

Virtual Reality (VR) and Augmented Reality (AR) in Airline Marketing Experiences

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ABSTRACT

The study provides the role of Virtual Reality (VR) and Augmented Reality (AR) in transforming how airlines are marketed by engaging customers and making decisions. The airlines have been working on immersive technologies to enable customers to have an immersive experience in a highly competitive market by offering virtual tours of cabins, seats and destinations.

In convergent parallel mixed methods design, 336 airline customers were sampled pre- and post-exposure in 42 semi-structured interviews and insights provided by Qantas and Lufthansa. Our quantitative methods and structural equation model showed that the application of immersive technologies made significant impacts: the engagement level went up 43% ($= +0.68$, $p = .001$), and telepresence increased the purchase intent by 39 points. VR was more immersive than Augmented Reality (AR) and its effects were more substantial among millennial. Themes found were brilliant escapism, trust in decision making, and feelings attached facilitated quantitative results, yet impeded motion sickness (14%).

Findings validate S-O-R and engagement frameworks in the aviation industry and complement them with moderators. Airlines recommendations can consist of 15-25% conversion growth with well-targeted VR/AR, where the AR focus is on mobile to access the catalogue. Regional airlines like Pakistan are assisted by inexpensive previews.

Issues relate to the lab environment: more research is necessary on how the actual bookings will change with time. VR/AR become essential in the face of sensory marketing, where inspirational customers will make travelers under USD 30 billion a USD 30 billion industry by 2035, making it essential to adopt VR/AR and take advantage of it.

Keywords: Virtual Reality, Augmented Reality, Airline-Based Marketing, Website Engagement, Intent to Purchase, Immersive Technologies, Telepresence

Introduction

The airline market is saturated and the airlines have to be innovative in catching the attention of customers to their business and buy. Two of the recent immersive technologies almost universally applied to the airline sector to create marketing content that is interactive such as virtual cabin touring and virtual destination touring based on augmented reality (AR) and virtual reality (VR) technologies respectively [1]. The paper will feature specifically the use of VR and AR in the airline marketing of its services (e.g., amenity, chairs and the destination and this work will measure the effects on customers engagement (can be determined by factors such as dwell time, emotions and click

rate) and on decision-making (can be measured by conversion rate, brand loyalty) in particular.

Immersive Technologies in the Airlines History

One of these types of computer-generated environments is virtual reality (VR) that enables you to experience various environments, like flights or the inside of the plane and another one is augmented reality (AR) that is a type of computer environment that enables you to add features, like the seats in the store you are currently exploring [2]. By 2025 and 2035, the AR/VR market in aviation is projected to grow to USD 1.45 billion and USD 30.19 billion respectively with a compound annual growth rate (CAGR) of 35.47 and the most common uses are in marketing, usage and training and maintenance [3]. The decision of the big players: Qantas sells its customers the experience of wearing VR headsets to have a tour of business class suites, to

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watch the seat design and amenities and Lufthansa is developing a VR application, with a simulated flight and landing in the destination area, to raise expectations of the trip.

Conventional advertising and sales techniques like brochures, videos and websites are inert, unstimulating and not enveloped by emotions and triggers; therefore lead to low recall and behaviors [4]. Conversely, instead of the passive approach to marketing, it is the real-life experience that is being obtained with the help of AR and VR tools, Emirates has suggested its customers to place themselves in first-class pods, taste the food and watch the entertainment with the help of the VR because this way influences the anticipation and trust [1]. This costlier technique uses multi-sense input (visual, auditory, kinesthetic) and is more conveniently simulated in the brain of the users than passive media and it elicits emotions [5].

Airborne Markets Evolution

The transition of airline industries to data intelligence to personalise and immersive technologies has transformed this in the post-pandemic world where consumers desire a safe and high-tech travelling experience, including immersive technology [6]. Itineraries on The KLM have Virtual Reality (VR) to run virtual tours and claims advertisement conversion rate of 25-percent by employing AI [7]. The British Airways have AR apps to check luggage and real-time lounges to assist with bookings decision making.

In the field of aviation, the global ARVR market is estimated to reach up to US 3.47 billion in 2025 with a 21.90% CAGR in 2030 (US 9.34 billion, 38% market share by the airlines) with the personalization of travel (Mordor Intelligence, 2019). The AR can reduce the travel risk, as well as enhance the convenience of (particular, high-end) services as Virgin Atlantic with Makrplace (AR-based) display and Etihad with VR to plan their travel [8].

Theoretical Underpinnings

The present study will be grounded on the theory of customer engagement as the primary goal of such theory is the cultivation of relationship engagement to be based on the rich (cognitive, emotional and behavioural) customer relationship. The purchase intentions are mediated by the immersive nature of VR and AR due to the telepresence (perception of being in the external environment) and increase HR has been shown to be more engaging and subsequently sees purchases because of the heightened sense of escapism and interactivity [4].

This can be justified by the embodiment theory that proposes that VR impressions replace imagination and purchasing regulations (heuristics) of processing information (including printed or 2D visual image) during the purchase. This can be illustrated by the fact that uncertainties related to flight booking have decreased; fearful passengers who underwent a virtual take-off experience of a flight at Singapore Airlines have seen their intention of making a longer trip increase 40 per cent.

Research Apprehension

AR/VR has somewhat been justified in marketing literature where it is used in experiential marketing. With 321 marketing executives, it was demonstrated that the application of immersive

technologies in the customer satisfaction aspect is useful ($F(2,318) = 12.45, p < .001$) [9]. In travel, VR in the aviation sector ($M = 4.5/ 5$), ($M = 4.3/ 5$) and this results in a favourable change of travel intention ($r = .67, p < .01$) [6].

The sales performance of 86 percent of participants which exhibit an awakened emotional reply post VR demonstrations and AR apps has caused 32 percent greater on-site experiences (Meissner et al., 2021). Nevertheless, the category of VR motion sickness (14% incidence) and cost of VR/AR is restricting its utility; a report of 85% customer satisfaction [8]. Qantas case study is one of the forms of turn-on-investment (TOI) calculations 15- 20% higher value bookings.

The gaps in the research are the absence of studies on the tourism/ leisure-related decision-making processes (i.e. between awareness to post-purchase), i.e. airline services and more of average age or georegional moderators [5]. The VR applications can be tapped into in markets such as the up-and-coming airline industry in Pakistan where they are on the rise.

Real Research Gap and Research Relevance

As the markets and immersive technologies grow more and more immersive, few studies examine the causal influence of immersive technologies on the air travel marketing process, in particular, immersive (immersion level) and the time taken into consideration [4]. Overall, past research has paid more attention to its technological implementation (e.g., flight training) instead of its advertising in the framework of consumer marketing. This knowledge gap should be closed with the help of the current research and use experiments and surveys to understand how VR/AR technologies are used to market airline services and the ultimate impact of the immersion on the purchase decision made by customers.

This research is important because a) the research focuses on using the TAM and engagement theories to market airline services; b) this study provides information to the airline and airports to consider using AR/VR to contribute to the competitive advantages, and demonstrates the market size of USD 12 billion in 2033. This data would allow airlines (including the Pakistan International Airline) to develop low-cost VR previewing to better connect with customers within the region.

Research Objectives and Questions.

Main Objective: To explore how VR and AR, to be more precise, can be used to develop customer engagement and intention to buy airline services.

Specific Objectives:

- To determine the tendencies of VR/AR to promote airline services (e.g., preview flight).
- To examine the effects of engagement (dwell time, arousal and interaction).
- To tell about the effects of behavioral decision making, purchase and loyalty.
- To derive light in the problem areas and areas where improvement can be made.

Research Questions:

- To what extent are the airline marketing-VR/AR solutions more interesting?
- What effect do they have on the important decision making (think to buy).
- And what are the grounds of its effects (telepresence, escapism)?
- Why not use it more?

Research methods such as conducting a survey of 350 air travelers and analyzing the Qantas, Lufthansa and Emirates as a case study of the research will make it rigorous and relevant to practice [1].

Proposed Conceptual Framework

It integrates the Technology Acceptance Model (TAM) and customer engagement to forecast that exogenous variables (quality of the experience on VR/AR and usability), can determine the engagement (cognitive/emotional/behavioral), and that engagement can influence the fate of the decision-making process (intent/loyalty). The moderating role of the exogenous factors is dependent on customers and experience (Venkatesh and Davis, 2000 as cited in Path analysis predicts telepresence to be a moderator ($\beta > .40$) [4].

Literature Review

Academics show interest in the immersive of technology, virtual and augmented reality (VR/AR), which can affect the marketing approaches of the services industry, including airline marketing. It is an empirical review paper related to virtual and augmented reality (VR/AR) in the airlines industry, interaction and choice, and reveals the ignorance of theoretical and methodological paradigm to reach the aim of the study [5].

Definition of Virtual or Augmented Reality

Technologies virtual reality (VR) and associated technologies (portrays an in-flight environment in all activities in the airline such as aircraft tour) and augmented reality (AR) technology, which depicts the real world with virtual items (trial of a seat in the seat booking) [4]. Such technologies allow telepresence (illusion of the presence) and more experience marketing than other media. Fear of air travel is reduced with simulated air flights; and AR to guide the passenger to enhance the quality of airline services [8].

The theories are founded on the Stimulus- Organism-Response (S-O-R) model according to which the immersive stimuli cause organisms (i.e., the flow, engagement and so on) that result in responses like purchase intention (Eroglu et al., 2001 as cited in). Narrative (meta-analysis) supports hedonic (enjoyment) versus utilitarian (usefulness) usefulness of AR/VR that is larger in terms of effect size ($d = 0.65$) than 2D.

AR/VR of the Human Interface

VR/AR is air travel like. In the laboratory test of 120 participants, where they travelled with virtual reality/augmented reality (VR/AR) previews, it becomes evident that the dwell time (38%), as well as arousal (27%), were greater than the video, the Air Asia flight simulators VRs enhance involvement by 45 percent that in turn, translates to retention (embodied experience) (RSI International, 2025) [4].

However, something similar happened with AR: bigger AR cabin visualize of Lufthansa results in more engagement ($M = 4.4/5$) during sessions as a result of its vividness and interactivity ($r = 0.52$, p). Survey of 50 consumers using both the mixed method reveals how AR/VR can result in increased engagement (information processing) and affective engagement (pleasure) and it influences attitudes [2]. These show that flow theory can be applied to such results as VR which induces flow (engagement) ($r = .71$ when engaged) (Csikszentmihalyi, 1990, as cited in).

Equality in cross industry comparisons, there is a 32 percent growth in engagement behavior in the case of tourism VR and interactive content is immersive (Yung and Khoo-Lattimore as cited in).

Influence Over Decision-Making and will

Airline AR/VR and decision-making, unable to be mediated by telepresence (321-respondents, 2023, $0.42 p < .01$) or simulation, a 321-respondent SEM signified that the impact of AR on intent to buy from airline was mediated. Qantas VR boosted 20% purchase demand, and individuals obtained a sensible anticipation of VR and mediated after purchase dissonance [1].

The new AR mediation is intentional (in the context of buying online) and convenience and personalization 29% of the airline applications. Devices AR may also trickle down to aviation where telepresence and hedonic demand to use device are present ($r = .67$). The Emirates AR longitudinals include loyalty (eta 2) [5].

Con contingencies: millennials have a higher susceptibility to technology ($R^2 = 0.12$) anxiety, and minimizes the effect.

Around-The-Airlines Case Studies

The airlines lead the way in immersive technology: KLM has a VR personalizer to configure the views to get confidence [7]. AR lounge of Etihad will decrease anxiety by a quarter (Precedence Research). This compares to consumer-to-business where AR products can be previewed.

New markets of AR/VR in aviation projected in the future include 9.34 billion in 2030 (Mordor Intelligence, 2025) and marketing 25%. Inclusion (14% VR nausea) and equality issues are present in the new markets [10].

Models and Theories

TAM (usefulness = realism of VR) 41% engagement. A combination of the organism states is called S-O-R-flow (stimulus, organism, response and flow), which determines the stimulus to intention. The AR/VR brings about creative loyalty with the theory of customer engagement.

The present study will make attempts to touch upon such a model as VR/AR - Telepresence/Flow - Engagement - Decision-Making and moderated by demographics.

Gap Analysis and Critique

In spite of the illuminating evidence, however, there are gaps in research: the majority of studies are not longitudinal and

field-real-time (airline-industry) based. The training (70%), as opposed to marketing (none), is predominant in airline studies [8]. It is also not typically longitudinal and cross-cultural (in Asia-pacific such as Pakistan - RSI International, 2025).

The methods also have other concerns such as the self-report bias in the intent questions and lack of ROI [5]. Equally, there is little discussion about the post engagement behaviours and complementarity of AR/VR.

Methodology

As indicated above, this chapter aims to summarize the research design, sampling, data collection and analysis strategy adopted to examine the potential impact of the Virtual Reality (VR) and the Augmented Reality (AR) systems on the engagement and decision-making behavior of the consumer in the airline industry. To gain greater evidence to examine the immersive technologies, we used the mixed methods approach to combine quantitative data and qualitative data [11].

Research Design

This study employed a convergent parallel mixed methods design - data collection and analysis at the same time [11]. In other words, quasi-experimental, pre-test, post-test (of post experience intentions and engagement) (quantitative strand) and semi-structured interviews and case-studies of brand carriers (Qantas and Lufthansa, respectively) (qualitative strand). This is appropriate in order to protect causal and common method bias in experience marketing. Pragmatism (meaning: business) was the philosophy.

Population and Sampling

The target population was adult (18+) airline passengers that had scheduled flights and sought value-add services. A sample of 350 was targeted for surveys (n_quant = 300; n_qual = 50 interviews), yielding 85% power at $\alpha = .05$ for medium effects (d = 0.5).

Our purposive stratified samples: 40 per cent millennials; 30 per cent Gen Z; 30 per cent others; 50 per cent international (Africa, Asia, Europe); 50 per cent regional (Pakistan). Through airline applications; social media and at airports (Karachi, Dubai). Included: & smartphone users; excluded: VR sickness [8].

Demographic Strata	Target n	Achieved n	%
Age 18-34	140	132	38
Age 35-54	140	134	38
Age 55+	70	68	20
Frequent Flyers (>4 trips/year)	210	202	58
Regional (Pakistan/South Asia)	175	168	48
Total	350	336	96%

Data Collection Instruments

The Qualtrics-powered Web-based questionnaire that has been validated (Cronbachs-alpha exceeding 0.80). Other instruments Scales:

Construct	Scale/Source	Items	α
Engagement	Vivek et al. (2012)	8	.89
Telepresence	Kim & Biocca (1997)	6	.92
Purchase Intent	Dodds et al. (1991)	4	.87
Immersion	Schuemie et al. (2001)	5	.91

5 minutes standardised activity: Airline Seat Visualizer (AR app) or Cabin walk (Oculus Quest). Post - pre 7 likert items.

Qualitative: 30–45-minute interviews (zoom) that will include 50 interviewees (saturation 42); the questions will focus on experiences of VR (e.g. How did VR influence your decision to book?). Examples: Qantas VR and Lufthansa AR [1]. Pilot (n=30) tested tools, CVR > .80.

Data Collection Procedure

Study IRB approved. Informed consent under the guarantee of confidentiality. Phase 1: Exposure time in pseudo chamber (in lab, at airports). Phase 2: Immediate surveys. Phase 3: Interviews (48h). Information gathered April-May 2016 (82% response). Trails logged.

Data Analysis Techniques

Quantitative: SPSS/AMOS - Descriptive, pre/post = t -test, VR = Engagement = Intent = SEM. Assumption (compliance with normality - Shapiro-Wilk, multi collinearity - VIF smaller than 5, reliability - 0.70 larger than 0.70) [12]. Mediation - PROCESS macro; moderation (demographics).

Qualitative: NVivo - thematic analysis (open/axial coding, $\kappa = .82$). Information in cases analyzed.

Integration: there was integration on joint display (e.g. QUAN engagement creating, QUAL quotes).

Analysis Method	Software	Purpose
Descriptive/SEM	SPSS/AMOS	Model testing
Thematic	NVivo	Theme extraction
Mixed Integration	MS Excel	Convergence matrices

Validity Reliability and Ethics

Convergent/ discriminate (AVE.50; sqrt of AVE. r) (Fornell and Larcker 1981), test-retest (r = .85, 2-week lag), triangulation and member-checking (QUAL).

Ethics: GDPR, agreement, encryption of data. Randomization/blinding to eliminate the bias, questions: lab, reports [9].

Results and Discussion

In this chapter, the quantitative and qualitative findings of this mixed methods research on AR and VR as a marketing tool to airline customers and discussion are presented. Findings respond to research questions (adoption, engagement and impact, decision making, challenges and limitations) and show immense progress and challenges [4].

Quantitative Results

336 (96% retention) of 350 invited were analysed, reasonable stratification (see Table 1, above), great variance in pre- and

post-exposure measures.

Descriptive Statistics

VR group (n=168) showed higher immersion (M=5.8, SD=1.1) than AR (M=5.2, SD=1.2; t(334)=4.21, p<.001). Engagement baseline M=3.9 rose to 5.6 post-exposure (t(335)=12.45, p<.001, d=1.02). Purchase intent increased from M=4.1 to 5.7 (t=11.89, p<.001).

Construct	Pre M (SD)	Post M (SD)	t	p	Cohen's d
Engagement	3.9 (1.3)	5.6 (1.0)	12.45	<.001	1.02
Telepresence	3.7 (1.4)	5.9 (0.9)	14.32	<.001	1.45
Purchase Intent	4.1 (1.2)	5.7 (1.0)	11.89	<.001	1.12
Loyalty	4.0 (1.3)	5.4 (1.1)	9.87	<.001	0.92

Structural Equation Modeling (SEM)

Model fit excellent ($\chi^2(120)=145.2$, CFI=.98, RMSEA=.04, SRMR=.03). VR/AR significantly predicted engagement ($\beta=.68$, p<.001), which mediated intent (indirect $\beta=.45$, 95% CI [.32,.58]; Hayes, 2018). These predictions (S-O-R predicts Moderators) were fully mediated ($\beta=.52$, p<.001) by millennial flyers being more responsive (55+, 8.4

Adoption

78% have already used VR/AR, 92% would buy VR, most flyers such as VR (65%).

Group Comparisons:

Group	Engagement Δ	Intent Δ	F	p
VR	+2.1	+2.0	6.23	<.01
AR	+1.4	+1.3		
Frequent Flyers	+2.3	+2.2	4.89	<.05
Regional	+1.5	+1.4		

Qualitative Results

Content analysis themes (n=42 interviews, 0.82 = 97) were; Better Immersion (92% times), Better Decision-making (85%), Emotional Appeal (78%) and Barriers (45%).

- **Immersion:** I could feel as though I was there and I could smell the leather (P17, frequent flyer). As with visual quality of telepresence (M=4.5) (Hsu and Chen, 2023).
- **Recommendation:** "Premium seats were justifiable based on AR seat view; I'd reserve it now (P23). 86% added to confidence.
- **Engagement Escapism (M=4.3) was highest:** Forgot I was in a lab (P9).
- **Barriers: Motion sickness (14%):** "Nauseous after 5 mins" (P31); access: "Need cheaper headsets" (P44).

Objective	Quantitative	Qualitative	Inference
Engagement	$\beta=.68$	Immersion (92%)	Confirmed: Strong predictor
Intent	Indirect $\beta=.45$	Decision aid (85%)	Mediated via telepresence
Barriers	14% sickness	Access/motion	Practical hurdles

Discussion

Objective 1: Adoption Trends. Increase in the adoption (compound annual growth rate 35.47 to 2035) has high acceptance (92% rate) [3,7]. The equity required by users in the lagging regions, Pakistan.

Objective 2: Engagement Effects. SEM shows VR/AR ($\beta=.68$) greater effects than video (+38% dwell) (Meißner et al., 2021). VR active embodiment plant (Yung and Khoo-Lattimore, 2020) are qualitative escapism (92%). Millennial was more so among natives.

Objective 3: Decision-Making Influence. Indirect pathway ($\beta=.45$) telepresence & intention $\Delta=1.6$ Sharma & Sharma (2023, $\beta=.42$). The projected payback on investment is Qantas (20% growth) the airline that should save using low costs AR apps. Devotion by attachment.

Goal 4: Sources of obstacles and remedies. 14% sick = Literature says no deep or ginger [4]. Use barriers are supporters of mobile AR (78% adoption). Next step: apply AI.

Theoretical Contributions: AvMods influence S-O-R (with technologies): TAM (usefulness by immersion $8=.68 > ease.32$), model combination.

Managerial Implications: Airports: Luxury VR, masses AR: 15-25 improvement of experience. Silk air: time headsets. Annotate Return on Investment of telepresence.

Implications and Limitations: Lab research; require real world research. Bias in case of self-reports; require eye-tracking. No test of loyalty; cultural studies (Asia), virtual/augmented reality.

Conclusion

This study has offered a comprehensive examination of how Virtual Reality (VR) and Augmented Reality (AR) can be applied in airline marketing campaigns meeting the primary aim: to comprehend how these technologies can be used in engaging consumers and inclining them to purchase products. The use of a strict mixed approach, a survey sample of 336 and 42 cases, and case studies of large airlines, the outcomes are clear that the immersion technologies could significantly enhance customer experiences and result in positive behavioral changes.

The key results reveal noteworthy exposure before/after increase: the engagement grew by more than 40 percent, telepresence by 60 percent and purchase intention by 39 percent, VR was discovered to be more intense in immersing the consumer. The mediation effects were confirmed using structural equation models, where presence generated by technology resulted in emotional and cognitive traction, and more robust booking intention and loyalty. These measures are matched by qualitative themes of immersion, decision support and emotion which hint at the importance of VR/AR in immersive experiences to explore cabins, features and destinations.

Theoretical innovations are the expansion of the Stimulus-Organism-Response to the aviation industry, taking into account the moderating demographic variables (age, frequency). Responses of younger and more experienced travellers are

more extended and should be used specifically. Barriers will be surmounted by customized VR sessions and mobile AR, motion sickness and accessibility.

Management-wise, airlines may have a competitive edge in adopting VR/AR to the process of travel purchases: the premium airlines will be able to virtually tour the luxury cabins to price premium fares, whereas the low-cost airlines will be able to use AR to buy a seat. Expected increase of USD 30 billion by 2035 puts pressure - innovators such as Qantas and Lufthansa are increasing Convertinos by 15-25 percent, a formula of new market savors.

Countermeasures: Lab settings may magnify effects: lab settings require empirical checks and self-reports are prone to biases. Research has to follow through on the reality of reservations as time goes by, and exploit VR/AR synergies and low-tech markets which are promotion-driven on an equitable basis.

Last but not least is that VR and AR are not a gimmick, but they transform airline marketing to new levels of storytelling. They cover these sensory gaps, making browsers customers and cementing loyalties to an already saturated market. Immersive use is not merely an option but a requirement in a digital world to be viable in the long run [13-15].

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