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Quantifying the Impact of Immersive Technologies: An Empirical Analysis of Augmented Reality & Virtual Reality in Bangladesh's Tourism Sector

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Abstract:- The research focuses on augmented reality and virtual reality in the transformation of the travel and tourism system in Bangladesh. This empirical research points to the satisfaction of tourists and loyalty of customers being enhanced by these technologies. Among the participants, a survey comprising 170 respondents was conducted, and the data were analyzed statistically using descriptive statistics, reliability tests (Cronbach's Alpha = 0.895), and ANOVA (p-value = .000). Results are indicative of augmentation in travel experience by means of AR and VR, rated on several dimensions with means ranging between 4.17 and 4.58 on a 5-point Likert scale by participants. The study entails possible revolution in tourism by AR and VR through immersive, interactive, and bespoke experiences. This study can help internal stakeholders and policymakers to establish sustainable growth within the tourism sector.

Keywords*: Augmented Reality, Virtual Reality, Tourism Sector, Tourists Satisfaction and loyalty, Bangladesh.*

1. Introduction

The rapid development and widespread use of information and communication technologies (ICTs) have had a profound impact on society. It is the era of fast communication and the free flow of information within the reach of these technologies, allowing almost limitless transmission of information from anywhere in the globe (Buhalis et al., 2019). This advancement has ushered in an era of reality–virtuality technologies such as augmented reality (AR), virtual reality (VR), and pure mixed reality (PMR), which are changing how customers perceive real and virtual experiences (Tom Dieck and Hang, 2022). AR means adding digital information to the real environment. In virtual reality (VR), users participate in fully computer-generated environments for an all-immersive experience. PMR is where real and digital elements are merged so that they coexist and interact with the user (Flavian et al., 2019). The immersive technologies market size is expected to grow as per recent reports to over US$100bn

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by 2026(Statista, 2023). This indicates how important these technologies really are for the future advancement of any society. The application of information and communication technologies (ICT) has been an immense boon to tourism as an industry lacking in tangibility and homogeneity for enhancing customer experiences (Buhalis et al., 2019). In particular, the new wave of immersive technologies, in particular AR and VR, can help mitigate some challenges of tourism products that defy tangibility by affording potential tourists entirely new ways of exploring and experiencing them (Guttentag, 2010; Tussyadiah et al.,2018a, 2018b). Entertainment while learning, personalized information, or access to physical places or historical moments that are otherwise not available are all potential advantages of these technologies for tourism (Guttentag, 2010; tom Dieck and Jung, 2018; Flavian et al., 2019b). These technologies unite the real and the virtual environments to create extra-sensory experiences (Petit et al., 2019). There is no doubt that immersive technologies have a great potential in the domain tourism to which further research is needed to improve the implementation of AR and VR in order to realize valuable tourism experiences. This is still a nascent area of research, and so far, the literature continues to emphasize the necessity of further study on experiences of tourists with AR and VR technologies (Loureiro et al., 2020; Wei, 2019; Yung and Khoo-Lattimore, 2017). Given the novelty of this research domain, with continuous advancements, most research was published recently and quite fragmented without a common focus. Literature reviews tried to harmonize the existing work for common lines of research to be analyzed by the research community (e.g. Fan et al. (2022b); Loureiro et al., 2020; Wei, 2019). All of them considered AR and VR under the same umbrella; however, as AR and VR have different natures which can clearly distinguish them (Flavian et al., 2019), such a review of the literature separately or comparatively can elucidate specific lines of research for each technology while fetching better understanding about how effectively each technology produces experiences for the tourists.

2. Literature review

This phenomenon, however, is compounded by the literature being rather fragmented, thus leading to the dearth of comprehensive literature reviews that have sought to consolidate the existing body of research. Therefore, this section attempts to give an overview of the existing literature reviews in AR and VR in the tourism arena and discusses much of the present remaining exceptions in the light of their temporal evolution, evaluating the contribution of each to the understanding and application of AR and VR in the tourism industry.

Beck et al. (2019), focus on virtual reality and its impact, presenting a state-of-the-art review analysis into understanding the application of VR in tourism. They feel that previous research has failed to specify the VR system being investigated, leading to confusion, as the term VR encompasses systems with varying technical capabilities. They further elaborate by distinguishing VR systems applied in tourism based on levels of immersion: non-immersive

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(e.g., desktop-based VR), semi-immersive (e.g. multiple projection screens that project content onto walls and floor), and fully immersive (complete isolation of the user with the world; e.g., head-mounted displays). The authors examine various research articles in VR tourism based on this taxonomy in an attempt to clarify terms and associated research. The authors state that development work for VR devices goes in parallel with research: focusing on non-immersive VR up until about 2013, research since then has mostly tackled VR in full immersive states.

Yung and Khoo-Lattimore (2017) they highlight there isn't much rigorous and systematic knowledge coming out of academic literature on AR and VR in the tourism sector. In that direction, with the intent of conducting a systematic quantitative review, they extracted 46 papers that reflected that the most cited types of VR/AR were found to be "virtual worlds" and "virtual environments." Marketing, education, and conceptual are among the majority of tourists' contexts in which VR/AR research emerges, while empty are categories such as food and beverage and MICE. Most common methodologies include conceptual papers and quantitative surveys. Authors claim there is need for more theory-based research on VR/AR in tourism. Among the exceptions, technology acceptance model (TAM), theory of planned behavior and flow theory are those that have been most applied to this context. From this review, they propose a model for the challenges in the adoption of VR in tourism for them.

Wei (2019) takes a dual approach to AR-VR studies in hospitality and tourism, having conducted a literature review from 2000 of 60 papers. The results showcased an upward trend in papers being published on this topic. Most of the research on VR/AR has been carried out in Europe and Asia, focusing on areas like tourism destinations or cultural heritage sites such as museums (with little research in hotels and restaurants). Upon analyzing the previous literature, the author came up with a holistic VR/AR user experience framework that involves stimuli (service environment, individual differences, interpersonal factors, and presence), dimensions of the VR/AR experience (instrumental, experiential, psychological, and social), and consequences (e.g. emotional response, satisfaction, image of destination, behavioral intentions). Most theories are grouped under antecedents related to the VR/AR user experience (e.g. TAM) or process-related theoretical models (e.g., process theory). As for the quantitative kinds of research, the dominant method utilized is surveys while focus groups and interviews seem to be the most common for qualitative methodologies; however, the area of experimental research is also in its infancy. Two suggestions for future research arise: the cross-cultural approach should be considered in studies, along with a greater emphasis on event settings and hospitality.

Jingen Liang and Elliot (2020) mostly focused on AR applications for tourism. They did a literature search, which identified 32 selected articles. They have shown the development of AR tourism research from design and development to more recent topics, such as gamification, user experience, satisfaction, and behavioral intention. A conceptual map featuring the

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constructs from these articles is provided. The methodologies included qualitative (e.g., focus groups) and quantitative (e.g., field surveys) approaches. Based on all findings, the authors propose an agenda for future research (e.g., gamification, actual behavior, negative consequences of AR, mixed methods).

Loureiro et al,. (2020), by using citation network analysis together with text-mining techniques allow conducting literature review in 56 articles related to VR and AR in tourism. The longitudinal study brings out the recent wave of published papers on the topic from 2014, being this trend stronger in recent years. They also point out the topics covered by the selected literature which include: smart cities and cultural heritage; mobile uses for sustainable tourism; tourism destination marketing; experiential and telepresence; AR, etc. Consequently, based on findings, research questions along with four key realms have been proposed by Loureiro et al. (2020) for future evolution of research on AR and VR in tourism, these being multisensory experiences, brain computer interactions, wellbeing development and use of artificial intelligence in immersive settings.

Fan et al. (2022b) are the latest conductors of a literature review; they also executed the first meta analysis on augmented reality and virtual reality within tourism based on papers 56 (65 studies). Presence is seen as a core construct that affects value perceptions (for instance, ease of use, enjoyment) and psychological responses (for example flow and affective engagement) and thus, the outcome (for instance, behavioral intentions/actual behaviors, attachment) becomes the prime subheading in this proposal along with moderators (like experience type). The meta-analysis results, in fact, support most of the assumptions. Particularly, presence has direct (and indirect) effects on the mediating variables, which affect the responses. The type of simulation and social interaction positively moderate (while prior visitation negatively moderate) the relationship of presence and tourism experience. They also propose hope for future research: applying VR/AR at the various phases of the tourism journey (pre-tour, during, post-tour), perhaps adverse effects of these technologies, other methods (for instance, sentiment analysis) to study them, immersive technologies and sustainability, or interaction with society.

Several studies worldwide have examined on AR & VR but most of foreign country perspective. But there are no studies Bangladesh perspective using empirical data. As such, the present study is on Virtual Reality and Augmented Reality in Travel &Tourism

3. Research Objectives

1. To describe virtual reality, augmented reality, AR & VR in tourism, etc.
2. To identify how AR & VR technologies enhance tourist satisfaction and increase customer loyalty.

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4. Theoretical Framework

4.1. Tourism

Tourism today is one of the most dynamic and complex industries, contributing to the economic development of many nations around the globe (Hossain et al., 2025). Modern tourism also stands as one of the most important branches of the economy and a leisure-time occupation (Hossain et al., 2025). The tourism sector added about $8.9 trillion to the world GDP in 2019, approximately 10.3 percent of the world economy (WTTC, 2020). In other words, here lies one out of ten jobs in the world. To reinforce this, huge sums can be quoted just for one market. With its ability to earn foreign exchange, tourism is one engine propelling currency into the lifeblood from international tourists to developing countries, where poverty is alleviated, and GDP growth is enhanced. This is another avenue for tourism that satisfies the international appetite for organic foods (Hossain et al., 2025).In the light of COVID-19, many economies whose performance contour predominantly depend on tourism had this vulnerability glaringly thrown into their faces as the pandemic curtailed the inflow of visitors (Gössling et al., 2020). The greatest extent of contraction almost every other country has been put through in the last 50 years, measured in terms of variations in scales of contraction studies from the IMF, indicates an economic contraction of travel-enabled countries into 12% of their GDP. Tourism casts a wide net on the environment, particularly air travel with carbon emissions, pollution, or habitat destruction in retraining guests (Lenzen et al., 2018).

4.2. Virtual Reality

VR refers to that computer-generated environment that simulates both real and imaginary settings in an attempt to offer users an as close to genuine interaction as possible (Guttentag, 2010), which may or may not involve the use of wearable technology (Loureiro et al., 2020). The user of a VR headset can feel absorbed in the virtual scene and present in the action (Wei et al., 2019a). In addition to this, the advent of 360˚ interactive video VR experiences allows marketers to utilize these VR experiential immersions without the need for wearables like headsets with their consumers (Beck et al. 2019). VR is acknowledged as an effective means of increasing cultural awareness and considered as an adjunct to, as opposed to a replacement for, real travel experiences (Mura et al., 2017). In Vincent's views: "I do believe that this has mushroomed and gathered steam along with Google applications." In 2017, Google introduced street-view, which people easily adopted and made it becoming their faithful app to travel the world viewing places in 360-degree. Meanwhile, its other estimated US$2.5m investment in the "Oculus rift" headset was made by Facebook (Luckey, 2009). All of these investments were made so as to improve user experiences in VR across such industries as education, tourism, games, entertainment, healthcare, and sports.

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4.3. Augmented Reality

Augmented Reality is a computer system capable of man-machine interaction enabling humans to coexist in an environment that symbolizes the interaction between the real world and the digital world, with a computer device in hand: a tablet or smartphone. Augmented Reality (AR) is the technology that allows for the virtual overlay of information onto our perception of the real world (Iberdrola, 2023). The key to working with any sort of 3D artist is that Blender is the program for creating 3D visuals, sculptures, animations, and visual effects. Being well known as a cross-platform applications, Blender can function across Linux, macOS, and Windows-based systems. Being comparatively lightweight in terms of memory and storage requirements, Blender is well-suited for use on low-range devices. The interface is OpenGL-based, ensuring a coherent experience across the entire spectrum of supported hardware and software platforms (Blender, 2024).

4.4. The Difference Between AR And VR Technologies

While VR and AR constitute interactive technologies, their manner of representing reality hints at the reason for this confusion. In VR, interaction happens inside an artificial environment simulated by the computer, which does not necessarily alter reality or provide any form of interaction with the real world. In AR, the person is able to see the real environment with objects either superimposed upon or combined with the real environment based on interaction with the virtual objects. Data generated in the computer environment such as sound, images, and shapes are integrated with the real environment inreal-time (Kipper 2012; Rampolla).AR relies on the existing real-world environment and overlays virtual information on it to enhance the user's experience. By contrast, VR applications immerse the users in an animated scene or in a real place, captured and integrated into the virtual environment (Bingöl, 2018). VR works on the premise that an artificial environment generated through graphics, colors, animations, and sound effects in the computer interact swith the human senses, creating an immersive experience where the user feels as if they are a part of the virtual environment (Arat & Baltacıoğlu, 2016). The key differences between the two technologies have been summarized in **Table 1**.

Augmented Reality	**Virtual Reality**
Adds virtual elements into the real world	Creates an immersive virtual experience
The user controls their senses	The system guides sensory controls
It is 75% real and 25% virtual	It is 75% virtual and 25% real
The user is partially involved.	The user is completely immersed in the technology.

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Requires top-notch bandwidth and connectivity for proper functioning	It creates realistic experiences artificially
Does not require any extra device	Mandatory to use sensory devices and intelligent wearables for the best experience

Table 1: The key differences between AR and VR technologies. (Source: Author)

4.5. Virtual Reality In Tourism

VR is now considered as a game-changing technology that will completely change various industries, with tourism as one of them (Yung & Khoo-lattimore, 2019). Its uninterrupted evolution has allowed the tourism industry to adjust current traveler needs and wants by transforming the complexity of the way they explore destinations and cultures (Xiang et al., 2015). The wide vista of the possible applications of VR is seen as including usage in almost every aspect of tourism, such as planning, marketing, information exchange, learning, accessibility, and preservation of history (Wiltshier and Clarke, 2017). Such an immersive experience is entertaining and stimulating for users. Also, a reality-reshaping event for users must have been emotionally involved (Holsapple & Wu, 2007).

Fig.1. Virtual reality in tourism (Source: google photo)

In addition, “enjoyment” refers to a kind of experience that draws people to visit a 3D tourism site (Huang et al. 2017). In addition, Venkatesh (2000) defined enjoyment as "the extent to which the activity of using a specific system is perceived to be enjoyed in its own right apart from any performance consequence resulting from system use."

4.6. Augmented Reality (AR) In Tourism

Augmented Reality is a technology that adds a virtual assemblage over the real. Like most things of the virtual world including 3D models, videos, texts, animation, audio, and videos, AR merges them into what the user perceives through gadgets such as a smartphone or tablet.

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Fig.2. Augmented reality in tourism (Source: google photo)

AR can provide tourists with additional information about historical and cultural landmarks, guide them through a city using digital navigation aids overlaid on the real-life surroundings, and engage them in an interactive experience with art. Several studies conducted in various countries provide a view of the role of AR in promoting, enhancing, and transforming interactions between street art and tourism, considering urban contexts, cultural storytelling, sustainability, and tourist engagement. Much previous literature pointed to the integration of AR into tourism impacting tourist satisfactions (Chourasia et al., 2023: 42; Lee et al., 2024; Wang et al., 2024; Zhu et al., 2024). Chourasia et al. (2023) further showed that AR increased tourist engagement and knowledge acquisition. Especially, it aided tourists' understanding of street art cultures (Yaakob et al., 2023). Moreover, location-based and AR navigation technology provided enhancement in the tourist experience (Moustafa et al., 2024; Omran et al., 2024; Zhang et al., 2024).

4.7. Immersive Technologies In Travel &Tourism

AR-VR technologies today are changing the paradigm by revolutionizing travel and tourism through immersive experiences imparted alongside tourist site planning. VR facilitates virtual touring of destinations and accommodations for travelers, while AR immerses users in the real environment, enhancing their experience with virtual information, objects, etc.

4.7.1. Augmented Based Travel

One of the best interactive and immersive tour experiences AR technology has brought toward the space of tour and travel is in allowing users to have a virtual or interactive tour of tourist destinations or places. Users can use the AR-based travel apps to virtually tour famous landmarks, all the while being in a single location.

Additionally, they can make use of such apps to obtain supplemental information while traveling about the various ancient buildings and landmarks and even an overview of different localities. AR also aids in location-based technology of mobile applications for giving proper city guide and navigation. Thus, augmented reality in tourism is indeed a great educational and

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explorative mode for places in the world and for obtaining engaging interactive AR tours in those places.

X1: Augmented reality based travel apps provide a more immersive touring experience.

4.7.2. AR-powered Self-Guided Tours

It is almost impossible for visitors to a place to tour without an escort, which makes it hard for the visitor to rely on a tour guide to show them the top places through a well-guided tour explanation. However, with the introduction of augmented reality in tourism, the game is going to be fully revolutionized-from entirely rearming travelers or tourists with self-guided tours to them with AR headsets or AR mobile apps for object recognition, which should provide complete information about the local places (museums, food joints, stations, historical landmarks, etc.). This is disruptive change for augmented reality in tourism. Most of the prominent mobile application development companies and tourism companies are going hand in hand with this kind of technology to innovate travel solutions.

X2: Augmented reality self-guided tours provide truthful and dependable information.

4.7.3. Travel From Home

With the help of augmented reality technology, customers can visit sites and destinations without having to travel there. A mobile application powered by AR allows a user to view and virtually explore world-famous destinations or ancient places. If using AR glasses, it also provides an immersive experience filled with various interactive elements. Thus, placing augmented reality travel experiences well in mind. Augmented reality technology has disrupted the very notion of travel from home in the tourism industry. Hence, increasing demand has seen companies wading into virtual reality to maximize customer interaction on their mobile applications.

X3: Augmented reality technology gives us a realistic idea of destinations from home.

4.7.4. Interactive Advertising and Marketing

Advertising and marketing form the backbone of travel and hospitality industries. Hotels, accommodation facilities, and travel agencies need effective marketing techniques for their products and services to increase sales and revenues. Augmented reality technology helps hotels and other businesses related to travel in marketing. It allows businesses in travel to virtually lead tour guides to a room, hotel, and accommodation facility.

Many hotels currently apply AR technology so users can see rooms in 360 degrees before making any reservations and gain enhanced customer satisfaction levels. In addition, they provide AR tour facilities either by web or mobile apps to help consumers in making decisions.

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Thus, augmented reality & app development are indeed changing the advertisement and marketing practices in the tourism industry.

X4: Augmented reality based advertisements influence travel decisions.

4.7.5. AR-based Travel Mobile Apps

For at least a decade now, mobile applications have been a prominent companion in activities within the travel and tourism industry. Mobile applications are utilized in the provision of just about every travel service imaginable, namely ticket booking, hotel reservations, itinerary planning, and travel package buying. Nevertheless, innovators and growing tech advances demanded new tech in the traveling marketplace to enhance their digital offerings to the next level. Here, augmented reality technology provides innovative and feature-rich apps for the Travel and Tourism industry. Companies hire dedicated mobile app programmers to create next-generation travel mobile applications that implement augmented reality-based features acceptable to modern users' expectations and needs. Today we can find various AR applications that help bridge the gap between end users and businesses with their travel mobile applications. AR applications in academia divide into 1-Location-Based AR application 2-Marker Based AR application 3-Marker-less alternatives 4-SIM (Simultaneous Localization and Mapping Software) 5-AR City tour applications.

X5: Augmented reality enhances the functionality of travel mobile applications.

4.7.6. Virtual Reality Based Travel

Traveling in virtual reality usually means VR tourism videos made for VR headsets. The idea behind these virtual travel experiences is to provide a sense of actually being on the real location.

With the crux of 360 virtual reality, the travel experience in VR ought to be a very unique and memorable experience to the user. Travel agencies or travel companies are continually embracing this technology; it appears that they promise a bright future in the industry.

X6: Virtual reality helps us feel like we are actually visiting a destination.

4.7.7. VR Headsets In The Travel Industry

VR headsets offer the user the closest-to-life virtual reality travel experience. VR headsets leverage specialized software that monitors the position of the user's head. This lets the user navigate or explore the travel destination almost as if they are really there.

The last few years have seen a great upward graph concerning VR headset ownership. This growth is mainly due to the gaming actual confront where this technology is being pushed strongly.

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Also, all the major online platforms such as Google, Facebook, and Amazon are investing a lot of money in VR headsets and VR content, which gives a good promise for this industry.

X7: Using a Virtual reality headset makes virtual travel feel more realistic.

4.7.8. VR For Travel Agencies

One of the most common uses of VR headsets in tourism is by the travel agencies themselves. They can offer prospects an in-store virtual travel experience: this completely redefines what it means to go to the travel agent.

Instead of just showing tourists brochures and computer screens, travel agents can now let their clients experience some virtual travel installations themselves. The same construction might be successfully executed at trade shows and events and can easily draw public attention.

Use of VR allows travel brands to really differentiate in the marketplace and provide a memorable experience for the consumer. Travel companies have adopted the VR space, exploiting it for everything from sales to brand recognition.

X8: Virtual reality experiences in travel agencies help to decide better.

4.7.9. Virtual Tours Of Hotels

Virtual hotel tours allow users to explore a hotel and its grounds far more deeply and immersively than in the past. Like virtual tours are changing up the real estate concept, they are already making quite an impact on the hotel industry.

The interiors and exteriors of a hotel are photographed in high detail by high-res cameras and special equipment. After that, the images are stitched into one full 360-degree interactive tour where the user decides which room to visit.

The VR hotel tours enjoy the quality of being mesoscopic, meaning they can be virtually manipulated with the same ease across all devices—mobile or desktop. These tours can then be put up on the website as well as social media so that all prospective clients can view them any time they want.

X9: Virtual reality helps us compare hotels more effectively.

4.7.10. AR & VR Enhancing Customer Engagement And Satisfaction

In an era when customer engagement becomes the center of gravity, leveraging AR & VR promotes the most powerful customer engagement experience. Traditional travel marketing mechanisms—brochures, websites, and even videos—however, can only go so far. With virtual reality, prospective customers may step into a destination virtually. Such types of engagement not only enhance customer satisfaction standards by promising a more realistic and attractive preview of what customers can expect from the destination, but it also makes traveling

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customers more assured about their choices and allows them further to create an emotional bond with their impending travel. This strong engagement translates into conversion rates for the travel businesses and customer loyalty, as a satisfied traveler is more likely to return and evangelize the experience to others.

Y: AR & VR increase customers satisfaction and loyalty.

5. Methodology

This study is mainly descriptive and seeks to understand the subject more thoroughly. Data is collected through primary and secondary sources. The primary data is collected using Google Forms for the survey. In this research, we use Likert Scales where 1= Strongly Disagree and 5= Strongly Agree. It also forms the foundation of secondary studies as a methodological basis for research. The authors reviewed and analyzed various existing literature such as research articles, journals, and books, highlighting VR & AR in tourism, which the authors considered as the methodological basis for research. Using SPSS 25 and MS Excel 2019, the analysis of the data will, therefore, provide the findings of this study.

6. Result And Discussion

Multiple variables have been analyzed to ascertain the dependent variable: "*AR & VR increase customer satisfaction and loyalty*" (Y). Independent variables (X1 to X9) are analyzed to estimate their effect on the dependent variable (Y). In this study, a survey questionnaire was developed to collect data from the population, with 170 respondents participating. A summary of the demographic profiles of the respondents is presented in the following figure.

Figure-03: Age of respondents

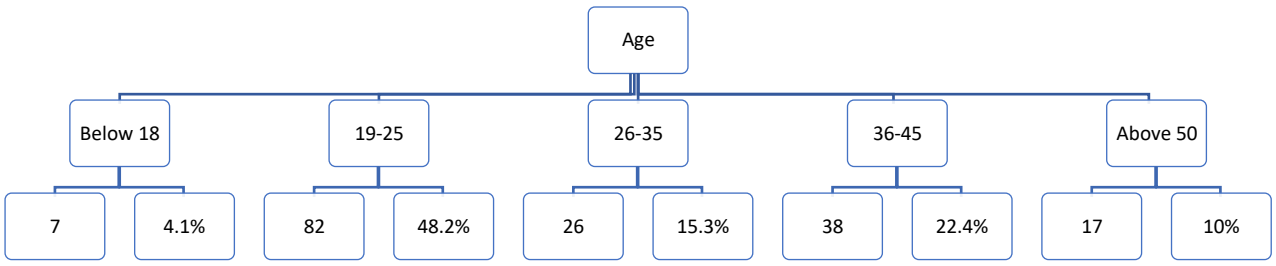

Figure 3, represent the finding the frequency and proportion of respondents' ages. Analysis of the figure indicates that below 18 is 7 (4.1%), 19-25 is 82 (48.2%), 26-35 is 26 (15.3%), 36-45 is 38 (22.4%) and 50-up is 17 (10%). The total number of respondents is 170.

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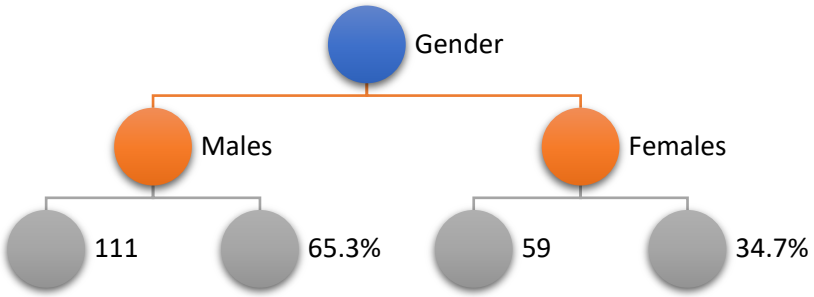
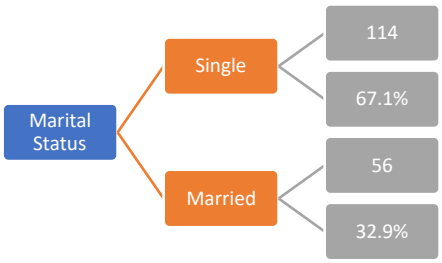
Figure-04: Gender of respondents



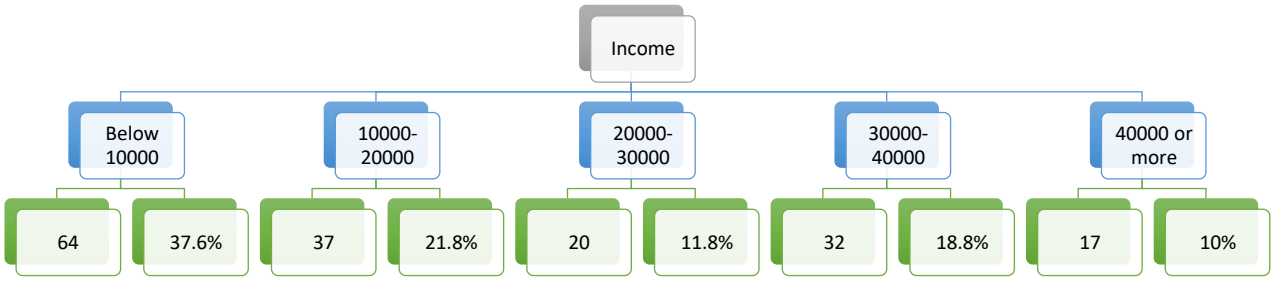
The figure 4, represents the finding the frequency and proportion of respondents' genders. Analysis of the figure indicates that males are 111 (65.3%) and females are 59 (34.7%). The total number of respondents is 170.

Figure-05: Marital Status of respondents



The figure 5, represents the finding the frequency and proportion of respondents' marital status Analysis of the figure indicates that single is 114 (67.1%) and married is 56 (32.9%). The total number of respondents is 170.

Figure-06: Income of respondents



The figure 6, represent the frequency and proportion of respondents' income. Analysis of the figure indicates that below 10,000 is 64 (37.6%); 10,000-20,000 is 37 (21.8%); 20,000-30,000 is 20 (11.8%); 30,000-40,000 is 32 (18.8%) and 40,000 or more is 17 (10%). The total number of respondents is 170.

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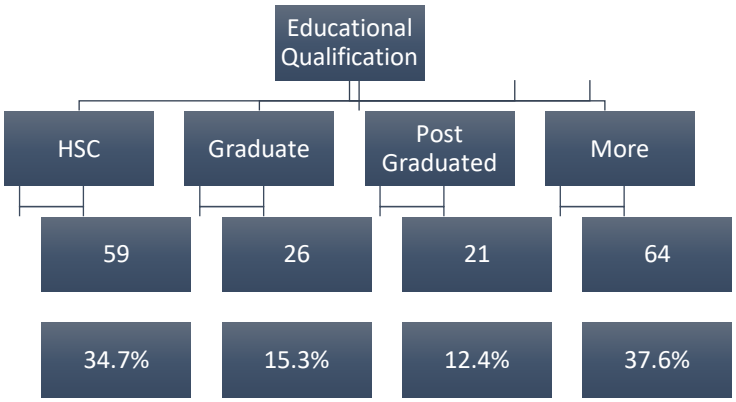
Figure-07: Educational Qualification



The figure 7, represent the frequency and proportion of respondents' educational qualification. Analysis of the figure indicates that below HSC is 59 (34.7%); Graduate is 26 (15.3%); Post Graduate is 21 (12.4%); More is 64 (37.6%). The total number of respondents is 170.

6.1. Reliability Test (Using Cronbach's Alpha Technique)

The dependent variable "*AR & VR increase customers satisfaction and loyalty*" served as the basis of data collection. "SPSS 25" was used to evaluate the collected data from the respondents. Interpretation of the Cronbach's Alpha method of reliability analysis produces the results as shown below.

Table 2: Reliability Analysis. Using Cronbach's Alpha technique (SPSS 25).

Reliability Statistics	
Cronbach's Alpha	N of Items
.895	10

The Cronbach's Alpha test was employed to calculate and confirm the consistency of the items (Zikmund and Babin, 2020). A Cronbach's Alpha score of 0.70 or higher is considered acceptable for any exploratory study to ensure the reliability of the data (Malhotra, 2010). As per the results of the study, the reliability score of the 10 items identified stands at .895, indicating that the data is highly reliable.

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6.2. Descriptive Statistics

Descriptive statistics is a term that refers to measures that describe and present data meaningfully such that the underlying information is much easier to interpret. Among measures of central tendency, the Mean or average method is more popular for indicating the center of distribution (Malhotra, 2010). Standard deviation is a term used to observe how the data varies from the mean value (Boone, H.N. and Boone, D.A. (2012). They represent 5-Point Scale mean Classification.

Five (5) Point Scale Mean Classification (Boone, H.N. and Boone, D.A. (2012).

Sl.	Mean Score	Interpretation
1	1.00-1.80	Strongly Disagree
2	1.81-2.60	Disagree
3	2.61-3.40	Neural
4	3.41-4.20	Agree
5	4.21-5.00	Strongly Agree

Table 3: five (5) Point Scale Mean Classification (Source: Boone, H.N. and Boone, D.A. (2012).

Table 4: Descriptive Statistics (SPSS 25)

Descriptive Statistics			
	Mean	Std. Deviation	N
Y	4.48	.808	170
X1	4.58	.694	170
X2	4.17	.746	170
X3	4.46	.800	170
X4	4.44	.729	170
X5	4.25	.703	170
X6	4.52	.698	170
X7	4.53	.672	170
X8	4.47	.858	170
X9	4.52	.715	170

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Table 4, It was a table of descriptive statistics that aimed to communicate the mean and standard deviation estimates for the ten predictor variables. The study has been seen that the mean value of the dependent variable (Y) is 4.48. *The value indicates that AR & VR increase customers satisfaction and loyalty.* The mean value of other variables such as

X1: Augmented reality based travel apps provide a more immersive touring experience is 4.58 that indicates strongly agree with statement.

X2: Augmented reality self-guided tours provide truthful and dependable information is 4.17 that indicates agree with statement.

X3: Augmented reality technology gives us a realistic idea of destinations from home is 4.46 that indicates strongly agree with statement.

X4: Augmented reality based advertisements influence travel decisions is 4.44 that indicates strongly agree with statement.

X5: Augmented reality enhances the functionality of travel mobile applications is 4.25 that indicates strongly agree with statement.

X6: Virtual reality helps us feel like we are actually visiting a destination is 4.52 that indicates strongly agree with statement.

X7: Using a Virtual reality headset makes virtual travel feel more realistic is 4.53 that indicates strongly agree with statement.

X8: Virtual reality experiences in travel agencies help to decide better is 4.47 that indicates strongly agree with statement.

X9: Virtual reality helps us compare hotels more effectively is 4.52 that indicates strongly agree with statement.

6.3. ANOVA test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.162	9	5.018	12.298	.000[b]
	Residual	65.286	160	.408		
	Total	110.447	169			

a. Dependent Variable: Y

b. Predictors: (Constant), X9, X4, X2, X7, X3, X5, X6, X1, X8

Table 5: ANOVA test (SPSS 25)

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a. Dependent Variable**:** AR & VR increase customers satisfaction and loyalty.

b. Predictors: (Constant**),**

X1: apps provide a more immersive touring experience; X2: self-guided tours provide truthful and dependable information; X3: technology gives us a realistic idea of destinations from home; X4: advertisements influence travel decisions; X5: enhances the functionality of travel mobile applications; X6: feel like we are actually visiting a destination; X7: headset makes virtual travel feel more realistic; X8: experiences in travel agencies help to decide better; X9: helps us compare hotels more effectively.

In the table 5, We shall proceed to determine if there is any relationship between the dependent and independent variables by carrying out a variance test on the variables included in the model. The statistical proof at a 95% confidence level (p-value =.000) vouches for the model's significant nature (Hossain *et all., 2025*). Also, because $p < 0.05$, the model is significant, indicating that at least one of the independent variables (X1 to X9) has a significant relationship with (Y).

7. Discussion

The study results are indicative of the revolutionary nature of AR and VR within tourism. Respondents strongly indicated agreement that AR-based travel apps (X1, mean = 4.58) and VR headsets (X7, mean = 4.53) produce extremely high levels of immersion for their users, allowing them to travel virtually. AR self-guided tours (X2, mean = 4.17) were seen as very reliable and thus allowed independent exploration, while AR advertisements (X4, mean = 4.44) generated significant effects in travel decisions. Furthermore, this real travel simulation (X6, mean = 4.52), and help in hotel comparisons (X9, mean = 4.52) show pre-trip planning value of these sources. The ANOVA proved the model significance within $p = 0.000$. Hence, the model reiterates the sound association that exists between AR and VR applications and the resultant increase in customer satisfaction (Y). These findings conform to worldwide trends. Therefore, there are real opportunities for such conversion in the tourism sector of Bangladesh to attract visitors and enhance service delivery. Reservations that should be addressed include access to technology and the cost factor.

8. Contribution

This research provides multiple important contributions to the field and practice of tourism technology. It first shows through empirical evidence that AR and VR would make a great impact on a way tourist experience in Bangladesh. Thus, it bridges a notable gap created by other studies. Second, it gives some practical inferences for tourism businesses, arguing that AR-based applications, VR simulations, and immersive marketing can enhance customer engagement and greatly satisfy them. The study extends theoretical contributions through establishing the importance of presence and interactivity in constructing tourist perceptions, as

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argued by earlier research. Like that, it endorses potential investment avenues by policymakers and industry stakeholders into building capacity through digital innovation and forecasting Bangladesh as a future-aware tourism destination. Future inquiry may build on this to find out the economic paybacks of adopting AR/VR as well as the health of suggested practices to be adapted by emerging markets in this area.

9. Acknowledgment

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10. Disclosure statement

This article's publication does not present any conflicts of interest. For this research, no outside funding has been obtained.

11. Limitations

Several limitations should be acknowledged in this study. The sample was first skewed toward younger respondents (48.2% aged 19–25), which may not fully represent the preferences of older demographics. Second, the study examined only Bangladesh, restricting the generalizability of findings to other regions with different technological infrastructures.

12. Conclusion

The research has shown that AR and VR technologies can prove to be a game-changer for travel and tourism in Bangladesh by way of enhancing customer experiences and satisfaction derived from them. The data also show a very high reliability, Cronbach's Alpha = 0.895, excellent provide completely valid responses from the participants as it has been seen concerning the positive effects of these technologies in tourism. AR would provide essentially interactive and informative experience when traveling, while VR would allow the user a more realistic preview of a destination to help him or her with the travel decision. The introduction of AR and VR as part of the tourism marketing and services in Bangladesh might provide the needed competitive edge attract greater number of international visitors and eventually add to the contribution towards economic growth. Policymakers and business leaders would need to consider investing in these technologies for upgrading the sector and keeping pace with the changing needs and expectations of travelers. Future research can look into the long-term economic effects of AR/VR use and also investigate proposals to overcome barriers in implementation.

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