RESEARCH IN MANAGEMENT OF TECHNOLOGY AND BUSINESS
e-ISSN: 2773-5044

RMTB

Vol. 7 No. 1 (2026) p. 287-295
https://publisher.uthm.edu.my/periodicals/index.php/rmtb

Examining the Acceptance of Virtual Reality Integration in Malaysian Aircraft Maintenance Training

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DOI: https://doi.org/10.30880/rmtb.2026.07.01.026

Article Info

Received: 31 March 2026
Accepted: 31 May 2026
Available online: 30 June 2026

Keywords

Virtual reality, aircraft maintenance training, VR-based training, level of acceptance

Abstract

Virtual Reality (VR) is a computer-generated technology that enables users to interact with a simulated environment. Increasingly adopted across industries for training purposes, VR has demonstrated the potential to transform traditional training approaches by replacing real-world exercises with immersive virtual experiences. This study investigates the level of acceptability and the effects of VR-based training within Malaysian aircraft maintenance training programmes. Compared to conventional methods, VR-based training offers two primary advantages: enhanced safety through risk-free simulation of high-risk scenarios, and cost-effectiveness by reducing reliance on physical resources and infrastructure. Using a structured survey administered to respondents from Canadian Aviation Electronics (CAE) in Kuala Lumpur, Malaysia, this research aims to determine the level of VR technology acceptance among trainees and trainers and to evaluate its overall impact. The study applies the Technology Acceptance Model (TAM) to identify key factors influencing VR adoption, including perceived ease of use, perceived usefulness, attitudes toward VR, and intentions to use. Data analysis was conducted using SPSS, encompassing reliability analysis, descriptive statistics, normality tests, and correlation analysis. The findings indicate that all three TAM constructs exhibit a significant positive correlation with the acceptability of VR-based training, with correlation values falling between 0.345 and 0.463. These results address existing research gaps and offer practical recommendations for integrating VR into maintenance training, providing valuable insights for training providers, policymakers, and industry stakeholders in Malaysia.

1. Introduction

The integration of Virtual Reality (VR) in aircraft maintenance training represents a significant advancement in the aviation industry, particularly in Malaysia. This innovative approach leverages immersive technologies to enhance the training experience, providing a safe, cost-effective, and highly engaging environment for both novice and experienced maintenance personnel. The significance of VR in this context lies in its potential to address the limitations of traditional training methods, which often involve high costs, safety risks, and logistical challenges associated with the use of real aircraft and equipment.

Recent studies have demonstrated the efficacy of VR in various aspects of aviation training, including pilot training, flight simulation, and maintenance procedures. VR technology offers immersive training environments that can replicate real-world scenarios, thereby enhancing the learning experience and improving skill acquisition (Duruaku *et al.*, 2024; Jonaid *et al.*, 2023; Noh *et al.*, 2023). For instance, VR has been successfully implemented in gas turbine engine training, providing a comprehensive and interactive learning platform for maintenance personnel (Jonaid *et al.*, 2023). Additionally, the use of VR in maintenance training has been shown to reduce training costs and risks associated with the use of real equipment (Zou *et al.*, 2013). Despite these advantages, the adoption of VR in aircraft maintenance training is not without challenges. Technical issues, such as the learning curve associated with new technologies, simulation sickness, and the high costs of VR systems, can hinder widespread implementation (de Lange, 2024; Duruaku *et al.*, 2024). Moreover, the fidelity of VR simulations and the development of effective VR handling skills are critical factors that influence the success of VR-based training programs (Jonaid *et al.*, 2023).

One of the primary challenges in integrating VR into aircraft maintenance training is the need for high-fidelity simulations that accurately replicate real-world maintenance tasks. This includes the development of detailed 3D models of aircraft components and the incorporation of haptic feedback to simulate the physical manipulation of tools and parts (de Lange, 2024; Nappi *et al.*, 2009). The complexity of the maintenance process and the need for precise and realistic simulations require significant investment in both hardware and software development. Another issue is the potential for simulation sickness, which can affect the effectiveness of VR training. Prolonged exposure to VR environments can cause discomfort and disorientation, limiting the duration and frequency of training sessions (de Lange, 2024; Duruaku *et al.*, 2024). Addressing these issues requires ongoing research and development to improve the comfort and usability of VR systems. Recent advancements in VR technology have focused on enhancing the realism and interactivity of training simulations. For example, the development of haptic-based maintenance training applications allows trainees to experience kinaesthetic feedback, improving their ability to perform maintenance tasks accurately (Nappi *et al.*, 2009). Additionally, the integration of VR with other immersive technologies, such as augmented reality (AR) and mixed reality (MR), has expanded the potential applications of VR in aircraft maintenance training (Mustapha *et al.*, 2021; Siyaev & Jo, 2021). In Malaysia, the Civil Aviation Authority Malaysia (CAAM) has recognized the potential of VR in maintenance training and has included VR in its aviation guidance (Noh *et al.*, 2023). This move highlights the growing acceptance of VR as a valuable tool for enhancing the training of maintenance personnel. Furthermore, research conducted at the Malaysian Institute of Aviation Technology has demonstrated the effectiveness of VR-based training applications in improving learning outcomes and student satisfaction (Yusof *et al.*, 2019).

The integration of VR in Malaysian aircraft maintenance training represents a transformative approach that addresses the limitations of traditional training methods. While challenges such as high costs, technical issues, and simulation sickness remain, recent developments in VR technology offer promising solutions to these problems. The ongoing research and implementation efforts in Malaysia and globally underscore the potential of VR to revolutionize aircraft maintenance training, providing a safer, more efficient, and highly engaging learning environment for maintenance personnel. As the technology continues to evolve, it is expected that VR will play an increasingly important role in the aviation industry, enhancing the skills and preparedness of maintenance technicians and contributing to the overall safety and efficiency of aviation operations. VR is increasingly used in global training programs, yet its acceptability and effectiveness within the Malaysian aircraft maintenance sector remain underexplored (Fauzi *et al.*, 2023). While VR offers significant potential, its adoption faces several barriers. Primarily, the substantial cost of hardware, software development, and infrastructure upgrades presents a considerable financial hurdle (Yazdi, 2024). Furthermore, resistance from trainers and trainees, who often prefer familiar, traditional methods, impedes acceptance and requires targeted efforts to demonstrate VR's tangible benefits (Yang *et al.*, 2024). Compounding these issues is the difficulty of designing comprehensive VR scenarios that accurately reflect the diverse range of real-world maintenance tasks, from electrical repairs to mechanical troubleshooting. Developing such effective and realistic modules demands close collaboration between technical experts and training professionals (Toyoda *et al.*, 2022). Addressing these intertwined challenges is crucial for the successful integration of VR into Malaysian aircraft maintenance training.

This study is grounded in the Technology Acceptance Model (TAM), which posits that perceived ease of use, perceived usefulness, attitude toward using, and behavioural intention are key interrelated factors influencing technology adoption. To effectively implement VR in Malaysian aircraft maintenance training, it is essential to learn from leading countries, establish robust legal frameworks and technical standards, and apply appropriate design models. Such foundational work will inform national policies crucial for successful VR integration. Accordingly, this research will collect user perspectives on VR-based training within Malaysian aircraft maintenance programmes, assess its overall acceptability, and examine the relationships between the core TAM variables to understand the factors driving its adoption.

2. Literature Review

Virtual reality (VR) technology has seen rapid development and integration into various training environments, including aircraft maintenance. The Technology Acceptance Model (TAM) provides a useful framework for understanding the factors influencing the acceptance and use of VR in this context. This review synthesizes recent literature from the past five years to explore the integration of VR in Malaysian aircraft maintenance training using the TAM model. Recent studies highlight the potential of VR to enhance the training process for aircraft maintenance personnel. VR offers immersive and interactive environments that can simulate complex maintenance tasks, providing trainees with a realistic and engaging learning experience. This technology has been shown to improve operational efficiency and the quality of training outcomes, with significant increases in the on-time completion rate of maintenance tasks (Li, 2023). The use of VR in training allows for the simulation of real maintenance scenarios, which can effectively prepare students for the challenges they will face in the workplace (Li, 2023; Sadasivan *et al.*, 2006).

The TAM model has been widely used to assess the acceptance of new technologies, including VR. Key factors in the TAM model include perceived ease of use (PEU), perceived usefulness (PU), and behavioural intention (BI) to use the technology. Studies have shown that these factors are critical in determining the acceptance of VR in training environments. For instance, perceived ease of use and perceived usefulness positively impact attitudes towards using VR, which in turn influence behavioural intentions to adopt the technology (Fussell & Truong, 2023; Wong *et al.*, 2023). Additionally, perceived enjoyment (PENJ) has been identified as an important factor that enhances the positive attitude towards VR-based learning (Fussell & Truong, 2023). Empirical studies conducted in various settings, including aviation and manufacturing, support the effectiveness of VR in training. A study involving aviation students demonstrated that those with an open attitude towards new technology perceived VR as a useful training platform and were more engaged in learning (Wong *et al.*, 2023). Another study in the manufacturing sector found that VR and augmented reality (AR) technologies could create efficiencies in cost and time while enhancing the quality of learning and maintenance outputs (Scott *et al.*, 2020). These findings suggest that VR technology is well-received by trainees and can significantly improve training outcomes.

Despite the promising benefits of VR, there are challenges associated with its implementation. Factors such as e-technology readiness and user requirements must be carefully considered to ensure successful adoption (Scott *et al.*, 2020). Additionally, the integration of VR into training programs requires substantial investment in hardware and software, as well as the development of tailored training and communication strategies to support diverse user groups (Halford *et al.*, 2025). However, the potential for VR to transform training methodologies and improve workplace preparedness presents significant opportunities for the aviation industry. The future landscape of VR in aircraft maintenance training looks promising, with ongoing advancements in technology and increasing acceptance among trainees. The CAAM has recognized the importance of VR and included it in their aviation guidance, highlighting its contribution to training both novice and experienced maintenance personnel (Noh *et al.*, 2023). As VR technology continues to evolve, it is expected to play a crucial role in enhancing the efficiency and effectiveness of aircraft maintenance training programs.

In conclusion, the integration of VR in Malaysian aircraft maintenance training using the TAM model shows significant potential to improve training outcomes. The positive relationships between perceived ease of use, perceived usefulness, and behavioural intention to use VR indicate strong acceptance among trainees. While challenges remain, the opportunities for VR to transform training methodologies and enhance workplace preparedness are substantial. Future research and development in this area will likely continue to advance the application of VR in aircraft maintenance training, ensuring better preparedness and efficiency in the aviation industry.

2.1 Hypothesis Development and Conceptual Framework

The Technology Acceptance Model (TAM), introduced by Davis (1989), remains a foundational framework for understanding user acceptance of new technologies. The model identifies four key constructs that shape technology adoption. Perceived Ease of Use (PEU) is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989), this construct reflects how intuitive and convenient a technology appears to the user. In the context of VR-based training, trainees are more likely to embrace and actively engage with the system if they perceive it as easy to navigate and operate. Meanwhile, Perceived Usefulness (PU) refers to the extent to which an individual believes that using a specific system would enhance their job performance or help them achieve desired outcomes (Davis, 1989). For VR-based training to be deemed useful, trainees must recognize its tangible benefits in facilitating learning and skill acquisition. While, Attitude Towards Using (ATU) is an individual's attitude toward using technology significantly influences their intention to adopt it. A favourable disposition toward VR can enhance its acceptance and integration into maintenance training programmes. Drawing from the literature and the TAM framework, the following hypotheses are proposed:

H1: Perceived ease of use positively influences the acceptability of VR-based training among trainees in Malaysian aircraft maintenance programmes.
H2: Perceived usefulness positively influences the acceptability of VR-based training among trainees in Malaysian aircraft maintenance programmes.
H3: Trainees' attitudes toward using VR-based training positively influence its acceptability in Malaysian aircraft maintenance programmes.

2.2 Conceptual Framework

Figure 1 presents the conceptual framework guiding this study, which adapts the TAM to the context of VR-based maintenance training. The framework identifies perceived ease of use, perceived usefulness, and user attitudes toward VR as the primary factors shaping the acceptability of this training approach.

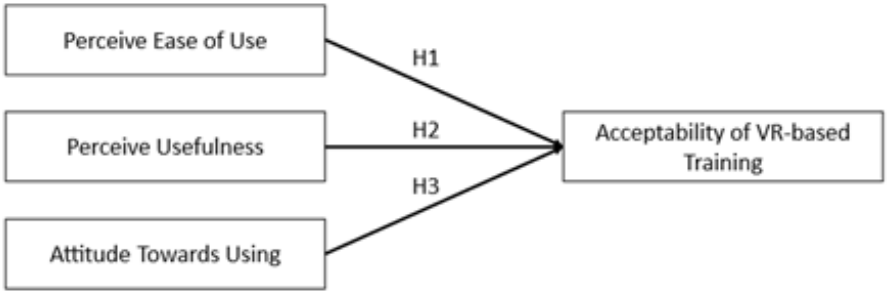

Fig. 1 *Conceptual framework*

3. Methodology

3.1 Research Design

This study adopts a quantitative research methodology to investigate the acceptability and impact of VR-based training within Malaysian maintenance training programmes. A descriptive research design was employed to provide a detailed account of the phenomena under investigation. The target population comprises employees involved in aircraft maintenance training programmes located in Kuala Lumpur, Malaysia. A convenience sampling technique was used, selecting employees who were readily available and willing to participate in the survey. The research instrument consists of a structured survey questionnaire designed to collect data on respondents' perceptions, attitudes, and experiences with VR-based training. Given the quantitative nature of the study, the required sample size was determined using G*Power software, which indicated a minimum of 77 respondents.

3.2 Data Collection

A structured survey questionnaire was employed to collect data on the acceptability and impact of VR-based training within Malaysian aircraft maintenance training programmes. The instrument, which was validated by an academic expert, was designed to elicit detailed responses pertinent to the research objectives. The questionnaire comprised three distinct sections, each addressing a specific dimension of the study, as outlined in Table 1. As aforementioned, the responses were collected by utilising a convenience sampling technique targeting at least 77 valid responses. All items in Sections B and C were measured using a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"), on which respondents indicated their degree of agreement.

Table 1 *Structure of questionnaire*

Section	Element / Construct
Section A: Demographic	Gender & Age
Section B: Dependent variable	Acceptability of VR-based Training
Section C: Independent variable	Perceive ease of use, perceive usefulness, and attitude towards using

Research in Management of Technology and Business Vol. 7 No. 1 (2026) p. 287-295

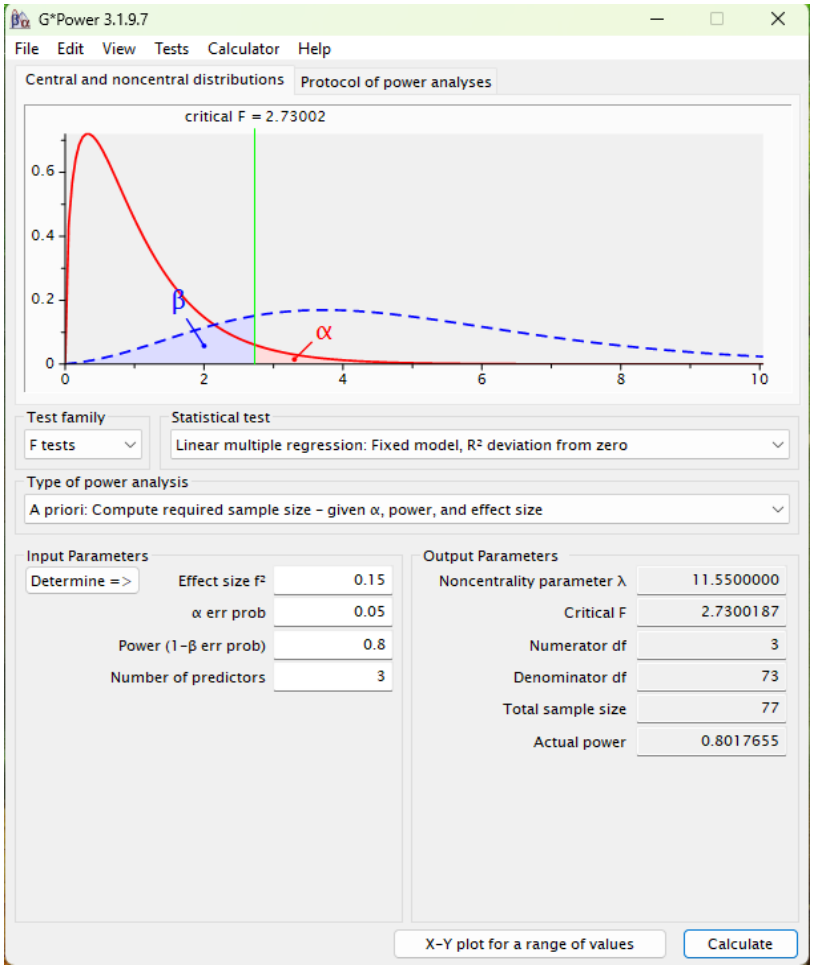

Fig. 2 *Sample size calculation using G*Power software*

3.3 Data Analysis

This study investigates the acceptability of VR-based training among personnel in Malaysian aircraft maintenance programmes located in Kuala Lumpur, using the Technology Acceptance Model (TAM) constructs of perceived ease of use (PEU), perceived usefulness (PU), and attitude toward using (ATU). Data were analysed using SPSS version 27 to conduct descriptive and correlational analyses, including assessments of reliability, normality, and variable relationships. A pilot test was conducted with 15 respondents to validate the instrument. As presented in Table 2, the Cronbach's alpha values for all variables exceeded the acceptable threshold of 0.6, indicating that the items were appropriate for measuring both the independent and dependent variables in this study.

Table 2 *Reliability of pilot study*

Construct	Cronbach's Alpha	Number of item (N)
Acceptability of VR-based Training	0.870	5
Perceive Ease of Use	0.750	5
Perceive Usefulness	0.851	5
Attitude Towards Using	0.827	5

4. Results and Discussion

4.1 Reliability Analysis

Table 3 presents the outcomes of the reliability analysis for the main survey administered to 87 respondents in Kuala Lumpur. The Cronbach's alpha coefficients reported in Table 3 range from 0.692 to 0.839. These values demonstrate satisfactory internal consistency, suggesting that the measurement instruments applied in the study possess acceptable reliability and are considered suitable for further analysis.

Table 3 *Reliability of actual study*

Construct	Cronbach's Alpha	Number of item (N)
Acceptability of VR-based Training	0.803	5
Perceive Ease of Use	0.768	5
Perceive Usefulness	0.839	5
Attitude Towards Using	0.692	5

4.2 Descriptive Analysis

Based on 87 valid responses, the highest mean score for the acceptability of VR-based training was recorded for the statement that VR-based training offers a superior learning experience compared to conventional methods, with a mean value of 4.632. In contrast, the lowest mean score, 4.115, was obtained for the statement concerning acceptance of this technology as a tool for aircraft maintenance training. Overall, the aggregated mean for this construct is 4.394, as presented in Table 4.

Table 4 *Reliability of actual study*

Construct	Mean	Std Dev.	Interpretation
Acceptability of VR-based Training	4.394	0.588	High
Perceive Ease of Use	3.762	0.540	High
Perceive Usefulness	4.508	0.582	High
Attitude Towards Using	4.274	0.567	High

For the Perceived Ease of Use construct, the statement regarding the convenience of accessing and using the VR-based training tool recorded the highest mean score (M = 4.012). Conversely, the statement "VR-based training is easy to use" received the lowest mean score (M = 3.609). The average mean score for this construct was 3.762, indicating a high level of central tendency. For the perceived usefulness construct, respondents gave the highest mean score of 4.690 to the statement that VR-based training saves time compared to conventional methods. They assigned the lowest mean score of 4.172 to the statement that they achieve better training outcomes by using VR. This construct achieved an average mean score of 4.508. Regarding attitude towards using, respondents recorded the highest mean score of 4.690 for the statement about having a positive experience with VR-based training. They gave the lowest mean score of 3.851 to the statement that they feel motivated to use VR-based training regularly. The average mean score for this construct was 4.274.

4.3 Normality Analysis

Two commonly used normality tests are the Kolmogorov-Smirnov test and the Shapiro-Wilk test. This study employed the Kolmogorov-Smirnov test, as the sample size exceeded 50, with a total of 87 respondents. The results of both the Kolmogorov-Smirnov and Shapiro-Wilk tests indicate whether the data are normally distributed. Specifically, if the significance level is equal to or greater than 0.05, the data are considered normal. Conversely, if the significance level falls below 0.05, the data are deemed not normal. Table 5 presents the results of the normality test.

Table 5 *Normality analysis*

Construct	Kolmogrov-Smirnov			Sharpiro-Wilk			Interpretation
	Statistic	df	Sig.	Statistic	df	Sig.	
Acceptability of VR-based Training	0.232	87	<0.001	0.885	87	<0.001	Not normal
Perceived Ease of Use	0.255	87	<0.001	0.901	87	<0.001	Not normal
Perceive Usefulness	0.165	87	<0.001	0.883	87	<0.001	Not normal
Attitude Towards Using	0.151	87	<0.001	0.897	87	<0.001	Not normal

a. Lilliefors Significance Correction

4.4 Correlation Analysis

Table 5 presents the significance levels for each variable based on the Kolmogorov–Smirnov and Shapiro–Wilk normality tests. The analysis indicates that all variables record significance values below 0.05, with p-values less

than 0.05. These results confirm that the data do not follow a normal distribution. Therefore, the study applies Spearman's rho correlation analysis to examine the relationships between the independent variables and the dependent variable. In Spearman's rho analysis, a correlation coefficient below 0.30 indicates a weak relationship. Coefficients ranging from 0.30 to 0.50 represent a low positive correlation. Values between 0.50 and 0.70 indicate a moderate positive correlation, while coefficients between 0.70 and 0.90 reflect a high positive correlation. Correlation values from 0.90 to 1.00 demonstrate a very high positive relationship. Table 6 shows that perceived ease of use records a Spearman's rho correlation coefficient of 0.345 with a significance level of $p < 0.01$. This result indicates a low positive and statistically significant relationship between perceived ease of use and acceptability. Perceived usefulness records a correlation coefficient of 0.463 with $p < 0.01$, demonstrating a moderate positive and significant relationship with acceptability. Attitude towards using records a correlation coefficient of 0.407 with $p < 0.01$, indicating a low positive and statistically significant relationship with acceptability.

Table 6 *Spearman Correlation analysis*

	Acceptability of VR-based Training	Perceived Ease of Used	Perceived Usefulness	Attitude Towards Using
Acceptability of VR-based Training	1.000	0.345	0.463	0.07
Perceived Ease of Use		1.000	0.287	0.364
Perceived Usefulness			1.000	0.557
Attitude Towards Using				1.000

4.5 Discussion

This study examined the relationship between TAM constructs and the acceptability of VR-based training for Malaysian aircraft maintenance training programmes. Perceived ease of use recorded a mean score of 3.762, indicating a high level among respondents. The correlation coefficient between perceived ease of use and acceptability of VR-based training was 0.345, reflecting a positive relationship. This finding suggests that the technology positively influenced users' acceptance of VR-based training within Malaysian aircraft maintenance programmes. This result aligns with previous research by Carlsson (2024), which found that perceived ease of use positively influences the acceptance of VR in training, although its impact may be less significant compared to other factors. Specifically, when users find the technology easy to use, their willingness to accept VR-based training increases. Furthermore, users who are satisfied and have positive experiences with VR-based training are more likely to continue using it in the future.

Next, the results indicate that perceived usefulness records a mean score of 4.508, demonstrating a high level of perceived usefulness among respondents. The correlation coefficient between perceived usefulness and acceptability is 0.463, which confirms a moderate positive relationship between the two variables. The findings emphasise the importance of perceived usefulness in influencing users' acceptance of VR-based training. The results support the conclusions reported by Carlsson (2024), which identified perceived usefulness as a significant determinant of technology acceptance. The present study shows that perceived usefulness strongly drives acceptance of VR-based training, suggesting that trainees prioritise the practical advantages of the technology rather than focusing solely on its ease of use. Perceived usefulness directly influences the acceptability of VR-based training. When users recognise clear benefits, their willingness to adopt the technology increases.

Furthermore, the results indicate that attitude towards using records a mean score of 4.274, which reflects a high level of positive attitude among respondents. The correlation coefficient between attitude towards using and acceptability is 0.407, demonstrating a low positive relationship between the two variables. The findings confirm that attitude towards using positively influences the acceptability of VR-based training. These results align with the findings reported by Carlsson (2024), which identified attitude as a significant factor in technology acceptance. The present study demonstrates that a positive attitude towards using VR strengthens the influence of perceived ease of use and perceived usefulness, thereby enhancing overall acceptance of the technology for training purposes. Users' attitudes directly affect their acceptance of VR-based training. When users develop a favourable attitude towards the technology, their level of acceptability increases accordingly. Therefore, cultivating a positive perception and experience with VR plays a crucial role in encouraging its adoption in training environments.

5. Conclusion

This study advances understanding of VR adoption within Malaysian aircraft maintenance training by empirically examining the relationships between perceived ease of use, perceived usefulness, attitude towards

using, and overall acceptability. Rather than merely confirming direct associations, the findings collectively demonstrate that acceptance of VR-based training is primarily anchored in users' evaluation of its instrumental value. Although ease of use and positive attitudes contribute significantly to acceptance, perceived usefulness emerges as the most influential determinant. This pattern reinforces the central proposition of the Technology Acceptance Model that performance-related beliefs constitute the principal driver of technology adoption, particularly in high-stakes, skill-intensive environments. Theoretically, the study contextualises TAM within immersive technical training, extending its application beyond conventional information systems to a safety-critical aviation setting. The results suggest that, in professional training contexts where operational accuracy and competence are paramount, users prioritise tangible performance enhancement over hedonic or convenience-related attributes. Attitude towards using functions as a reinforcing mechanism that strengthens the influence of cognitive beliefs on acceptance, thereby supporting TAM's structural assumptions while highlighting the salience of utility perceptions in vocational education and training.

From a practical perspective, aviation training institutions and regulatory stakeholders should emphasise demonstrable training outcomes when implementing VR initiatives. Investment decisions should prioritise high-fidelity simulations that clearly enhance task comprehension, procedural accuracy, and time efficiency. Policy makers, including accreditation and oversight bodies, may consider establishing structured implementation guidelines that integrate VR as a complementary rather than substitutive training modality. Evidence-based communication strategies that showcase measurable benefits will be critical in mitigating resistance and fostering sustained adoption. Methodologically, this study contributes by applying non-parametric correlation analysis in response to non-normal data distribution, thereby ensuring analytical robustness within a moderate sample context. The validated measurement instrument and empirical evidence provide a foundation for subsequent confirmatory modelling using structural equation approaches.

Notwithstanding these contributions, limitations warrant consideration. The use of convenience sampling and a single organisational context restricts generalisability. The cross-sectional design precludes causal inference, and behavioural intention was not examined longitudinally. Future research should employ multi-site sampling across diverse maintenance organisations, integrate structural equation modelling to test mediating effects, and incorporate longitudinal designs to assess sustained usage behaviour. Further investigation into moderating variables such as technological readiness, simulation fidelity, and organisational support would also enrich theoretical refinement and practical deployment strategies.

Acknowledgement

Communication of this research is made possible through the continuous support by Universiti Tun Hussein Onn Malaysia.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Ong Yuan Sheng, Mohamad Ali Selimin;* ***data collection:*** *Ong Yuan Sheng;* ***analysis and interpretation of results:*** *Ong Yuan Sheng, Mohamad Ali Selimin, Nor Aziati Abdul Hamid;* ***draft manuscript preparation:*** *Ong Yuan Sheng, Mohamad Ali Selimin. All authors reviewed the results and approved the final version of the manuscript.*

References

Carlsson, L. (2024). Technology Acceptance of Virtual Reality for Aircraft Maintenance Training.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, *13*(3), 319-340. http://dx.doi.org/10.2307/249008

de Lange, R. D. (2024). A literature review and proposal towards the further integration of haptics in aviation. *International Conference on Human-Computer Interaction*, 159-178. https://doi.org/10.1007/978-3-031-61044-8_12

Duruaku, F., Nguyen, B., Sonnenfeld, N. A., & Jentsch, F. G. (2024). Unveiling virtual reality overheads and their potential impact on flightcrew training. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 68, 1047-1053. https://doi.org/10.1177/10711813241276484

Fauzi, W. J., Radzuan, N. R. M., Fauzi *et al.*, A. K., Ngah, E., Romli, A., Abd Wab, R., & Ahmad, W. A. S. W. (2023). Tertiary Educators' Awareness of and Readiness to Use Virtual Reality (VR) in Remote Online Learning. *International Society for Technology, Education, and Science*.

Fussell, S. G., & Truong, D. (2023). Accepting virtual reality for dynamic learning: An extension of the technology acceptance model. *Interactive Learning Environments*, *31*(9), 5442-5459. https://doi.org/10.1080/10494820.2021.2009880

Halford, E., Taleb Hussain, A., Keningale, P., & Condon, C. (2025). Implementing virtual reality training in policing: A case study using the technology acceptance model. *International Journal of Police Science & Management*, *27*(3), 339-359. https://doi.org/10.1177/14613557251316088

Jonaid, S. M. H., Noh, H. M., Yusoff, M. R., & Zuhudi, N. Z. M. (2023). Virtual reality for gas turbine engine training at Part 147 and Part 145 organization: Review on implementation factors and challenges. *Proceedings of the 1st International Conference on Frontier of Digital Technology Towards a Sustainable Society*, 2808, p. 060004. https://doi.org/10.1063/5.0133159

Li, S. (2023). Design and development of aviation aircraft maintenance training platform based on VR technology. *Procedia Computer Science*, *228*, 898-906. https://doi.org/10.1016/j.procs.2023.11.118

Mustapha, S., Chong, C. A., & Mohammed, M. N. (2021). Review on the usage of mixed reality and augmented reality assisted learning tool in aircraft maintenance. *2021 IEEE 9th Conference on Systems, Process and Control (ICSPC 2021)*, 168-173. https://doi.org/10.1109/ICSPC53359.2021.9689118

Nappi, M., Paolino, L., Ricciardi, S., Sebillo, M., & Vitiello, G. (2009). Advanced Maintenance Simulation by Means of Hand-Based Haptic Interfaces. *IFIP Conference on Human-Computer Interaction*, 76-88. https://doi.org/10.1007/978-3-642-03658-3_12

Noh, H. M., Jonaid, S. M. H., & Yusoff, M. R. (2023). Maintenance training organization (part 147) virtual reality for gas turbine engine: Assessment of future landscape of training. *Proceedings of the 1st International Conference on Frontier of Digital Technology Towards a Sustainable Society*, 2808, p. 060003. https://doi.org/10.1063/5.0135043

Sadasivan, S., Vembar, D., Stringfellow, P., Washburn, C., Duchowski, A., & Gramopadhye, A. (2006). Aircraft Maintenance Technology Education: Integrating Asynchronous Technology & Virtual Reality. *2006 Annual Conference & Exposition*, 11-166.

Scott, H., Baglee, D., O'Brien, R., & Potts, R. (2020). An investigation of acceptance and e-readiness for the application of virtual reality and augmented reality technologies to maintenance training in the manufacturing industry. *International Journal of Mechatronics and Manufacturing Systems*, *13*(1), 39-58. https://doi.org/10.1504/IJMMS.2020.108310

Siyaev, A., & Jo, G. S. (2021). Towards aircraft maintenance metaverse using speech interactions with virtual objects in mixed reality. *Sensors*, *21*(6), 2066. https://doi.org/10.3390/s21062066

Toyoda, R., Russo-Abegão, F., & Glassey, J. (2022). VR-based health and safety training in various high-risk engineering industries: a literature review. *International Journal of Educational Technology in Higher Education*, *19*(1), 42. https://doi.org/10.1186/s41239-022-00349-3

Wong, E. Y. C., Hui, R. T. Y., & Kong, H. (2023). Perceived usefulness of, engagement with, and effectiveness of virtual reality environments in learning industrial operations: the moderating role of openness to experience. *Virtual Reality*, *27*(3), 2149-2165. https://doi.org/10.1007/s10055-023-00793-0

Yang, M., Miller, C., Crompton, H., Pan, Z., & Glaser, N. (2024). The implementation of virtual reality in organizational learning: attitudes, challenges, side effects, and affordances. *TechTrends*, *68*(1), 111-135. https://doi.org/10.1007/s11528-023-00917-y

Yazdi, M. (2024). Augmented reality (AR) and virtual reality (VR) in maintenance training. *Advances in computational mathematics for industrial system reliability and maintainability*, 169-183. https://doi.org/10.1007/978-3-031-53514-7_10

Yusof, M. A., Ya'acob, A. M., Zaki, M. A. M., Rahman, Z. A., Abidin, N. H. Z., Padil, I. F., ... & Hashim, H. F. M. (2019). Developing a virtual reality (VR) app for theory of flight & control as a teaching & learning aid. *International Journal of Innovative Technology and Exploring Engineering*, *8*(6), 670–673.

Zou, Z. B., Wu, J. B., & Ma, M. (2013). Virtual maintenance training system of airborne electronic equipment. *Applied Mechanics and Materials*, *437*, 861-865. https://doi.org/10.4028/www.scientific.net/AMM.437.861