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Enrichment of Passenger In-Flight Experience using Virtual Reality Technology

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Abstract

This mixed-method study explores the incorporation of virtual reality (VR) into in-flight entertainment (IFE) systems, aiming to identify the opportunities to improve passenger experience in aviation. It surveys current IFE choices, pinpoints the areas that need improvement, and evaluates how VR can boost passenger involvement, happiness, and relaxation by means of immersive and interactive entertainment. The results corroborate that VR greatly upgrades IFE as it can provide fun, anxiety-reducing experiences, especially on long-haul flights. Such a tool not only supports customer loyalty but also carries airlines a competitive position in the market, as it is the one that attracts premium travelers and allows for targeted marketing. In addition, the airline industry, by adopting VR, can furnish a novel, high-tech service that embraces the changing requirements of passengers and further enhances the total travel experience.

Keywords: Virtual reality (VR), in-flight entertainment, passenger engagement

INTRODUCTION

In-flight entertainment (IFE) systems are a critical determinant of passenger experience during air travel. While traditionally limited to basic offerings such as books and magazines, IFE has significantly evolved with technological advancements, thereby enhancing passenger comfort and satisfaction, particularly on long-haul flights (Liu & Li, 2022; Caves & Wirth, 2021). Recent trends indicate a growing interest in immersive technologies, such as virtual reality (VR), which possess the potential to transform IFE by providing engaging and therapeutic experiences that alleviate flight-related anxiety and monotony (Williamson, McGill, & Outram, 2019; Kim & Park, 2024). Despite these promising developments, challenges persist regarding the seamless integration of VR into the physical cabin environment and the associated operational costs (Thompson & Black, 2020; Wilson & Roberts, 2023).

While prior research has extensively explored the benefits of VR in various entertainment and educational contexts, there remains a notable gap in understanding its

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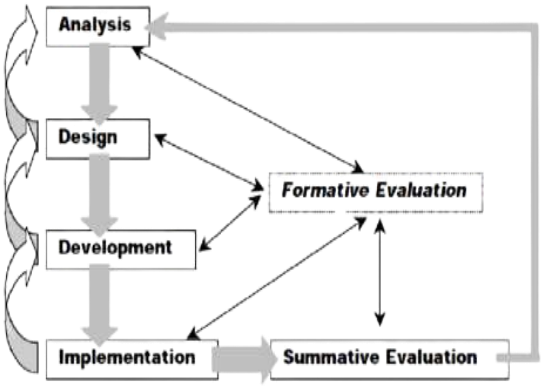
specific application and acceptance as an in-flight entertainment medium within the aviation industry. Furthermore, passengers' perceptions of VR's value relative to traditional IFE options and its subsequent impact on airline choice and loyalty warrant further investigation (Jones & Miller, 2022; Noviantoro & Huang, 2022). Addressing these gaps is crucial as airlines strive to differentiate themselves in a highly competitive market by enhancing service quality through innovative technologies.

This study aims to investigate the potential of virtual reality as an in-flight entertainment system, focusing on its effects on passenger engagement, satisfaction, and willingness to pay, particularly for long-haul flights. Building upon the Virtual Reality Hardware Acceptance Model (Manis & Choi, 2019) and the Technology Acceptance Model (Davis, 1985), this research examines how VR can serve both therapeutic and amusement purposes, thereby contributing to an improved passenger experience and enhanced operational efficiency in the aviation sector.

The study found out that virtual reality elevates in-flight entertainment significantly by offering a more captivating and immersive experience, especially on long-haul flights where their novelty is most effective. Moreover, this technology consolidates customer loyalty and satisfaction, thus giving airlines a competitive advantage as well as increased profitability by winning over passengers looking for premium travel experience. VR is more practical and profitable on long-haul flights, as passengers are more than willing to pay for longer immersive entertainment, and moreover, their booking decisions tend to be affected by VR-related promotions, thus emphasizing its marketing power. Hence, the passengers, on the one hand, should also consider VR IFE options, while airlines, on the other hand, are urged to continue investing in and upgrading their VR systems if they want to create loyalty and differentiate themselves. Besides that, business travelers can also utilize VR in order to make their flights more productive, and future research should conduct a comparison between VR and the traditional IFE to quantify the benefits thereof.

Theoretical Framework

Fig. 1: Administrator Experience Factors diagram



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This study focuses on technology adoption, which is influenced by factors such as performance expectations, ease of use expectations, social influence, and conditions that make usage easier. The progression in the field of information communication technology (ICT) has been significant. How businesses carry out their operations has been significantly transformed. The integration of technology in the workplace has revolutionized communication within and among organizations, creating a more efficient business framework that leads to increased productivity, improved employee wellness, and customer satisfaction (Marikyan, 2023). According to UTAUT's theoretical framework, the utilization of technology is established by the intention to behave. The probability of accepting technology is contingent on four significant factors that influence it directly: performance expectancy, effort expectancy, social influence, and facilitating conditions. Influential factors and enabling circumstances. The impact of predictors is influenced by variables such as age, gender, experience, and the degree of willingness in their use.

Conceptual Framework

Figure 2 is the conceptual framework based on UTAUT's theoretical framework that focuses on the perception of the integration of technology. The conceptual framework for this study is grounded in understanding the perceptions of BS Air Transportation students regarding the integration of Virtual Reality (VR) into in-flight entertainment. The analysis, efficiency, implementation, evaluation, and quality phases serve as a structured approach to assess the potential and impact of VR on the passenger experience. Here's how each phase aligns with the perceptions of students:

The process begins with implementation, where teaching strategies, resources, and methodologies are applied to create a structured learning environment. These actions aim to align with the objectives of aviation education, providing both students and instructors with a clear framework to achieve their goals.

Once implemented, the focus shifts to perception, which reflects how students and instructors experience these strategies. Students' perceptions revolve around behavior, expectations, and satisfaction, while instructors evaluate efficiency, cost, and opportunities for professional development. These perceptions are essential for understanding the initial impact of the implemented strategies.

Following this, analysis is conducted to assess and compare the perceptions of both students and instructors. This step identifies strengths, weaknesses, and areas for improvement by integrating into the viewpoints of all stakeholders. The insights gained during analysis ensure a balanced understanding, helping to refine the strategies further.

Finally, an evaluation is carried out to determine the overall effectiveness of the implementation. This involves assessing whether the goals, such as student satisfaction and instructor development, have been achieved and identifying areas for continuous improvement. Together, these stages create a feedback loop that ensures the ongoing refinement of aviation education practices.

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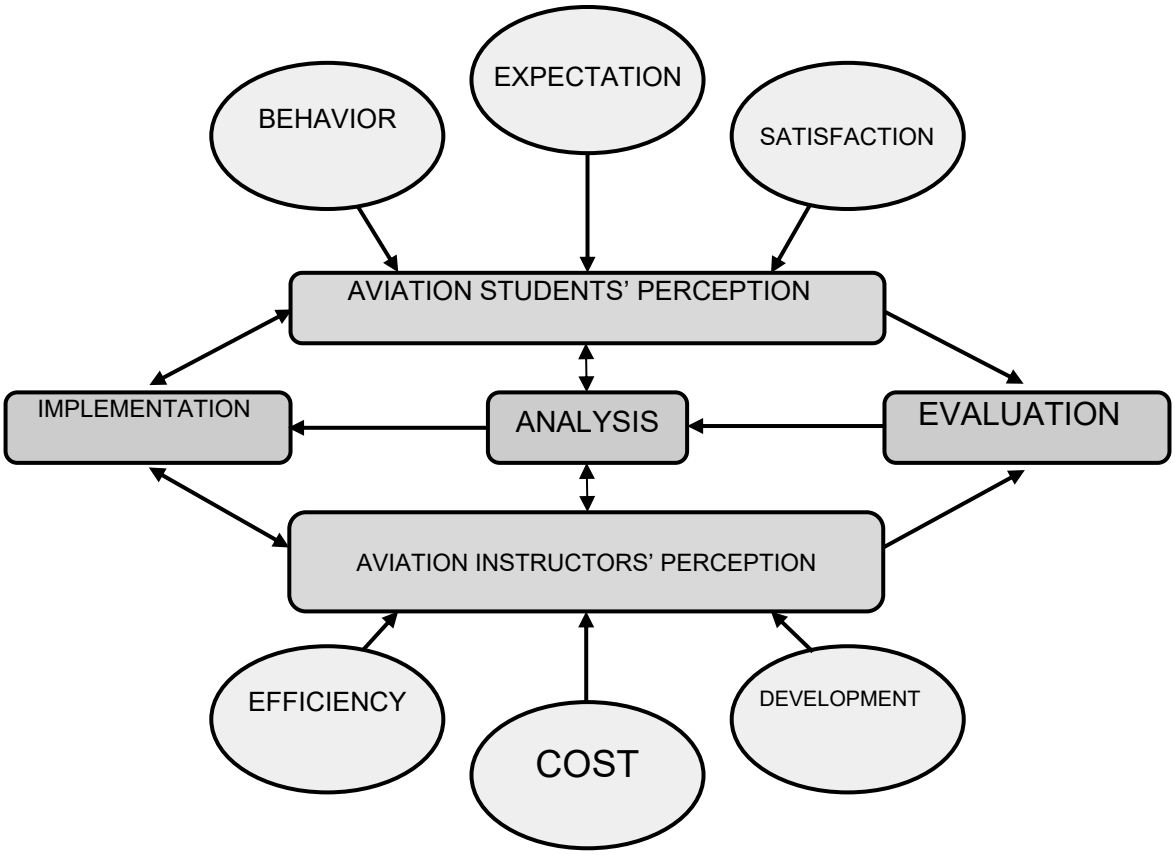
Fig. 2: The perceptions of aviation students and instructors on the integration of virtual reality as in-flight entertainment



Research Questions

This study aims to assess the enhancement of inflight entertainment on how it can boost airline loyalty to its customers and introduce individuals to more advanced inflight entertainment using virtual reality. Specifically, the study sought the answers of the following questions:

1. How does a young adult experience his/her flight for a long period of time?
2. What is the impact of enhancing in-flight entertainment in terms of a) cost, b) efficiency
3. What is the impact of enhancing in-flight entertainment in terms of passenger satisfaction?
4. What impact does the enhanced fare have?
5. What is the difference between virtual reality in-flight entertainment and the traditional inflight entertainment?
6. The feasibility to implement virtual reality in in-flight entertainment in terms of: a) cost, b) technological capabilities
7. What are the factors affecting the implementation of virtual reality as an in-flight entertainment?

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METHODOLOGY

Research Design

To answer the research topic, mixed methodologies research combines parts of quantitative and qualitative research. Since it incorporates the strengths of both methodologies, mixed methods can provide a more comprehensive picture than solo quantitative or qualitative research (George, 2022). The purpose of mixed-method research is to explore, elucidate, and construct ideas or theories related to the phenomenon being studied and to comprehend and clarify social patterns

The objective is to unveil and elucidate the fundamental nature of the cognitive processes exhibited by individuals about shared experiences. The culmination of a phenomenological investigation is the production of a descriptive account that embodies the essential attributes of the observed phenomenon.

Participants

The current total student population enrolling in the Air Transportation program stands at 814. To maintain statistical reliability, a sample size was estimated using Slovin's formula that decided 269 respondents to be enough to represent the population faithfully.

This response rate of about 32% is within the range that is considered acceptable for internal surveys, which normally have a span from 30% to 40%. The last number of respondents was 86, which is enough for this study.

The researchers interviewed three informants selected based on the study's primary objectives, providing each with a Research Data Form (RDF 17) to review and sign, thereby confirming their informed consent and understanding of the study's purpose, their role, and confidentiality assurances. These informants were chosen to offer diverse and valuable insights relevant to the research. The study was conducted by 4th-year BS Air Transportation students who administered an online survey via Google Forms, distributed through social media platforms, to gather data on students' perceptions of enhancing passenger in-flight experience using virtual reality technology.

Research Instruments

The validation of the questionnaire revealed minimal revisions and the removal of certain questions. Most of the validators concurred that the implementation of in-flight virtual reality does not have an impact on the aircraft's weight and balance. Consequently, in our final survey questionnaires, the researchers have shifted our focus toward assessing passenger satisfaction, ensuring a more comprehensive understanding of passenger experiences. This strategic emphasis aims to enhance our service offerings while prioritizing the feedback and preferences of our clientele.

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Data Analysis

To facilitate a more efficient and precise data collection process, the researchers utilized Google Forms in conjunction with Microsoft Excel as our statistical tool. Google Forms enabled us to design a user-friendly interface for respondents, allowing for seamless data entry and collection. Meanwhile, Microsoft Excel provided robust analytical capabilities, allowing us to organize, analyze, and interpret the gathered data with greater accuracy. This combination of tools not only streamlined our data management process but also enhanced the reliability of our results, ensuring that our findings are both comprehensive and actionable.

Ethical Considerations

This research assures that privacy of all personal data is safeguarded by stipulation of data protection legislation like the Data Privacy Act of 2012. The surveys have been conducted in such a way that the privacy of the respondents is protected. They have thus made sure that participation is not infringing upon their daily routines and that the data collected will be used in a responsible manner and stored securely. The type of data being collected, the purpose of the data, and the participants' rights, such as voluntary participation and the possibility to exit the study at any time, were all outlined in detail.

A designated representative has been appointed to supervise the study, and the proper organization has given permission as well as consent prior to the gathering of information. To make sure the environment stayed safe, the researchers undertook extreme safety measures prescribed by the aviation school, avoided going to dangerous areas, and performed their activities in well-lit and cozy places. An evacuation plan which was part of the safety plan was clearly indicated, and along with emergency exits that were easily accessible, the places were kept safe and ready for any emergencies.

To help participants feel comfortable during the extended hours of research, meals were offered, and there were also some support systems in place to take care of any physical or emotional issues. To make sure that the participants are not distracted, they were advised not to carry any valuables with them. To make sure that the work goes smoothly and if there is a need for any help, the organization's representatives, security, and school clinic were always kept informed through continuous communication. The researchers also allowed open communication with participants as this enabled them to establish trust and get instant feedback. The research findings are more relevant and useful for enhancing organizational practices and decision-making because of the collaborative approach that was fostered by the study's careful management to minimize disruption to the organization's daily operations.

RESULT AND ANALYSIS

1. Passenger experience on long-duration flights

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Table 1: How does a passenger experience his/her flight for a long period of time

Questions	Standard deviation	Weighted mean	Remarks
Could personalized in-flight entertainment experiences, tailored to individual preferences, become a standard feature in the future?	0.56287	3.42	Agree
Are there enough music or game options to keep you entertained?	0.65800	3.22	Agree
Have you ever selected a flight based on the quality of its entertainment offerings?	0.82073	3.09	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

Different passengers have different experiences on long-haul flights that can be dependent on their environment. Based on table number one, all statements "agree" with the highest standard deviation being 0.82073; the highest weighted mean being 3.42 with the lowest standard deviation being 0.56287, and the lowest weighted mean being 3.09. Respondents agree that a passenger's in-flight experience depends on their environment, specifically in-flight entertainment. It influences their experience and view of the current flight they are taking. The respondents also agreed that having quality experience in their inflight entertainment with enough content can boost passengers' demand and make the flight more marketable. It is the airline's goal to make their flights more marketable, to do that they have to meet three requirements which are to satisfy their customers' needs, to satisfy their shareholders by producing profit and lastly, to outperform their competitors (Alamdari, 1999). Having good in-flight entertainment can significantly improve passenger experience for a long period of time.

2. Impact of enhancing in-flight entertainment in terms of:

2.1 Cost

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Table 2: What is the impact of enhancing in-flight entertainment in terms of cost.

Questions	Standard deviation	Weighted mean	Remarks
Could the costs of inflight entertainment influence your choice of airline?	0.65582	3.40	Agree
Do you feel that the in-flight entertainment provides good value for its cost?	0.57739	3.38	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The cost of entertainment must be justifiable and that can give the passengers a delightful in-flight experience. Based on table number two, all statements "agree" with the highest standard deviation being 0.65582; the highest weighted mean being 3.40 the lowest standard deviation being 0.57739, and the lowest weighted mean being 3.38. Respondents agree that the cost of in-flight entertainment can significantly influence their choice of airline. However, the respondents claimed that in-flight entertainment provides good value despite its cost. In-flight entertainment (IFE) is an airline-provided service that has, for a long time, provided movies, music, newspapers, and magazines to ensure that long-term on-board passengers are comfortable and not bored (Park & Yoon, 2009). The cost of in-flight entertainment must be of the same value as the service and entertainment it provides.

2.2 Efficiency

Table 3: What is the impact of flight entertainment in terms of efficiency

Questions	Standard deviation	Weighted mean	Remarks
Will you benefit from personalized entertainment recommendations during your flight?	0.54772	3.50	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

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Table 3 presents the results of a survey question aimed at determining whether personalized entertainment recommendations would benefit passengers during their flight. The weighted mean of 3.50 falls in the "Agree" range (2.51 - 3.50), which indicates that respondents generally feel positive about the idea of receiving personalized entertainment recommendations while flying. The standard deviation of 0.54772 suggests relatively low variability in the responses, meaning most passengers hold similar views on the matter.

The survey response shows a clear majority of passengers are open to personalized entertainment options during flights, with a mean score of 3.50 aligning with the "Agree" category. This suggests that entertainment personalization could be an effective way to enhance the overall flight experience, improving passenger satisfaction.

The low standard deviation (0.54772) implies a consistent level of agreement among respondents. Most passengers agree that personalized recommendations would be beneficial, but the absence of scores closer to 4.0 or above indicates that the level of enthusiasm may not be overwhelming. This suggests room for improvement or further investigation into what specific types of personalized recommendations would maximize their perceived value.

3. Impact of enhancing in-flight entertainment in terms of passenger satisfaction

Table 4: The impact of enhancing in-flight entertainment in terms of passenger satisfaction?

Questions	Standard deviation	Weighted mean	Remarks
Can the design of virtual environments make your immersive experience feel better and more engaging?	0.58900	3.49	Agree
Can the design of virtual environments help you feel more comfortable during flight?	0.56868	3.51	Agree
Does your feelings of comfort influence how you view the overall quality of an experience?	0.53967	3.59	Agree
Does interactions with virtual reality have an impact on your sense of usability and ease of use?	0.61446	3.37	Agree
Does the in-flight entertainment system differentiate our airline from competitors in terms of content offerings	0.56771	3.53	Agree

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Have you ever picked an airline because of something unique they offer, like special amenities or exceptional service?	0.72939	3.34	Agree
Do you think that VR in-flight entertainment adds to the overall service experience?	0.55897	3.40	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The data explores the impact of enhancing inflight entertainment, specifically through virtual reality (VR), on passenger satisfaction. Responses from passengers are generally favorable, with weighted mean scores ranging from 3.34 to 3.59, indicating agreement with the positive effects of VR on their flight experience. Passengers strongly agreed that the design of virtual environments makes the experience more engaging (mean = 3.49) and that VR enhances comfort during the flight (mean = 3.51), which significantly influences perceptions of flight quality, as reflected in the highest mean score of 3.59. Other aspects, such as usability and ease of use, also received positive feedback, though responses showed more variability, with a higher standard deviation (0.61446). Passengers agreed that VR-based inflight entertainment could differentiate the airline from competitors (mean = 3.53) and that unique amenities or services influence their choice of airline (mean = 3.34), although the higher variability indicates diverse opinions. These findings highlight comfort and engagement as key factors in passenger satisfaction, with VR offering an opportunity to meet these needs effectively. Airlines should prioritize investments in VR-based inflight entertainment to enhance comfort and usability, cater to varying passenger preferences, and differentiate themselves from competitors, aligning with their goals of satisfying customers, generating profit, and outperforming rivals.

4. Impact of enhanced fare on flights

Table 5: The impact of the enhanced fare

Questions	**Standard deviation**	**Weighted mean**	**Remarks**
Do you believe the in-flight amenities justify the enhanced fare?	0.64657	3.35	Agree
Is the cleanliness of the VR Device important to you in assessing service quality?	0.53509	3.62	Agree

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Do you often compare prices and services among different airlines before booking?	0.56687	3.55	Agree
Did the upgraded service meet your expectations?	0.50171	3.47	Agree
Does a good travel experience make you stick with an airline?	0.55405	3.63	Agree
Do special offers or promotions affect your booking behavior?	0.58621	3.56	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The data presented in Table 5 examines the impact of enhanced fares on passenger satisfaction, indicating that service quality generally justifies the higher price, with weighted means ranging from 3.35 to 3.63, all within the "Agree" range (2.51–3.50). Respondents agreed that in-flight amenities justify the enhanced fare (mean = 3.35, SD = 0.64657), while cleanliness of the VR device was particularly important in assessing service quality, receiving a mean of 3.62 and a relatively low standard deviation (0.53509), reflecting consistent opinions. Passengers also showed a strong tendency to compare prices and services among airlines before booking (mean = 3.55, SD = 0.56687), and agreed that upgraded services met their expectations (mean = 3.47, SD = 0.50171) and contributed to customer loyalty through a good travel experience (mean = 3.63, SD = 0.55405). Additionally, special offers or promotions influenced booking behavior (mean = 3.56, SD = 0.58621), emphasizing the importance of price and service quality in travelers' decisions. These findings suggest that maintaining cleanliness, ensuring high service standards, offering promotions, and exceeding passenger expectations are crucial for airlines to justify enhanced fares, attract price-sensitive customers, and build loyalty.

5. The difference between the virtual reality in-flight entertainment and the traditional in-flight entertainment:

Table 6: The difference between virtual reality in-flight entertainment and the traditional in-flight entertainment

Questions	**Standard deviation**	**Weighted mean**	**Remarks**
I would rather use virtual reality inflight entertainment rather than traditional ones.	0.68290	3.20	Agree

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I can be more satisfied using virtual reality inflight entertainment rather than the traditional ones.	0.64657	3.35	Agree
I enjoy embracing new technology in terms of inflight entertainment	0.54722	3.52	Agree
I can enjoy my flight without any in-flight entertainment.	0.85317	3.24	Agree
I would rather watch movies with traditional inflight entertainment rather than virtual reality.	0.64837	3.29	Agree
I am satisfied just using the traditional inflight entertainment.	0.62593	3.28	Agree
I can be satisfied without the use of any in-flight entertainment.	0.84244	3.14	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The data in Table 6 explores passenger perceptions of virtual reality (VR) inflight entertainment compared to traditional options, revealing a general agreement that VR enhances the passenger experience while traditional systems remain appealing. Weighted means indicate a moderate preference for VR, with statements such as “I would rather use virtual reality inflight entertainment rather than the traditional ones” (mean = 3.20) and “I can be more satisfied using virtual reality inflight entertainment rather than the traditional ones” (mean = 3.35) reflecting a mild to moderate inclination toward VR. Passengers also expressed enthusiasm for new technology, as shown by a mean of 3.52 for the statement, "I enjoy embracing new technology in terms of inflight entertainment." However, the data highlights a balance in preferences, with passengers moderately agreeing they could enjoy flights without inflight entertainment (mean = 3.24), preferring watching traditional movies over VR content (mean = 3.29), and expressed satisfaction with traditional inflight entertainment (mean = 3.28). Overall satisfaction without in-flight entertainment scored a mean of 3.14, suggesting that VR offers enhanced experience, traditional systems and the option to forgo in-flight entertainment altogether remain viable for many passengers. The relatively low standard deviations across responses indicate a moderate level of consistency in opinions, underscoring the importance of catering to diverse preferences by integrating VR as an innovative choice while maintaining traditional inflight entertainment options.

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6. Feasibility of the implementation of virtual reality in inflight entertainment in terms of:

6.1 Cost

Table 7: Is it feasible to implement virtual reality in inflight entertainment in terms of cost?

Questions	Standard deviation	Weighted mean	Remarks
Do you think airlines would be able to offset the initial investment in VR equipment through increased ticket prices or additional services?	0.66174	3.34	Agree

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The feasibility of implementing virtual reality (VR) in inflight entertainment was evaluated by analyzing whether airlines could offset the initial investment in VR equipment through increased ticket prices or additional services. Respondents provided a weighted mean of 3.34, falling within the "Agree" range, with a standard deviation of 0.66174 indicating moderate agreement. This suggests that most participants believe airlines could recover VR-related costs by adjusting ticket prices or offering supplementary services. The "Agree" rating highlights a generally positive outlook on the financial feasibility of VR implementation, with the weighted mean nearing the threshold for "Strongly Agree," indicating optimism despite some concerns about the upfront investment. The data implies that, although the initial costs may be significant, airlines could strategically manage these expenses through pricing adjustments and enhanced services. These findings support the conclusion that introducing VR inflight entertainment could be a viable investment, provided airlines employ careful pricing strategies and service innovations to ensure financial feasibility over time.

6.2 Technological capabilities

Table 8: *Is it feasible to implement virtual reality in inflight entertainment in terms of technological capabilities*

Questions	Standard deviation	Weighted mean	Remarks
Do you think it is feasible to maintain consistent VR performance on long-haul flights with limited	0.69047	3.31	Agree

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onboard power and processing resources?

Legend: 3.51 – 4.00 – Strongly Agree; 2.51 – 3.50 – Agree; 1.51 – 2.50 – Disagree; 1.00 – 1.50 – Strongly Disagree

The feasibility of implementing virtual reality (VR) in inflight entertainment, specifically regarding technological capabilities, was assessed based on respondents' views on maintaining consistent VR performance during long-haul flights with limited onboard power and processing resources. The weighted mean for this evaluation was 3.31, falling within the "Agree" range on the Likert scale (2.51–3.50), indicating a generally positive outlook on sustaining VR functionality despite these challenges. The standard deviation of 0.69047 reflects some variation in responses, yet the majority of participants agreed, suggesting confidence in the technological feasibility of VR implementation. These findings reinforce the conclusion that the necessary technological capabilities for VR inflight entertainment are attainable, even under the constraints typical of long-haul flights.

7. Factors affecting the implementation of virtual reality as an in-flight entertainment

MASTER THEMES	SUPERORDINATE THEMES
Factors to consider in improving passengers' experience using virtual reality.	Entertainment
	Efficiency
Impact of In-Flight Entertainment (IFE) on Passenger Satisfaction and Customer Loyalty.	Passenger Satisfaction
	Customer Loyalty
Passenger Experience and Satisfaction with In-Flight Entertainment Options.	Passenger Engagement
	Overall Satisfaction
Feasibility and Cost Efficiency of Implementing Virtual Reality in In-Flight Entertainment.	Passenger Demand
	Challenges and Risks

Master theme 1: Factors that make virtual reality significantly improve passenger experience

Superordinate theme 1.1: Entertainment

Informant 2: "...So for example, you have kids on board, then you have virtual reality. So I think for me, based on my opinion, then it would be good for the kids to have virtual reality

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for them to be more entertained because we all know that virtual reality is just like you are in a real, real world. For example, you are in a real playground…"

Informant 3: "...So in long-haul flights, we all know that in long-haul flights we are spending three hours, six hours, nine hours, most are, some are twelve hours, seventeen hours. For example, a flight from Manila to Los Angeles for seventeen hours. So I think, improving inflight entertainment is one of the best things that you can offer to a passenger..."

Virtual reality as in-flight entertainment can significantly improve passenger experience by providing them the luxury of the immersive virtual reality experience on their flight. According to the informants, virtual reality can greatly enhance the inflight entertainment for long-haul flights can be frustrating to some passengers and can give a poor experience to the airline. Passengers are paying more attention to their comfort during flights. The passengers' choice of an airline depends on several factors including price, safety, loyalty programs, quality of service, inflight entertainment, and baggage handling. Another key factor influencing their choice of airline is their level of satisfaction and sense of comfort in the aircraft cabin. (Hamza Y. et al., 2023)

Superordinate theme 1.2: Efficiency

Informant 1: "Yes I think it can significantly increase passengers, yes it will significantly increase because it can be a form of advertisement for airlines, especially legacy airlines."

Informant 2: "...Then regarding for the efficiency, uh, I think. There are pros and cons, right? One of the pros for efficiency is there might be, uh. There are times you as a flight attendant. We must call them for something since we are well entertained given the VR. So, there will be a time that it is possible that the work of the flight attendant will be lessened because the passengers are entertained. However, there is a concern. For example, each flight the maintenance or the authorized representative must ensure that the VR equipment is working. What if it's not? So, they should have enough ample time to change the equipment, which again nowadays is very costly. But I do believe in the near future it is still possible because it will be much cheaper…"

Traditional in-flight entertainment is somehow efficient but lacks more technological advancement due to the limits of the service it can currently provide. According to the participant, introducing virtual reality as in-flight entertainment can significantly increase passenger experience, and can be used as a marketing tool for an airline that can provide this kind of inflight entertainment. The informants also stated that using virtual reality as inflight entertainment can give us new insight and ways to increase the efficiency of the cabin crew and introduce the passengers to a whole new flight experience. Many factors of the entire cabin system, including the cabin environment, facilities, services, and psychological variables of passengers, all have an impact on their comfort. As time passes, products and services must improve to give their customers the best service they can provide, airlines must focus on comfort to differentiate themselves by developing the aircraft cabin interior to

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enhance passenger comfort and obtain a competitive advantage in highly competitive markets. (Hamza Y. et al., 2023)

Master theme 2: Impact of Inflight Entertainment on passenger satisfaction and customer loyalty

Superordinate theme 2.1: Passenger satisfaction

Informant 1: "...It varies greatly because I remember I used to be in a long-haul flight and I went with this particular airline here in the Philippines and there in-flight entertainment was broken like the screen was not working and not consistent, so if much better in-flight entertainment... I hope that it is much better if it's VR…"

Informant 2: "...Let's say. But given that you have a VR, you know you would like to integrate the VR. It is more entertaining. Entertaining for me as a passenger, if you would integrate that into the in-flight entertainment…"

Informant 3: "...But for me who is seated in economy, the seats that have in-flight entertainment are not working. So that is one of the frustrating experiences, knowing that I'm flying from Manila to Los Angeles for seventeen hours straight…"

Passenger satisfaction in in-flight entertainment is one of its most crucial purposes, having an in-flight entertainment system that cannot satisfy or give comfort to its passengers is a waste. According to the informants, having a quality in-flight entertainment system is important, especially for a long-haul flight that can be sometimes boring and frustrating for the passengers if not provided with a good in-flight entertainment system. Inconsistency and incompetent entertainment systems can greatly impact how a passenger experiences their flight and how it can affect an airline's image. The emergence of smart aircraft cabins provided smart solutions to all discomfort issues that negatively influenced passenger experience during flight (Hamza et al., 2023)

Superordinate theme 2.2: Customer loyalty

Informant 1: "... I would be eager to try it now and for the sake that I can tell people that experience VR during flight as advantages I think is the experience and new learning opportunity like if it will work or it will not, disadvantages since it is new it will be very costly…"

Informant 2: "...it is another level of experience for us as a passenger, because given that we are, it gives us an experience that we are in a real situation,"

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Informant 3: "...if the airlines were to put that on long haul flights, definitely a lot of passengers would be willing to pay extra for that kind of improvement for VR.

Virtual reality as we know is a technology that can take us to a whole new artificial reality that can give us a unique experience of a certain game, movie, or even for educational purposes. Virtual reality can greatly give passengers a whole new level of experience that can give an airline an upper hand over its competitors. According to the informants, virtual reality can be very helpful for passengers that will be going on a long-haul flight, and they would be willing to pay extra to experience this kind of improvement. Another informant stated that if he/she experienced using the virtual reality inflight entertainment system, the informant would be very eager to share this with their family and friends, and that is great for an advertisement for an airline. In the current situation of a competitive environment, having the upper hand of having quality service can gain a competitive advantage. Aviation companies must consider their customers' insights that can make them give what they want and need to achieve their loyalty. (Nivaintoro V. & Huang J. 2022)

Master theme 3: Passenger experience and satisfaction with inflight entertainment options.

Superordinate theme 3.1: Passenger engagement

Informant 1: "...Yes, it is an advantage for the airlines… it is like the feeling of the passengers. Mostly for the experience…"

Informant 3: "...the inflight entertainment greatly worked, there were a lot of choices regarding movies, you will not get bored. I was able to finish three movies, and that is a total of seven hours, and the rest, I was asleep. And now, as a previous passenger, definitely, inflight entertainment, or improvement in in-flight entertainment would work specifically for long-haul flights.

The current in-flight entertainment that airlines use proved to be effective in terms of giving the passengers a lot of choices for them to entertain them. According to the informants, having good in-flight entertainment can be an advantage for airlines, improvements in in-flight entertainment would work especially for long-haul flights. With more and more passengers choosing to fly by air, improving customer in-flight experience has become an important issue for airlines (Heiets et al., 2020)

Superordinate theme 3.2: Overall satisfaction

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Informant 1: "...a particular airline here in the Philippines and there in-flight entertainment was broken like the screen was not working and not consistent. I wish that it would be much better if it's a VR…"

Informant 2: "...Because some of the contents of that in-flight entertainment is very limited. For example, in terms of movie choices. Next is the music. Okay. So, for the improvement of in-flight entertainment, I think it is better than the quality of the TV. No, no, not the TV, the LCD or the screen in front of the seat is offering you a variety of activities or any type of entertainment movies, music, games or any, let's say, passenger to passenger chatting. Let's say.

But given that you have a VR, you know you would like to integrate the VR. It is more entertaining. Entertaining for me as a passenger, if you would integrate that into the in-flight entertainment…"

Informant 3: "...the inflight entertainment greatly worked, there were a lot of choices regarding movies, you will not get bored. I was able to finish three movies, and that is a total of seven hours, and the rest, I was asleep. And now, as a previous passenger in-flight entertainment, or improvement in inflight entertainment would work specifically for long-haul flights…"

A major contributor to customer pleasure is in-flight entertainment (IFE), which greatly improves comfort and kills time on long-haul trips. Informants' feedback shows a range of experiences, with some pointing out problems including broken screens, a lack of available content, and antiquated functionality. Modern technology like virtual reality (VR), a variety of multimedia libraries, and interactive features like passenger-to-passenger chat are some ideas for enhancement. Good experiences, like having access to a large movie library, highlight how an effective IFE may enhance the enjoyment of lengthy trips. Airlines should concentrate on updating IFE systems by enhancing hardware dependability, increasing content possibilities, and adding cutting-edge technologies to satisfy changing passenger expectations (Liu & Li, 2022).

Master theme 4: Feasibility and Cost Efficiency of Implementing Virtual Reality in In-Flight Entertainment.

Superordinate theme 4.1: Passenger demand

Informant 1: "...So I think if I heard about VR and the idea is... I would be eager to try it now and for the sake that I can tell people that experiencing VR during flight as advantages I think is the experience and new learning opportunity…"

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Informant 2: "...let's say Gen Z or, you know, the newer generation of people. So some of them are elderly that might not know how to operate the technology. No. But given the current in-flight entertainment for now, based on the literacy of the elderly, I think it is much, uh, efficient for now. But if we're going to integrate, on the other hand, VR as an in-flight entertainment, again, there are pros and cons…"

Informant 3: "...of course, some or most of the travelers here, especially in the airline are there for business and investments in other countries. So, meaning, that most of the passengers, especially in the airline industry are most likely involved in business."

Passenger demand and differing degrees of technical proficiency influence the opportunities and challenges associated with virtual reality (VR) in in-flight entertainment. Because of its novelty, Informant 1 was excited to try virtual reality (VR), highlighting how it could provide special experiences and educational opportunities while flying. Informant 2, however, emphasized the disparity between generations, pointing out that although younger travelers might welcome virtual reality, elderly travelers would find it difficult because they are not familiar with the technology. They recommended that older travelers continue to find the present IFE systems easier to utilize. Informant 3 also noted that business travelers make up a sizable percentage of aircraft passengers, and their tastes and practicality issues need to be considered when assessing VR's viability. Although VR has the potential to improve the traveler's experience, its application must take into consideration the various needs of users, striking a balance between cost-effectiveness, accessibility, and innovation to guarantee a workable and inclusive solution. (Jin, M.-J., & Kim, J. K., 2021)

Superordinate theme 4.2: Challenges and risks

Informant 1: "...I don't think they can manage such VR reality because aside from being costly let's think of low-cost airlines most people use low-cost airlines, or they are not paying for entertainment, so they are paying for the ride. As for who is travelling, they want everything to be comfortable so if you introduce for example VR experience, they would be more eager to try it out, and if they like it they will pick a certain airline... example just for the VR experience…"

Informant 2: "...However, there is a concern. For example, each flight the maintenance or the authorized representative must ensure that the VR equipment is working. What if it's not? So, they should have enough ample time to change the equipment, which again nowadays is very costly…"

Informant 3: "...Okay, so including VR will require a lot of costs for the airlines. A lot of additional costs because it is an investment. As I mentioned before, if the airlines were to put

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that on long haul flights, definitely a lot of passengers would be willing to pay extra for that kind of improvement for VR."

Implementing virtual reality (VR) in in-flight entertainment poses significant challenges related to cost and maintenance. While VR might draw travelers looking for unusual experiences, Informant 1 pointed out that it would not fit with low-cost airlines' budget-conscious business model. The significant maintenance needs, such as making sure the VR equipment is operational before each trip, were highlighted by Informant 2, which raises operating costs. Its implementation may be feasible for long-haul flights where passengers are prepared to pay more, according to Informant 3, who also emphasized the significant initial expenditure required. Even though VR has significant advantages, these difficulties highlight how crucial it is to strike a balance between innovation, viability, and operational dependability. (Wilson, K., & Roberts, H., 2023)

CONCLUSIONS

Based on the results and analysis, the following were concluded:

1. Virtual reality is a remarkable improvement in the present in-flight entertainment. This is due to VR offering a more engaging and immersive experience along with the excitement of the novelty effect, particularly on long-haul flights.

2. Using VR technology can bring about customer loyalty and satisfaction, this, in turn, supplies airlines with a competitive edge and the chance of higher profits.

3. Passengers in search of a luxurious travel experience that goes beyond the mere act of getting to their destination will find VR in-flight entertainment to be highly marketable.

4. Long-haul flights, in comparison to short-haul flights, are more conducive for the viability and profitability of VR entertainment since passengers tend to appreciate and pay for longer immersive entertainment.

5. The booking decisions of passengers are found to be dependent on the special offers and promotions dealing with VR entertainment, indicating that airlines not only can use VR as an entertainment tool but also as a strategic marketing instrument.

RECOMMENDATIONS

Based on the conclusions, the following were recommended:

1. Passengers should always choose the right choice of airline, with a variety of entertainment options that can be justified to the amount of money they are paying. Passengers should always be aware of the possible incursions that they may encounter in their flight experience. For long-haul flights, passengers should always check for the available

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inflight entertainment for them to get to their destination without having to realize how long the flight is.

2. The airline industry should understand the importance of good in-flight entertainment, especially for long-haul flights, for them to gain more loyal customers. Airlines should invest in new technology for in-flight entertainment to lessen the frustration of their passengers. Airlines should be more aware of their in-flight entertainment quality and there must be maintenance for these systems because in some airlines, the in-flight entertainment is not working, and it can cause a lot of frustration to their passengers.

3. Business travelers who often go to long haul flights should invest in their comfort along the flight to make their flight more engaging in terms of entertainment, for them to be more productive and inspired in their work.

4. Future researchers must focus on the comparison of traditional inflight entertainment and virtual reality flight entertainment and focus on how virtual reality can significantly improve the inflight entertainment rather than the traditional ones.

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