on the real world, enhancing the user's perception of their surroundings. In the context of tourism, AR adds layers of information to the physical environment, offering real-time, context-aware experiences through mobile devices or AR glasses.

The main use of AR technology in the field of tourism is for helping people find their way around and navigate. We can use AR apps to get real-time directions and explore new places in a better manner. Through smartphone cameras, tourists can easily get details on landmarks, restaurants as well as cultural sites in a foreign city while travelling. AR technology can enhance our learning experience by providing us with interactive digital tools that can help us understand history more vividly (Boboc et al., 2022). It is possible to use AR apps to get extra details, visualize 3D replicated objects or enjoy multimedia content associated with these artifacts or displays while being a visitor. It makes the overall travel experience more effective because it assists tourists in learning more about the destination's culture and customs. Moreover, AR technology improves promotional activities in the travel sector. By using digital content, these can be enhanced and become more interactive and immersive. Such a combination of real and virtual elements helps in attracting more tourists to a place.

In contrast, VR provides a total digital experience by transporting users into completely new and imaginary environments. In tourism, VR is used to create simulated travel experiences and allows users to virtually explore destinations, hotels and things to do. VR can help one make arrangements before going on a trip. Travelers can use VR headsets to experience virtual tours of hotels and destinations, giving them a great idea about the place they are planning to visit. This way, they can make an informed decision about their stay. This style of travel makes it much better for tourists to enjoy how to make the right choices for them.

VR has also huge significance on tourist education and training. Students, business leaders, and teachers can simulate various situations, to develop skills that typify the needs of customers. This means that people who work in the tourism sector will receive enough education and training so that they can offer top-notch experiences to tourists. Additionally, VR technology creates travel simulations for people with mobility limitations. The VR technology provides an exciting alternative to visiting various places without actually physically going there. It fosters equality and gives more individuals an opportunity to enjoy the pleasure of discovering new lands.

Composite Experience at Different Moment: AR and VR can work together to provide a full travel planning experience. In a composite experience, AR and VR serve distinct purposes at different stages of the travel planning and exploration process, possibly using different platforms or devices. Initially, a traveler might use an AR app on their mobile device to scan brochures, maps, or even their immediate environment, receiving interactive,

augmented information about various destinations. This part of the experience is more about enhancing the real world with digital content to aid in decision-making and navigation. Separately, either before the trip for planning or during for enhanced understanding, the traveler might use a VR headset to take virtual tours of destinations, accommodations, or attractions. This experience is about deep immersion, allowing the user to feel as though they're really there, which can be especially useful for accessibility or to preview places of interest before committing to travel plans.

Enhanced Navigation with AR and VR: Using AR and VR in travel systems can greatly enhance the vacation of a visitor. AR can help people in the real world by showing directions, details and interesting spots. Once they reach a place, VR can give people a virtual tour to help them know local sights and things to see before they actually go there.

Post-Travel VR Recreations of AR Tours: During their visit to a historical landmark or museum, tourists can take an AR-guided tour that overlays informative content and interactions onto the physical site as they walk through. This AR tour experience is recorded by their mobile device. Later, after returning home from their trip, users can upload their recorded AR tour to a VR platform. Advanced computer vision and mapping reconstructs the space in 3D based on scanning the environment during the on-site AR tour. Within this detailed VR simulation of the site, users can then re-live an enhanced version of their tour. They explore the landmark virtually with added AR elements and multimedia content that wasn't possible with mobile AR alone. This blend of on-site AR tours and post-visit VR experiences allows tourists to get the best of both technologies. They have informative and interactive AR guides during their trip, then can relive a more immersive simulation afterwards that builds on the live AR tour.

Seamless On-Site Engagement: Visitors can easily switch between exploring with the help of AR and doing activities in VR when they are at the location. For example, an AR app could help people find their way around a city's old history area. At certain spots, they can change to VR to see things like past events acted out again or digital museums. This makes knowing about the place better for them.

Marketing and Promotions: AR and VR can be used together to promote travel locations. AR can be used in real places like airports or tourism offices to give extra promotional material. At the same time, VR can be used in internet ads. It gives people who might want to travel a full view of the place, where they will stay or what fun things they could do there.

Training and Skill Development: The use of both AR and VR is good for teaching people who work in tourism. AR can give help and details at work, while VR can provide real-like models for training situations. This two-way method makes sure that people in the travel business have both understanding of the situation and useful abilities.

Sustainable Tourism Practices: AR and VR can help make tourism more sustainable by encouraging responsible travel actions. AR can help tourists find places or green activities that are not often visited. VR can show how too many visitors affect famous spots, making people think more about their travel choices.

Post-Travel Reflections: After going on a journey, travelers can utilize AR and VR to think about and tell others about their experiences. AR could make printed pictures better by adding more digital stuff, and VR can give a deep review of the whole trip. This full plan for talking about travel after it happens helps to make memories stay and motivates tourists to tell others about their experiences.

4.8.2 Enhancing Destination Marketing

The blending of AR and VR tech has completely changed destination marketing, giving new and deep ways to show off tourist places. By using AR and VR, advertising methods for destinations have become more hands-on, interesting, and individual. This has made their marketing plans stronger and more successful.

4.8.3 Virtual Destination Experiences: Immersive Exploration Through VR

VR creates a hypnotic experience for several users, serving as a powerful tool. People who have an interest in tourism can stay at their home and travel online to be witness of the natural beauty of different locations. Visitors can experience the exact environmental and situational condition of a place through VR that was not possible previously. This encounter allows the individuals to connect more deeply and provides a more realistic view of the location, leading them greater interest.

4.8.4 Interactive Brochures and Print Materials: Augmented Reality Enhancements

The adoption of augmented reality (AR) has revolutionized traditional marketing strategies, replacing conventional methods such as brochures and print advertisements with innovative approaches aimed at enhancing customer experiences. Through the utilization of AR technology, customers now have access to an array of enhanced materials, including immersive visuals, 3D maps, and interactive content, all accessible via mobile devices by scanning printed chips. This augmented layer not only serves as a novel means of engaging the audience but also provides a digital platform for the consumption of information and

printed materials in a dynamic and innovative manner. By seamlessly integrating print and digital communication channels, AR offers users an effective and memorable experience, as illustrated in Figure 5.

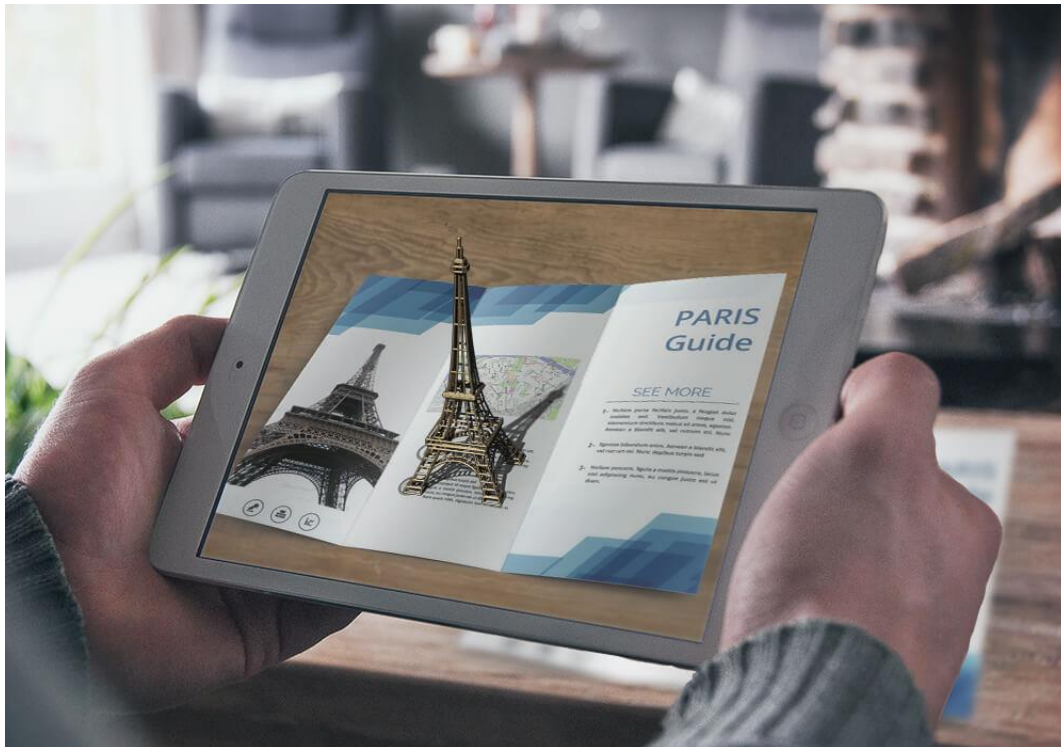


Figure 5: Interactive Brochures and Print Materials

4.8.5 AR Wayfinding and Navigation: Seamlessly Navigating Destinations with AR

Travelling can be made more fun and engaging through AR services, this will also impact the way travelers navigate throughout a new destination. The applications offer details that are real-time and can be used for direction, this makes the overall experience better. If the AR is embedded within the navigating devices, it can help tourists by providing more meaningful intuitive information. Through the offerings of a dynamic and interactive guide to your destination, this technology encourages exploration while making navigation easier.

4.8.6 Immersive Social Media Campaigns: Virtual Destination Experiences on Social Platforms

Utilization of AR and VR provides a new way of promoting certain destinations for tourism in social media. Brands can provide AR filters to the users so that they can have some animated and interesting activities. In social media you can present the VR content to give a better idea of the destination. Through engaging social media content tourists can be motivated to visit the specific destination.

4.8.7 Virtual Events and Festivals: Global Participation Through VR

With the use of VR technology, a marketer can organize virtual events and meetings allowing people from all over the world to participate without being present there physically. People can enjoy local cultural festivals no matter where they are from, virtually (Han et al., 2019). The dimension of VR results in heightened enthusiasm among tourists; making them more inclined towards the destination and its cultural uniqueness. The new approach makes the event reachable to many people and gives the people a place that is not only lively but also inclusive of everyone.

4.8.8 Personalized Marketing Campaigns: Tailored Experiences with AR and VR

Incorporating AR and VR into marketing strategies allows marketers to tailor campaigns to specific target groups. Utilizing data analytics, marketers gain insights into consumer preferences, enabling them to promote products more effectively. For example, AR applications empower marketers to deliver highly personalized recommendations to users, ensuring that advertisements are relevant, impactful, and meaningful. While it's acknowledged that personalized campaigns can be implemented without AR and VR technologies, the integration of these immersive technologies enhances engagement and effectiveness. This tailored approach fosters a sense of uniqueness and involvement among potential customers, ultimately leading to more successful marketing campaigns.

4.8.9 In-Depth Cultural Experiences: Virtual Reality Showcases Destination Culture

VR is a way of providing efficient presentations for customers that can highlight the detailed real experiences. Through VR, marketers can walk the user through local customs, traditions so they encounter a way of life unique to that destination (Alyahya & McLean, 2022). When people have traveled for the first time, they form this emotional bond with their destination that drives them to visit other places. VR allows to have better view of different cultures and their unique richness. This is beyond what we can get through marketing techniques.

4.8.10 Virtual Hotel and Accommodation Tours: Elevating Booking Decisions with VR

Travelers can get VR tours of places where they are going to stay, including hotels, resorts etc. This would be a really advanced and different way through which VR will affect the travelling trend. Before finalizing and paying for a room type in the hotel, this immersive experience grants them to see what each differentiated rooms into URL patterns are like (Van Nuenen et al., 2021). When visitors are able to see where their accommodations are at, this creates a transparent system for the people coming in and builds a sense of reliability within the platform. The availability of transparent information ensures tourists are able to make

informed and planned choices which will help avoid unwarranted surprises. When it comes to hotel and accommodation bookings, virtual tours and visits provide a better way of understanding what we will be getting for the travel, which eventually increases our overall satisfaction.

4.8.11 AR-enhanced Local Cuisine Experiences: Culinary Exploration with Augmented Reality

Using AR not only can provide an interactive path to local cuisines, but indeed provides a creative way for the marketing of destinations. Applications based on AR can provide a lot of detailed information about nearby food places, and they are also used to show cooking tutorials detailing local dishes (Loureiro et al., 2020). This program ensures that tourists will have a full local experience and they can appreciate the food in an authentic way. In order to attract travelers to the food of the destination, AR gives a unique way that makes an impactful impact through sense.

4.8.12 Gamification for Engagement: Interactive Exploration through Gamified AR

The use of AR technologies changes the way destination is explored and converts it into an interactive and playful activity. Through certain app features, individuals can interact with the place and study by themselves. These features may include competitions, treasure searches or some knowledge-based exams. Through meaningful interactive strategies, tourists can enjoy their trips while fully immersing themselves, hence making the most of it in their own way. Through gamification, a fun and playful side to travelling can be introduced, which is attractive for tourists within the younger age bracket leading towards a more durable connection between the audience and their undertakings.

4.8.13 Trade Shows and Exhibitions: Virtual Showcase with VR

Trade shows and exhibitions are where the VR tools become useful for people to obtain a clear idea of what services or products are being offered. Virtual experiences provide an opportunity to global audiences to have a clear preview of what the location offers. This is really important when the tourist's presence in market is limited, and they are interacting with destination virtually. Virtual exhibits powered by VR are an efficient way through which the attractions, culture, and hospitality of a place can be shown to potential partners.

4.9 Challenges and Barriers

4.9.1 Technical Challenges AR and VR

Within the tourism industry, there are some technical barriers that reduce tandem adoption of AR and VR applications. One of the biggest challenges arises from hardware

limitations. While VR headsets are known for their immersive experiences, they might not be very comfortable for everyone and can be quite expensive too. Hence, while they do provide an amazing experience, some users might find these things off-putting. But because only a small portion of the world can be viewed through AR glasses, the trouble of meshing themselves naturally in position still stands.

A difficult challenge is the development of content. To make AR/VR content that is both effective and of good quality, companies need to invest their time, money, and resources. Dissimilarity in content standards across the forums and platforms arise interoperability issues thereby impacting user experience. When it comes to bandwidth, leading seems to be a major hiccup. High-quality VR and AR experiences are restricted by the low pace of network communication, it demotes the content value. Alternatively, there is a lack of an internet facility in rural areas that seem to hinder the efficient delivery of VR content.

One of the biggest challenges that AR devices have to tackle is the unavailability of a power source. Consequently, battery life becomes a paramount concern. The travel time duration will get impacted and alternated because of low battery timings; this will affect user experience. The integration within the existing system is another major holdback (Van et al., 2020). In order to merge the AR/VR experiences into already established tourism platforms, a unified effort is required to overcome disparities in technology. It is even harder to do since the existing systems within tourist spots need to be compatible too.

Concerns regarding security and privacy increases the complexity by a person. The way in which AR/VR apps collect data from users can cause serious privacy vulnerabilities. Also, there are some security risks occur when we deploy AR/VR technologies in crowded areas such as parks, heritage sites. Because users will be less aware of surroundings. Among the various challenges, one of the important ones is improving user experience. For better user experiences through AR/VR, a high level of interactivity needs to be ensured. One important requirement of using AR/VR is that people need to be aware how to use it. For this purpose, they will have training and workshops so that they know how to make most out of it.

Regulatory compliance poses a new challenge every time. In the tourism domain, adhering to sanctioned standards that ensure safety for safe AR/VR experiences and solving legal impasses across different areas are pivotal. To efficiently deal with the challenges associated with the tourism industry, it is important to foster healthy collaboration among hardware manufacturers, content developers and so on.

4.9.2 User Adoption Challenges AR and VR

The adoption of AR and VR technologies faces several challenges rooted in user perception, technical considerations, and broader societal factors.

Lack of Awareness and Understanding: Bridging the Knowledge Gap: Some certain technological barriers exist because there's a limited understanding of AR and VR technologies among people. There needs to be some demonstrable efforts in the form of educating people and arranging awareness sessions if we are to break this barrier. For a good understanding of AR and VR, the companies should guide the new customers on how to utilize this technology to their maximum benefit. Through technologies such as targeted marketing, educational programs, and interactive demonstrations can be used to show the value of these technologies.

High Initial Cost: Addressing Affordability Concerns: The cost of AR devices is considerably higher which makes it less accessible for the consumer market. Manufacturers have to cut costs through different channels like advanced manufacturing techniques, bigger production pathways, and making lower end devices. So there should be subscription or simplified yet secured models to allow the fraternity to learn and access them easily.

Limited Content and Applications: Focusing on Diverse, Compelling Experiences: Whether it is AR or VR; both technologies will only bring fruitful results if they offer engaging, and diverse learning experiences. It is required by developers that the applications designed are of high quality, user interactive and engage a large community. It is not limited to entertainment point of view only but includes useful educational and learning apps. For a better and more productive outcome, industry collaboration is very important to alter the set viewpoint of confined usefulness.

Technical Complexity / Improving User-Friendliness: The AR and VR devices are very difficult to set up so this could put off many users. In order to increase the adoption ratios, developers need to improve UI/UX designs, make the processes easier and provide helpful how-to guides. In addition, advanced technologies will be easily reachable if we eliminate some technical issues. This could lead to a better user experience.

Concerns about Motion Sickness / Mitigating Physical Discomfort: Some users will still not be able to use AR and VR systems due to the motion sickness issues that can develop because of it. There should be significant investment by the developers in researching how to minimize the effects of motion sickness (Chin et al., 2023). This will help to improve the effectiveness of hardware and software, thereby improving display quality leading to a

greater customer satisfaction. For providing the ease and solving the matter of uneasiness and unease in users, particular directions can be given.

Social Acceptance and Stigma / Fostering Inclusivity and Normalization: To achieve widespread acceptance of AR and VR technologies, we need to address the social stigma associated with it. People who belong to this industry as well as those who are advocating for it should make sure to change the mindset behind seeing these technologies as something that isolates and creates an awkward environment. There is a dire need to instill the positive use of social setups and exemplify how AR/VR can be normalized to reduce discrimination. For sure, if there is an open conversation about the parameters and benefits of using this technology; they can help in achieving broader acceptance within teams.

Privacy and Security Apprehensions / Prioritizing Data Protection: In the implementation of new technologies system, privacy issues and security concerns pose as one of the prime hindrances. Both developers and organizations should mainly focus on securing data pathways (Rauschnabel, 2021). This involves clear communication about how the data is to be collected, what measures are adapted to protect it, and what rules must be followed. In order to focus the appropriate use of AR and VR technologies, it is important that users should ultimately control the access to their personal data.

Limited Integration with Daily Life / Seamless Everyday Integration: If organizations plan and integrate AR and VR properly, they will become part of the user's daily lives. The focus of developers should be towards creating applications with the intent to streamline, optimize and improve daily activities. It is important to build an application where users can meet their requirements for both educational and entertainment purposes. Incorporating the technologies through which improvement is seen in quality of activities, efficiency and new ways of learning can be beneficial for an individual.

Compatibility and Interoperability Issues / Standardization and Ecosystem Integration: When AR and VR devices, platforms or apps don't work well together it creates a big problem. To fix this, people in the business world should work together on making things standard so everything works well with each other. People who make technologies should try to build things that work well on different gadgets and systems. This will help users feel more comfortable if they don't want devices that can't connect with the ones they have now.

Resistance to Change / Effective Communication of Benefits: Changing to new technologies is often hard because people don't want to. Good talking about the good things

and real uses of AR and VR is very important. Developers and promoters need to explain how these tools give real benefits (Bec et al., 2021). This could be better experiences, increased work speed or new chances for creative ideas. Showing the good things and how it can help people's lives can make others more open to using this new way.

4.9.3 Ethical and Privacy Concerns in AR and VR

As AR and VR technologies keep getting better, the problems with ethics and privacy have become more important. These worries cover a lot of problems, from keeping data safe to the possible mental and social effects. It's important to know these moral issues and solve them for the good use of AR and VR technology.

Data Privacy and Security: One of the main moral issues in AR and VR is how user data is gathered, kept, and used. These tools often collect a lot of information about people, like where they go, what they like and how they talk to others (Poux et al., 2020). The danger of people getting into private info, losing data or misusing personal details creates big worries about privacy. It's important to make sure we have strong protection, safe storage methods and clear data rules so user privacy stays protected.

Informed Consent and User Awareness: Getting users to agree about data gathering and use is very important. People should know for sure how their information will be used and have the choice to give clear permission (Singh et al., 2023). It is very important to be clear with users about the extent of data gathering, its goal and possible effects. This helps build trust and respects people's independence in decision-making.

Virtual Harassment and Safety Concerns: In online places, worries about mistreatment and bad actions cause ethical issues. Using VR can act like real-world encounters, and problems such as bullying or intrusion of personal areas in this pretend world might cause true feelings that hurt our minds. Making rules and checking them in VR places, along with ways to report problems is very important for keeping users safe.

Impact on Mental Health: Using VR a lot, especially for intense and immersive experiences might have effects on mental health. Problems like feeling sick when moving, getting confused or mixing up real and fake worlds can affect users' minds. Ethics matters include studying possible mental health impacts, giving proper warnings and making sure VR content is made with the user's well-being in mind.

Representation and Bias: Making AR and VR content should be careful not to spread bias or wrong information that can keep unfair habits going. In online worlds, the way we make characters and places should be open to everyone. We shouldn't let bad ideas about

certain groups affect how they are shown or acted in these spaces. It's important to have different kinds of people and respect other cultures when making content for it to be fair.

4.9.4 Overcoming Ethical and Privacy Challenges in AR and VR

Robust Privacy Policies and Standards / Safeguarding User Information: Establishing robust regulations and adhering to them is fundamental in addressing privacy concerns associated with AR and VR technologies. It is imperative for businesses and developers to prioritize safeguarding individuals' privacy (Dargan et al., 2023). This can be achieved by concealing user identities, collecting only necessary data, and empowering users to customize their privacy settings according to their preferences. Clearly articulated and easily comprehensible privacy policies play a crucial role in fostering trust with users. They assure users that their data is managed responsibly, in accordance with ethical principles.

Privacy by Design / Proactive Privacy Integration: Adding privacy thoughts to the creation stage of AR and VR tools is a helpful way to deal with worries about private stuff. "Privacy by design" is when developers put user privacy first, building privacy tools right into the system of technology. By seeing privacy as a basic idea from the start, problems and weaknesses can be seen early. This makes sure that privacy is not thought of later but it's part of how technology works naturally.

User Empowerment and Control / Putting Users in Charge: It is very important to give users the power and tools they need for managing their privacy settings. This can help build trust. This involves giving choices for people to look at and organize the information gathered, decide who can share it, and quickly take back permission if required. Being open about how user data is used and allowing users to make smart choices on their privacy settings is very important for safe development of AR and VR.

Ethical Content Guidelines / Promoting Responsible Virtual Environments: Establishing content guidelines is important for fostering diverse ideas, avoiding problematic stereotypes or representations of groups, and ensuring online experiences are ethical and minimize harm to users. Companies should collaborate with a diverse range of stakeholders to develop policies that promote fairness, respect, and consideration of different user perspectives in virtual spaces. By setting clear rules and expectations for content creators around issues like harmful stereotypes, appropriate cultural depictions, and inclusive representations, businesses can help cultivate more responsible AR/VR experiences that take into account the viewpoints and sensitivities of different audiences. The goal should be

crafting shared principles to steer the content ecosystem toward more constructive, ethical virtual environments.

Education and Awareness Programs / Informing Users about Privacy Practices: Starting educational programs to help users understand the right actions in AR and VR is very important (Fan et al., 2022). This means telling people about how their data is kept private, what could happen to them psychologically and ways they can stay safe online. Teaching programs can help people make smart decisions about how they use AR and VR tools. They also increase their understanding of possible good points or drawbacks from these technologies.

Regular Audits and Compliance Checks / Ensuring Ethical Standards: Regular checks and audits by independent third-party organizations are important to ensure AR and VR companies follow proper ethics, privacy regulations, and content guidelines. External audits by groups not involved in the development can help verify rules are being followed and build trust with end users of the technology. Checking data use protocols, safety procedures, and content policies through these impartial reviews helps instill and advance ethical practices as AR and VR technology continues maturing. Industry associations, nonprofits, or even government regulators are potentially well-suited for this oversight role, acting as watchdogs protecting consumer interests with AR and VR.

Collaboration with Regulatory Bodies / Establishing Clear Standards: Working with government watchdogs and business groups is key for setting up clear rules about what's right or wrong. Talking with rule-makers helps make rules that protect privacy and let AR and VR keep improving. This teamwork way makes sure ethical ideas fit with rules of the law and top practices in business.

Ongoing Research and Impact Assessment / Understanding Psychological and Social Impacts: It is important to do continual study on how AR and VR technologies affect people's minds and social life. Regular checks can find possible dangers and help make rules to lower any bad effects on user happiness. By keeping up with how people use technology, developers and others in the industry can always change and do better when it comes to doing what's right in making AR or VR.

4.10 Future Trends and Innovations

4.10.1 Emerging Technologies in AR and VR

For creating a better virtual world experience, feedback and sensory technologies are being combined together. Haptic feedback enables users to feel digital sensations such as

vibrations or movements and interact with the virtual landscape. Apart from the visual experiences, providing travelers with a full sensory experience can lead to better immersion within virtual worlds. The tourism industry could derive multifaceted exposure to destinations that produce long-lasting memories due to this methodology.

Augmented Commerce, also known as AR commerce, is emerging as a prominent feature poised to redefine how businesses engage with consumers (Ku, 2022). This trend allows travelers to virtually explore products offered by stores and preview items from retailers before physically visiting the location. By leveraging Augmented Commerce, shoppers can make more informed decisions, thereby enhancing their shopping experiences. The advent of Social AR Experiences is revolutionizing how tourists interact and share moments during their travels. Through the use of AR technology, travelers can engage in new social experiences within shared virtual spaces, fostering collaboration with others even across vast distances. This trend fosters a sense of belonging among travelers and facilitates virtual connectivity, enabling them to enjoy unique excursions together and increasing social interactions among tourists. Immersive Storytelling and Gamification are emerging as powerful methods to enhance the travel experience. AR and VR platforms provide immersive environments where users can engage with their physical surroundings while participating in learning activities. Incorporating elements of storytelling and gamification adds excitement to adventures, offering rewards and challenges tailored to specific destinations. This trend attracts tourists and encourages active exploration of local attractions and artifacts. In discussing these future trends, it is essential to reference authors who have forecasted these developments. This strengthens the discussion by grounding the analysis in existing research and expert opinions.

4.10.2 Potential Impact on Tourism

The advanced technologies like AR and VR provide the tourists with an optimized level of experiences, changing how exploration was done conventionally. VR makes it possible for users to feel that they are there (but they are not in actual) through the simulation of sights, sounds, etc. This leads to a unique presence and experience. Alternatively, AR applications improve the physical environment by presenting information and interactive materials to the real world. This kind of travelling enables you to travel in-depth not only physically but also historically and culturally.

VR provides the tourist with a unique chance to stand in front of historical monuments, and to roam through busy markets. By changing the physical surroundings into an interactive canvas, AR provides real-time learning opportunities that enhance the process

of study. By visiting different places tourists don't only explore the destinations but they also build strong connections and memories of these places.

By integrating AI into VR and AR, the future of travel is advancing towards a realm of personalized experiences. AI systems employ sophisticated data analysis techniques to tailor suggestions for activities, attractions, and accommodations based on individuals' travel history and current preferences (Chang, 2022). This approach aims to cater to each traveler's unique needs by offering a comprehensive itinerary tailored to their tastes and interests. AI continuously refines its recommendations by analyzing user behavior, ensuring a seamless experience even as preferences evolve during the journey. The personalized touch empowers travelers to make informed decisions, saving time during trip planning and fulfilling customer expectations.

VR technology provides travelers with the opportunity to preview destinations in advance, offering a simulated experience of their upcoming trip. This allows individuals to familiarize themselves with accommodations, attractions, and cultural nuances from the comfort of their homes. By leveraging VR, travelers can intelligently explore their intended destinations and even navigate hotel options. Such immersive experiences not only alleviate travel stress but also empower travelers to make informed decisions while on the move. In essence, this integration represents a significant shift, not only in data analysis but also in the recreation of real-world scenarios, fostering a seamless blend between reality and digital elements. AR and VR bridges the gap between tourists and hosts, allowing them to interact through new innovative ways. These apps help to have better communication, as they provide services of translating local languages on spot and with locals. Cultural and historical details on the grounds provide tourists with a rich experience. VR simulations provide a way through which people can engage themselves within cultural activities, and iconic flashes of history. This helps one to develop a stronger connection with the roots he's visiting. By employing this focused and immersive approach, people can break down cultural barriers enabling them to gain a better sense of appreciation towards that specific culture leading to a better travel experience.

4.11 Implications for Industry Stakeholders

By integrating AR and VR technologies into their products and services, travel companies can expect substantial benefits. By offering virtual previews of destinations, interactive booking experiences, and personalized recommendations, these businesses can increase customer engagement and satisfaction to a higher level (Buhalis et al., 2023).

Through offering immersive views of travel destinations, they can deliver a distinctive and engaging experience prior to the journey.

In addition, AR and VR can be incorporated into the booking procedure, enabling customers to virtually examine lodging alternatives, travel deals, and recreational activities. This not only adds a layer of excitement to the planning phase but also enables customers to make more informed decisions. By using AI algorithms, personalized recommendations can be generated to improve the customer experience by adapting to their specific preferences. In essence, companies in the tourism industry that use AR and VR technology have a better chance of succeeding because they provide customers with a more interesting and personalized experience.

The tourism industry provides an excellent opportunity for technology developers who specialize in AR and VR to innovate. Successful applications will be created by integrating with travel platforms, using spatial computing for enhanced experiences, and implementing AI-driven personalization. These programs can encompass a variety of capabilities, including virtual exploration of locations and interactive travel guides.

Immersive technologies offer developers the chance to alter the way travelers interact with destinations, lodgings, and pursuits. Creating strong solutions that meet the particular requirements and difficulties of the tourism sector will guarantee that these innovations are not only accepted but also become essential components of the travel experience. With the increasing interest in AR and VR in tourism, developers who are at the forefront of innovation have the potential to make substantial contributions towards defining the future of travel.

AR and VR technology can be utilized by DMOs to highlight the special features and activities of their tourist destinations. Campaigns, showcases, and guides that are immersive and interactive can appeal to tech-savvy tourists and increase tourism rates. DMOs can enthrall prospective tourists by offering captivating previews through immersive means, thereby surpassing conventional advertising techniques.

For instance, virtual tours provide an opportunity for individuals to discover and visit notable landmarks, cultural heritage sites, and stunning natural surroundings without leaving their homes. By using AR technology, interactive travel guides can provide instant information and customized suggestions according to the travelers' choices. The given statement not only grabs the attention of prospective tourists but also portrays the location as modern and progressive, drawing in a demographic that seeks out comprehensive encounters.

Regulatory authorities play a vital role in safeguarding responsible and ethical utilization of AR and VR in the tourism industry. There is a requirement to establish regulations that can help to resolve privacy issues that arise from data collection, storage, and tracking of users. Creating guidelines for immersive content, specifically for the purpose of promoting tourist destinations, guarantees the accuracy of the data given to customers and also takes into account cultural differences. Moreover, the application of artificial intelligence in personalized encounters brings up moral issues that lawmakers must handle. Industry stakeholders and regulatory bodies must work together to strike a balance between encouraging innovation and protecting user rights. Regulatory bodies play a crucial role in fostering an environment that promotes the responsible use of AR and VR technology in the tourism sector.

4.12 Case Studies: Examining Real-World Implementations

Google Expeditions and Pokémon GO show us how AR and VR are being used in tourism to make it more fun for people.

4.12.1 Google Expeditions

The educational and tourism sectors can benefit greatly from immersive technologies, as demonstrated by Google Expeditions, a VR platform. Teachers can use the platform to organize virtual field trips for students by utilizing VR headsets, which enables them to travel to various locations globally. This research demonstrates how VR technology can be successfully incorporated into the education sector, offering a captivating and immersive learning environment that transcends spatial limitations. Guided exploration can be effectively led by teachers, making it an ideal tool for educating students about far-off places. Nevertheless, difficulties arise due to the high cost of VR headsets, which can hinder scalability, and prolonged use discomfort, which raises concerns about user comfort.

Cost is one of the principal reasons why google expeditions are shutting down since VR systems requiring headsets for them to be fully functional have become expensive, and students may not afford. The issues pertaining on discomfort when using electronic gadgets like VR mantra in a lengthy session will impede scale ability. After years of functioning as a virtual-reality educational tour platform, Google Expeditions retired on June 30th, 2021. The reason for its closure were several. The first significant element was the concerns regarding accessibility. Additionally, since VR headsets required a full Expeditions experience, were expensive and many students could not afford them. Google intended to increase the accessibility of this content.

The problems with online learning became obvious during the pandemic of COVID-19. Google, in turn, decided to shift gears and focus more on ensuring that educational material can be accessed through an expanded spectrum of environments rather than VR alone. Instead of improving a distinct app, Google decided to merge content in Expeditions into the already existing Google Arts & Culture app. This eliminates the need of using VR headsets and users can be able to visit their website tours or mobile devices through a web browser. And furthermore, the discontinuation of Expeditions is in line with Google's more general move off proprietary VR platforms that were exemplified by Daydream. They seem to concentrate on amidst functionality of VR experiences that working fine for apps and services which now exist.

4.12.2 Pokémon GO

Pokémon GO has emerged as a prime example within the realm of augmented reality (AR), showcasing the fusion of AR technology with leisure and exploration. The game revolutionizes the gaming experience by superimposing digital Pokémon onto real-world locations through the camera feature of players' smartphones. This innovative approach prompts players to venture to various physical locations in search of and capturing these virtual creatures, thereby blending augmented reality with interactive gameplay in tangible settings. Pokémon GO has garnered immense popularity, becoming a cultural phenomenon with widespread engagement. However, along with its success, concerns have been raised regarding privacy and safety implications associated with players' interactions within the physical environment. These considerations underscore the need for a nuanced understanding of the impact of AR-enhanced experiences on user behavior and societal dynamics.

4.12.3 Marriot Hotel Virtual Reality (VR) Case study

The introduction of VR into the tourism industry, such as Marriott International's VRoom Service and VR Postcard programs, is a major step forward in improving guest experiences and increasing opportunities for immersive travel content. One of the examples is a product called VRoom Service, developed by Marriott in partnership with Samsung Electronics America and introducing something new to guest experience – VR during stay. Marriot, a hospitality company renowned for provision of unique experiences adopted various means to remain competitive in its business line and provide better services to clients through incorporating technology on their processes. Some of these symbols include, ordering guests a valise which contains Samsung gear VR headset hence enabling one take an immersive trip that takes 25 hours and allows experience some feel just like they were been taken on another dimension.

Furthermore, the fact that Marriott has embraced VR can be seen as a tactical decision to enhance its product offering and focus on customers who are technology conscious. In an industry emphasizing the need for differentiation, providing VR experiences turns into a competitive advantage that snaps potential travelers and tourists seeking extraordinary innovative and cutting-edge amenities. This strategy is consistent with the changing tastes of contemporary travelers, making their experience better beyond what traditional services have to offer.

Marriott of Marriott's VR Postcard platform further confirm the potential disruption in tourism brought by social media. Virtual postcards that take users on 3D trips; some of the tourist sites they can visit include The Andes Mountains (Chile), an Ice cream shop located in Rwanda, and The jubilant streets of capital city Beijing (Marriott launches a virtual reality service. (n.d.)). This not only adds an extra feel of a remarkable hotel experience but also aligns Marriott with the pioneers who have succeeded in using technological innovation to help move guests from one captivating corner around the world.

Marriott's commitment to innovation is exemplified by its strategic collaboration with Samsung to introduce "VRoom Service" and its utilization of Oculus Rift technologies in marketing campaigns, introduced a year and a half prior (Marriott launches a virtual reality service. (n.d.)). Through such partnerships, the hotel group not only enhances its service offerings but also underscores its dedication to staying at the forefront of industry trends. Marriott's adoption of VR in service provision reflects a broader trend in the tourism sector, where technology plays an increasingly vital role in delivering guest experiences that surpass those offered elsewhere.

4.12.4 Key Learnings and Success Factors in AR and VR Tourism Case Studies

User Engagement and Interactivity: Both Google Expeditions and Pokémon GO show how very important it is for users to actively take part. AR and VR apps doing well in tourism depends on including fun features for exploring and chatting with other people. When users take a bigger part in using the app, they are usually more likely to get worth and be happy with it.

Educational and Experiential Content: Adding learning material or hands-on experiences keeps showing up as a key to success. Giving history lessons using VR in school trips, seen on Google Expeditions. Or making exploration exciting with Pokémon GO game; the quality of what they offer helps a lot for user happiness. Adding fun and learning features makes AR and VR apps more popular in the field of tourism.

Integration with Real-World Locations: For AR and VR programs to work well in tourism, they need to fit smoothly with real places. Both examples show how useful it is to connect online experiences with real locations, used either for learning or playing games. This joining boost the feeling of being linked and important for users, making technology a key piece of their real-life experiences.

Scalability and Accessibility: It's common to face the problem of getting things to scale up, and it's very important to deal with issues about reaching into something. Google Expeditions, which aims to help in education, has issues linked to how much VR hardware costs. However, Pokémon GO's use of phones makes it easier to access but might have drawbacks in relation to the abilities of the hardware. Being successful in AR and VR tourism depends on finding a way to let everyone use it without making the experience less good.

Privacy and Safety Considerations: Both examples show that privacy and safety issues are very important. Pokémon GO had problems with how players were meeting in the real world. This shows the importance of having clear rules, protections and careful planning to make sure that these deep experiences do not hurt or put users at risk.

4.12.5 Comparative Analysis: Google Expeditions vs. Pokémon GO and Marriott Hotel

Purpose and Target Audience: Expeditions is an educational tool developed specifically for use in the classroom where teachers oversee virtual field trips experienced by students through VR technology. This primary audience includes educational organizations aimed at the improvement of conventional learning. In comparison, Pokémon GO is a mobile AR game that caters to a wider user base since it targets gamers and Pokémon lovers; the aim of this game is to promote outside attraction seeking spirit as well as socialization. Marriott hotels introduce VR, as shown by such ventures as VRoom Service and VR Postcard which focus on making hotel guests seeking new mind-blowing experience instead of traditional accommodation more diversified within the industry.

Technology: Technologically, Google Expeditions capitalizes on VR to offer a 360° immersive experience which require instances of VR headsets for full engagement. On the other hand, Pokémon GO uses mobile devices and AR overlaying virtual elements onto the real world via a device camera, as well as using GPS to allow location-based gameplay. The main aspect of VR use in Marriott hotels consists in the combination of AR and VR technologies when VRoom service organizes lodging-based VR experiences through Samsung Gear VR headsets, on the one hand, and another program called a VR Postcard by delivering 3D traveling elsewhere via standard virtuality headsets.

Educational vs. Entertainment Focus: Google Expeditions and Pokémon GO have major differences in their intentions. Google Expeditions is decidedly pedagogical, it takes students to historical places and museums making learning in class full of add-ons. On the other hand, Pokémon GO focuses on fun and games prompting players to walk around actual locations collecting virtual Pokémon. VR at Marriott hotels finds a balance to include both elements, teaching and entertainment. VRoom Service offers immersive VR experiences to the guests; meanwhile, VR postcard was based upon 3D travel experience and that they have unique edutainment idea into accommodation industry.

4.13 Implications and Recommendations for Tourism Industry

4.13.1 Recommendations for Tourism Businesses

In the busy world of travel, businesses are always looking for new ways to grab and keep tourists' attention. One great way that has a lot of promise is combining AR and VR technologies. These new tools can change how tourists see places, giving them many choices. They could offer things like virtual tours or deep storytelling experiences. In this study, we dive into the different parts of using AR and VR for tourism. We focus mainly on teamwork, learning through these tools as well making it easier to visit new places by utilizing feedback from people who have used them before.

The main charm of AR and VR is that they can take users to new places or see in a new way known places. Tourism companies can use these technologies to give virtual tours that show places better than anything else. Fun experiences can be more than just pictures. They can include guides with extra reality to help people learn and join in better. Using VR to tell stories can create strong feelings between travelers and the places they go. This helps them understand better why these locations have special history or culture significance.

To use AR and VR at their best, businesses in tourism need to work closely with tech people who know a lot about these fields (Caciora et al., 2021). By teaming up with experts, companies can make answers that perfectly match their brand and products. This teamwork way encourages creativity, making programs made just for the special problems and needs in tourism. These team-ups can be very helpful in being the leader of technology improvements. Even though AR and VR have a lot of potential, they might be new for some people who travel. To get past this problem, companies need to focus on teaching users. Giving understandable school stuff and fun shows can help people get the good things of AR and VR. This makes them use these technologies better. This active strategy makes sure obstacles to use are taken down. This helps make a more welcoming and smarter user group.

The success of AR and VR projects depends on their availability to a wide range of people. Making things less expensive is very important, so these experiences are not only for people with fancy stuff. Businesses should find other ways for people without fancy tech gear, so they can enjoy AR and VR. This will make it possible for more folks to use these experiences. User-friendliness should be very important. It has to help people with different skills in computers so everyone can use it easily and have fun.

People's comments are very important for the growth of AR and VR experiences. Asking users who use these tools helps businesses know what they like, find problems and get helpful ideas. This circle of feedback helps make things better over time. It makes sure that AR and VR products are improved to meet or even go beyond what their audience wants. This promise to make customers happy is important for the success of AR and VR plans in the travel business.

4.13.2 Policy Implications

In the world of AR and VR, where personal experiences get better through new technologies, strong privacy rules to keep data safe are very important. The people who make laws are very important in setting up clear rules about how personal data should be collected, saved and used within AR and VR apps. By making sure tight privacy rules, lawmakers not only keep users' personal information safe but also build trust and confidence in using these technologies. In a time when people worry about their privacy and cyber-attacks, strong rules become very important for technology to be used well. Clear rules about how user data is kept safe, saved and dealt with in AR and VR apps are very important. This not only protects people from possible wrong use of their personal details, but also helps make tourism companies that use these technologies more trustworthy and honest. In privacy rules, openness is very important. People should get simple information about what kind of data is being taken, why it will be used and how safe their info will be. By doing this, people who make rules help to build a place where users feel safe using AR and VR experiences without hurting their privacy.

To really change tourism with AR and VR experiences, we need to make sure everyone - even those with disabilities or limited access to technology - can use these tools. To make this happen, creating and using rules for accessibility are very important. These rules should take into account people with disabilities, making sure that AR and VR moments are made to include everyone's needs. Rules for making things easy to use should talk not just about the tech parts, but also how people interact with them. This is so those who know a little or lots can easily enjoy these experiences fully. Also, when making AR and VR

applications we need to think about how they will work for people with eyesight problems, hearing difficulties or mobility issues. Also, it's important that everyone can have a chance to use these fancy gadgets. Both people who make decisions and businesses should look at ways to bring AR and VR experiences into use on many different things, from smartphones to cheaper headsets for VR. By making sure everyone is included, tourism businesses can reach more people and give them exciting times for many types of visitors.

Governments can help push the use of AR and VR tools in tourism by giving out bonuses, grants or money support. By giving money help, governments inspire tourism businesses to spend on these new technologies. This helps make things better and boosts economy growth. Incentives can come in different ways, like tax reductions, money for research and development or help buying AR and VR things. These programs not only help businesses with money problems but also make the place a friendly area for technology. This brings in tourists who like tech things and helps the whole tourism industry compete better. By encouraging invention with money, governments help tourism change. This makes sure places don't get left behind by tech updates. This makes businesses change their ways to stay ahead, which helps the whole economy overall.

In the changing area of AR and VR in tourism, rules should give clear instructions about good behavior and safety issues. This involves rules for making content, keeping users safe and following privacy laws. By giving clear rules, leaders make a safe and sure place for the making and use of AR and VR technologies. It's important to think about what is right and wrong when making content for AR and VR. We need them to respect cultures, not spread bad stories or stereotypes that hurt people. People should use cautions for risks to health from using immersive tech long times. Setting how much can be used or adding parts that keep the person safe is important. Following privacy laws is very important to keep a careful balance between new technology and personal rights. Laws should clearly tell what businesses must do to keep user information safe, prevent others from getting in without permission and be open about how they use data.

4.14 Considerations for Destination Management Organizations (DMOs)

Tourism gets its technology landscape shaped by Destination Management Organizations (DMOs). They are very important for this task. By pushing together, the tourism businesses, technology builders and educational groups DMOs can make an environment that encourages new ideas for AR and VR uses in travel. Making groups work together helps them share knowledge, tools and ideas. This results in creating new technology to improve the experience of traveling or visiting places.

Working together, travel businesses and tech makers can create custom answers that solve specific problems in the industry. On the other hand, schools can help by offering training sessions and doing research. This will make sure that people who work in tourism have all they need to use AR and VR technologies well. DMOs help create a team environment that supports creativity. This helps make immersive tourist experiences even better in new ways.

DMOs can pick out and boost good AR and VR stuff that acts like a digital way in to the unique places of interest or cultural activities at these destinations. Virtual tours of cities, acting out history and storytelling that you can be part of become strong ways to get visitors interested (Ariza-Colpas et al., 2023). These technologies let DMOs go beyond body limits. They show travelers a bit of what the place has to offer, helping them decide where they want to visit next. The selection of content is not only about displaying famous places but also making a personal bond. DMOs can make stories that show what the place is like and get people excited about visiting it. This chosen content turns into a powerful advertising thing, showing the place as an important spot to go with many experiences.

Putting money into school projects is very important for making sure that AR and VR tools work well in our neighborhoods. DMOs should be in charge of giving training for local companies and helpers. They need to teach them how AR, VR can make their business better with useful tips on using it every day. This work makes the place better with technology and also helps that people who are in tourism can give great experiences to visitors.

These school programs can talk about many things, from learning the basics of AR and VR tools to helpful hints on making good content and getting people involved. By helping small businesses, DMOs help make good use of technology in tourism last longer. This leads to a place where new ideas become part of its personality. DMOs can plan to show the place as good for technology by actively advertising that AR and VR activities are available. This advertising work is for people who love technology and travel to find new experiences. By showing how the destination uses cool technology like AR and VR, DMOs can draw a group of people who love new tech stuff. They're also more likely to get involved with these things themselves.

Marketing campaigns can show that there are lots of fun AR and VR experiences to do, which shows how much the place cares about being up-to-date with technology. This placement not only draws in a special part of travelers but also helps make the place known as an up-to-date and technology loving spot. Getting local people involved in making and

using AR and VR technology is very important for these new tech ideas to be successful. DMOs should include people from the community in making choices. This helps make sure that what is said or written fits their culture and matches with local beliefs well. This stops possible culture misunderstandings and also helps community backing for improvements in technology related to travel.

Getting the community involved is more than just asking for their thoughts; it's about working together to make stuff, get feedback and mix in local ideas into AR and VR experiences. DMOs make communities feel like they own and love the places they live. This brings progress to what already works well so that it is connected with how local people are doing good too.

CONCLUSION

In conclusion, Augmented Reality (AR) and Virtual Reality (VR) have emerged as transformative technologies in the tourism industry, reshaping the way travelers plan, experience, and remember their journeys. AR enhances the real-world environment by overlaying digital information, providing instant data, and promoting immersive interactions. It aids in navigation, offers cultural enrichment, and contributes to sustainable tourism practices. VR, on the other hand, takes users on a total digital journey, allowing them to explore destinations virtually and make informed decisions. VR's applications in tourism include education, training, and providing accessible travel experiences for those with limited mobility. The integration of AR and VR offers synergies, creating a more inclusive, engaging, and sustainable tourism ecosystem. These technologies play a crucial role in destination marketing, offering new and immersive ways to showcase tourist places. Virtual destination experiences through VR provide a hypnotic and realistic view, fostering deeper connections and increasing interest. Interactive brochures and print materials enhanced by AR create memorable experiences for customers. AR wayfinding and navigation make travel more engaging, while immersive social media campaigns, virtual events, and personalized marketing campaigns attract and engage tourists effectively. Moreover, in-depth cultural experiences through VR, virtual hotel tours, and gamification for engagement contribute to a more transparent and enjoyable travel experience. The use of AR and VR in destination marketing not only transforms advertising methods but also creates a more hands-on, interesting, and individualized approach, making marketing plans stronger and more successful. In essence, the integration of AR and VR in the tourism industry is a game-changer, providing a more immersive, engaging, and sustainable travel experience for both tourists and local communities. These technologies have not only revolutionized the way we explore the world but have also opened new avenues for marketing, education, and cultural exchange in the dynamic landscape of global tourism.

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