A Preliminary Study on Technology Acceptance in Airline Safety Risk Management: Extending the Technology Acceptance Model

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ABSTRACT

Aviation safety is paramount, and advancements in technology play a pivotal role in mitigating risks and enhancing operational efficiency. The Technology Acceptance Model (TAM) has been widely utilised to understand the adoption of various technologies across industries. However, its application within the context of aviation risk assessment requires nuanced considerations due to the unique operational environment and stringent safety requirements. This paper applies the TAM model to aviation safety risk assessment methods. A review of the literature on TAM and its adaptations in aviation risk assessment is carried out. Drawing from interdisciplinary insights in psychology, human factors, and aviation safety, this paper proposes constructs that may enhance the TAM framework to improve its applicability to the aviation industry. This study explores key areas including individual versus organisational acceptance of technology, procurement and operational costs, trust in technology, system complexity and security issues. These factors are examined to provide a comprehensive understanding of technology acceptance within aviation risk assessment practices. By proposing an expansion of the TAM framework, this paper aims to offer valuable insights for researchers, practitioners, and regulators involved in aviation safety management and technology integration efforts.

1. INTRODUCTION

Safety risk management (SRM) is fundamental within the framework of a robust safety management system, crucial in preventing accidents and incidents caused by hazards or safety deficiencies. Core activities include operational system delineation, hazard analysis, safety risk evaluation, and implementing preliminary mitigation measures.According to Aven and Ylonen (2018), contemporary literature increasingly adopts a socio-technical perspective.

According to Aven and Ylonen (2018), contemporary literature increasingly adopts a socio-technical perspective. This viewpoint emphasises the intricate safety dynamics within complex systems, often overlooked by conventional risk assessment approaches and it also highlights the importance of technology consideration.

In the aviation industry, a persistent challenge lies in accurately determining the probability of safety occurrences and representing risks through tools like risk matrices. Existing methodologies, including bowties, face criticism for their static nature, as highlighted by Cox (2008). Malakis, Kontogiannis and Smoker (2023) argue that the dynamic nature of risk, coupled with 'information-based uncertainty,' undermines safety assessments. Current risk assessment methods often overlook the fundamental aspects of uncertainty and variability (Vose,2008). Quantitative risk assessment methods, advocated by Apostolakis (2004) and Saluda and Idris (2012), offer a clearer depiction of risks but are underutilised in aviation.

While quantitative risk assessment methods hold significant potential benefits, they encounter barriers to widespread adoption, notably data scarcity and limited technological comprehension. Fenton and Neil (2019) strongly refute the notion that data scarcity is a justifiable impediment. In their seminal work, "Risk Assessment and Decision Analysis with Bayesian Networks (BNs)," they assert that data limitations should not serve as a pretext for exclusively employing qualitative analysis. They argue that BNs exemplify the capability to adeptly address such challenges. Hubbard (2020) emphasises the importance of probabilistic models in risk analysis, highlighting a resistance to leveraging data within safety risk management circles.

In the realm of aviation safety risk assessment, a plethora of quantitative methods, including Fault Tree Analysis, BNs, Monte Carlo Simulation, Failure Modes and Effect Analysis (FMEA), and Event Tree Analysis are available. Among these, BNs stand out as a promising solution to data scarcity, facilitating the seamless integration of subject matter expertise. Khakzad, Khan, and Amyotte (2013) comment that, through their graphical representation of causal relationships, coupled with Conditional Probability Tables, BNs offer distinct advantages over traditional methodologies. Belief Bayesian Networks (BBN), as a quantitative method, leverage deterministic or probabilistic real-world information, enriching the comprehension of risk dynamics. Furthermore, the inherent modularity of BNs enables effortless extension or modification to accommodate new variables or changes in dependency structures, thus facilitating impact analysis on system elements (Bauranov & Rakas, 2024). This, however, requires the use of readily available technology, which the aviation industry is somehow not utilising.

According to Zurheide, Hermann, and Lamesberger (2021), BNs offer a mathematically sound methodology for computing probabilities to address uncertainty. Beyond mere probability computation, they provide versatile functionalities such as predictive and diagnostic analysis, model updating, and optimization (Kabir & Papadopoulos, 2019). Pan, Feng, and Xue (2020) point out that in the realm of system safety, the BBN approach stands out for its ability to integrate and update testing and operational experience data, effectively managing the inherent uncertainties in aircraft systems with scientific rigour.

However, despite their merits, BNs have faced criticism. When used as standalone approaches, they lack formal semantic guidelines for system development and may not ensure model coherence (Kabir & Papadopoulos, 2019). They further argue that the robustness of BNs depend on having a coherent model. In aviation, bowtie diagrams can be utilised as these coherent models. The technology advocated in this piece of research is bowties mapped into BNs. This research underscores the technology that integrates mapping bowtie analyses into BNs to bolster model coherence and reliability, potentially enhancing safety risk assessment in airline operations.

This preliminary research aims to explore resistance towards technology adoption among safety risk management personnel in which BNs is an example. The research focuses on technology that can be used in the quantitative determination of probabilities of safety occurrences. Anchored in the TAM, the study seeks to understand the industry's perception of technology's usefulness in enhancing safety risk assessment practices. It also explores factors influencing technology adoption in the aviation industry, despite increasing data accessibility and data analytical tools. Previous studies in aviation have focused on the application of the TAM in areas like maintenance training and interactive learning tools.

2. LITERATURE REVIEW

2.1. Technology Acceptance Models (TAMs)

The pervasive influence of technology has reshaped lifestyles and professional practices, primarily fuelled by the advancements in computers and information technology. With the advent of artificial intelligence, this transformative trend is poised to persist. Central to this evolution is the critical question of technology acceptance, both at the individual and organisational levels. The TAM, among other frameworks, serves as a valuable tool for scrutinising technology adoption, particularly within SRM. Extensive research attests to the TAM's popularity and utility, underscored by numerous studies highlighting its relevance across diverse technologies and user groups (Venkatesh, Morris, Davis, & Davis, 2003). Nevertheless, there remains a gap in current literature concerning representative academic works that underpin TAM research within the context of aviation SRM.

TAM was introduced by Davis in 1986 with the aim of investigating the acceptance of information technology for personal use (Fussell & Truong, 2023). Since its inception, TAM has demonstrated remarkable adaptability and universality, finding application across various industries such as healthcare, education, construction, mobile tourism, and beyond. Originating from the psychological Theory of Reasoned Action (TRA), TAM has evolved into a cornerstone model for understanding the determinants of human behaviour concerning the potential acceptance or rejection of technology (Granic & Marangunic, 2019).

With the emergence of information technology, there has been an ongoing pursuit to comprehend why individuals choose to adopt or decline the use of specific technologies. TRA proposed by Ajzen and Fishbein (1980) serves as the foundation of TAM, along with the Theory of Planned Behaviour (Ajzen, 1985). These theories paved the way for the TAM model (Davis, 1986), which posits that a user's inclination towards technology usage can be explained through three key factors: perceived ease of use (PEU), perceived usefulness (PU), and attitude towards usage (see Fig.1). At the time of its inception, the utilisation of technology within organisations was relatively underexplored, a trend that persists, particularly within the realm of SRM in aviation.

Davis (1986) postulated that the attitude of a user towards a system serves as a pivotal determinant in the decision to adopt or reject it. According to his hypothesis, PU denotes the extent to which an individual believes that utilising the system would enhance their job performance. On the other hand, PEU refers to the degree of effortlessness the individual associates with using the system (Fig.2).

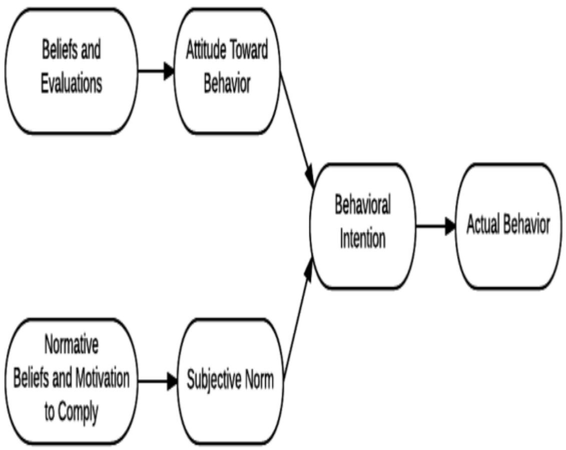

Figure 1. Theory of Reasoned Action (Ajzen and Fishbein, 1980).

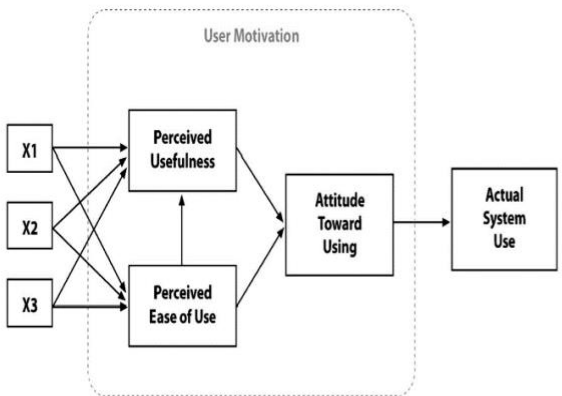

Figure 2. Technology Acceptance Model (Davis, 1986).

Over time, the TAM has undergone numerous iterations and refinements, primarily aimed at expanding the breadth of factors influencing the acceptance or rejection of technology. Notably, Venkatesh (2000) introduced TAM 2 as an extension of the original TAM, incorporating significant enhancements. In TAM 2 (depicted in Fig. 3), two essential processes are integrated: social influence processes (including subjective norm, voluntariness, and image) and cognitive instrumental processes (such as job relevance, output quality, result demonstrability, and perceived usefulness). These augmentations, proposed by Wu, Chou, Yung, Weng, and Huang (2008), were acknowledged for their pivotal role in elucidating user acceptance dynamics. TAM 2 represents a notable departure from Davis's initial framework, particularly in revisiting the influence of subjective norms on behavioural intention to use technology. This collaborative effort between Davis and Venkatesh signifies a concerted endeavour to refine and enhance the model's explanatory power.

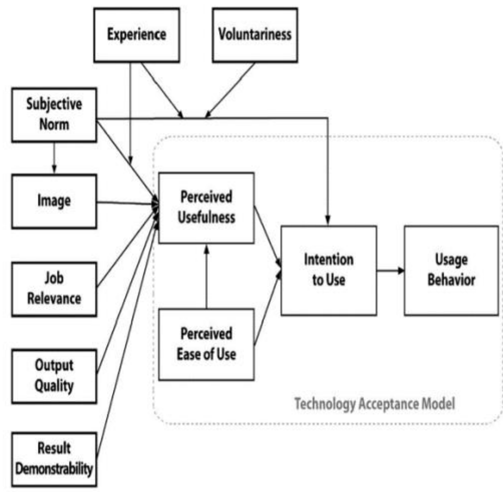

Figure 3. TAM 2 (Venkatesh and Davis, 2000).

While the original TAM explains around 40-50% of technology acceptance (Averson, 2005), TAM2, as noted by Davis, demonstrates a higher explanatory power, reaching 60% (Venkatesh & Davis, 2000). This paper aims to look deeper into additional factors influencing technology adoption within aviation SRM.

In the aviation domain, the construct of 'subjective norm' (Fig. 4) assumes paramount importance, particularly regarding 'voluntariness.' Voluntariness serves as a crucial determinant, categorising usage contexts into mandatory or voluntary settings. This distinction holds significant relevance within the aviation sector, characterised by stringent regulations alongside organisational discretion in safety risk management technology adoption. Despite the regulatory framework, the full extent of technology utilisation in aviation safety risk management remains underexplored. With the increasing integration of artificial intelligence, understanding its implications on technology acceptance becomes imperative, especially anticipating potential regulatory mandates.

The seminal work by Hartwick and Barki (1994) underscores the complexities associated with perceived mandates within organisational settings, highlighting nuanced variations in usage intentions even when systems are mandated. Such insights necessitate probing how mandating technology adoption for safety risk assessment may influence actual usage patterns. Central to this inquiry is examining the 'image' component, exploring whether aviation organisations believe in the efficacy and efficiency enhancements facilitated by technology in safety risk assessment.

Furthermore, cognitive instrumental processes warrant thorough investigation, covering dimensions such as job relevance, output quality, and result demonstrability. As posited by Kieras and Polson (1985), the cognitive load in executing tasks within a given system depends on users' comprehension of job situations, emphasising the need to explore these cognitive facets further.

This research also investigates the ramifications of potentially mandating technology employment in safety risk assessment within the aviation sector. By scrutinising various dimensions encompassing subjective norms, organisational perceptions, and cognitive processes, this study aims to provide valuable insights into technology acceptance dynamics in this critical domain.

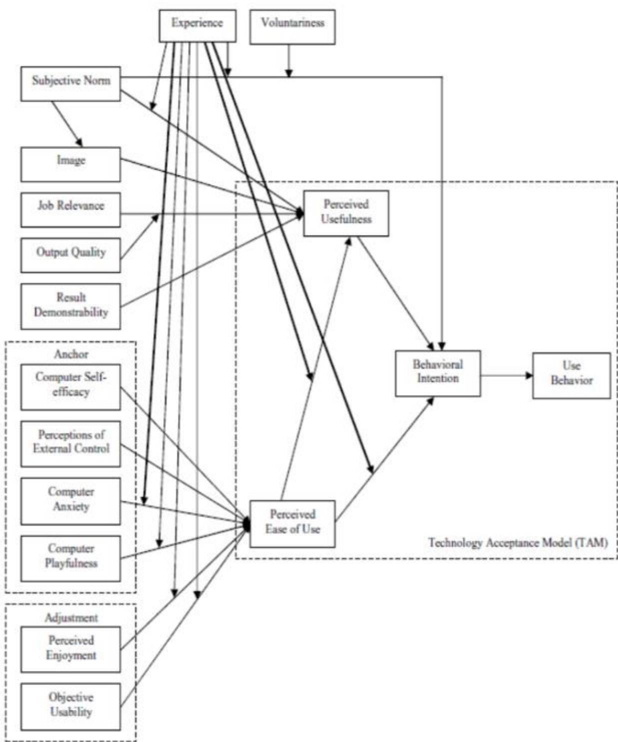

Figure 4. TAM 3 (Venkatesh and Bala, 2008).

While TAM models encompass determinants related to PEU and factors relevant to information technology and systems, as demonstrated by studies like Lai (2017), this study shifts focus to the PU of technology within aviation safety risk assessment. Once tools integrating technology into safety risk probability assessment are developed, the aspect of PEU will be further examined. Over time, the original TAM framework has demonstrated remarkable adaptability, effectively adjusting to various technological landscapes and environmental contexts. This adaptability underscores its validity and robustness as a model for understanding factors influencing user acceptance of technology, as emphasised by King and He's meta-analysis (2006), examining the efficacy of the TAM.

However, Lai (2017) presents a critical perspective on the applicability of TAM2/3 frameworks in assessing 'Novelty technology,' suggesting that established models may not be entirely suitable for evaluating novel technologies due to factors that could be considered inappropriate or irrelevant in certain contexts. This assertion highlights the importance of examining the relevance and applicability of established models when confronted with emerging technologies characterised by novelty and distinct user dynamics. Such critical evaluations contribute to refining our understanding of technology acceptance frameworks and guide the development of more tailored models capable of accommodating the nuances inherent in novel technological paradigms. BNs can be viewed as a new or innovative technology in the realm of determining the probability of safety occurrences and might, therefore, fit this criterion.

2.2. Application of TAM in Aviation

In aviation research, significant attention has been given to exploring TAM primarily within training contexts. For instance, Wang, Ong, and Nee (2016) explored augmented reality in maintenance training instruction, examining aviation students' perceptions of its effectiveness. Their study highlighted the perceived benefits and drawbacks of augmented reality, showcasing its potential to enhance learning experiences in aviation. Similarly, Fussell and Truong (2021) expanded the TAM framework in their exploration of virtual reality acceptance for dynamic learning, demonstrating TAM's adaptability in understanding user attitudes and behaviours toward emerging technologies in aviation training. Additionally, Guest, Wild, Vovk, Lefrere, Klemke, Fominykh, and Kuula (2018) investigated TAM's application in augmented reality and wearable technologies, emphasising their substantial potential to enhance human performance in aviation settings.

Nevertheless, a noticeable gap persists in the literature concerning TAM's application to understanding technology acceptance or rejection within the realm of SRM in aviation. To address this gap, the present preliminary research aims to utilise the foundational TAM factors while also identifying specific factors relevant to safety risk assessment within the organisational context of aviation. By adapting the TAM framework to suit the unique demands of SRM in aviation, this study aims to offer new insights into the dynamics of technology acceptance within this critical domain.

Several studies have examined safety risk assessment and technology acceptance, particularly focusing on the public's acceptance of technology. In his 2016 paper titled "SMS Derived vs. Public Perceived Risk in Aviation Technology Acceptance," Paul Myers III primarily explores the nexus between technology acceptance and public risk perception. He underscores the significant influence of public perceptions on the rate and adoption of technological advancements within the aviation industry. Myers contends that public perception, often characterised by apprehensions or concerns, can hinder or even delay the adoption of technology. Similarly, Clothier, Greer and Mehta (2015) researched the importance of perceived risk compared to other determinants, affirming that perceived risk poses a significant barrier to technology acceptance. Furthermore, Dobbie and Brown (2014) support this viewpoint, emphasising perceived risk as a crucial factor influencing the adoption or rejection of technology within aviation contexts.

However, it's essential to note that these studies primarily concentrate on the public's perception of technology usage and its associated risks, rather than on how technology adoption unfolds within aviation organisations. As a result, there remains a gap in understanding the intricacies of technology acceptance and rejection within the organisational context of the aviation sector. This underscores the necessity for additional research aimed at investigating the dynamics of technology adoption within aviation organisations. Such research should not only consider external perceptions but also internal factors that influence decision-making processes regarding technology implementation and risk management. This paper aims to narrow this knowledge gap.

3. METHODOLOGY

3.1. Survey Design and Scale Development

This study adopts a survey methodology, beginning with a pilot study to assess the reliability and validity of the survey instrument, followed by the implementation of a broader measurement model as proposed by Fussell and Truong (2021). The pilot study involved three academics with expertise in technology acceptance, along with safety professionals from five different airlines, whose feedback prompted several iterations of the questionnaire items. The research makes use of convenience sampling and exponential non-discriminative snowball sampling. Initially, fifteen employees involved in safety risk management from various airlines were identified. These employees in turn, asked relevant personnel within their airlines to complete the survey. This aligns with the research aim of evaluating the current utilisation of technology in airline operational safety risk assessment and investigating barriers to its adoption. No incentives were promised to participants upon completion.

Snowball sampling is one of the most popular methods of sampling in qualitative research, valued for its network potential, flexibility and reliance on referrals (Parker et al.,2019). Researchers use their social networks to establish initial links, with sampling momentum developing from these, capturing a growing chain of participants. The process continues until a target sample size, or a saturation point has been reached (Naderifar, Goli & Ghaljaie, 2017). Davies (2007) points out that with these types of sampling, there is no means of knowing to what extent the sample is biased. While Cohen and Arieli (2011) also highlight some limitations of this approach, others such as Woodley and Lockard (2016) acknowledge its shortcomings yet still advocate for its use, particularly in reaching hard- to- access populations. Polit and Beck (2004) also emphasise the efficiency and cost effectiveness of this method in locating otherwise difficult-to -find participants. In this research, this method proves valuable for accessing aviation professionals involved in their organisations' SRM, a group that is otherwise challenging to reach.

Informed by the TAM and pertinent literature, questionnaire items were developed. Some items related to PU were adapted from established instruments (Ajzen & Fishbein, 1980; Davis, 1989; Davies, 1993; Venkatesh, 2001; Venkatesh & Davis, 1996) and relevant academic papers. The questionnaire underwent iterative refinements following comprehensive reviews, with face and content validity assessed by a panel of three technology assessment experts. Pretesting among airline safety personnel further validated its efficacy.

Cronbach's alpha values were employed to evaluate internal consistency for each theoretical variable. Internal consistency refers to the degree to which all items within a test measure the same concept or construct, reflecting the interrelatedness of these items (Tavakol & Dennick, 2011). Various assumptions underlying the use of Cronbach's alpha—such as tau-equivalence, data normality, continuous measurement, uncorrelated error terms, and unidimensionality—have been discussed extensively by several authors (Kumar, 2024; Vaske, Beamann & Sponarski, 2017; Sijtsma, 2009). While alternatives to Cronbach's alpha exist, including Alpha with Confidence Intervals, McDonald's Omega, and the Greatest Lower Bound (Kumar, 2024), Cronbach's alpha was selected for this study due to its flexibility, convenience, and widespread use.

Effective methods for assessing dimensionality include both confirmatory and exploratory factor analyses (Huysamen, 2006). Several studies have applied factor analysis to explore the dimensions of the TAM within the aviation sector, such as the work by Wang et al. (2016) and Fussell (2020). Given the limitations of this study's sample size, which would not support a robust Confirmatory Factor Analysis (CFA), this research builds on the factors identified in previous studies (Froman, 2001; Tinsley & Tinsley, 1987).

Likert scales were used to gauge respondents' perceptions of the usefulness of technology in safety risk assessment, with responses ranging from 'strongly agree' to 'strongly disagree'. This approach is suitable for analysis using SPSS. Other researchers in the aviation field, such as Wang et al. (2016), Talley (2020), Fussell and Truong (2022), and Syarifudin, Abbas & Heriyati, (2018), have successfully applied Likert scales in their studies on technology acceptance.

The structured questionnaire encompassed four key areas: participant and company information, assessment of current risk assessment tools, perceived usefulness of technology, and potential barriers to technology acceptance. Ethical considerations such as informed consent and confidentiality of participants were covered in the first key area. Each section featured tailored questions evaluating technology use efficacy in safety risk assessment by airline personnel. Drawing from similar published studies (Fussell and Truong, 2021; Liu and Chou, 2020; Chang, Su and Hajivev, 2017; Muñoz-Leiva, Climent-Climent and Liebana-Cabanillas, 2017), the questionnaire assessed the satisfaction level with current tools and explored the potential of technology to enhance safety risk assessment in airline operations. The questionnaires were distributed through personal networks.

This study primarily focuses on PU defined as the belief in technology's beneficial effects, in line with TAM. It aims to investigate to what extent airline personnel perceive technology as enhancing safety risk assessment. The study also explores factors such as cost, security, regulatory impact, individual versus organisational attitudes towards technology use, and staff experience and expertise.

Studies employing TAM often assume that perceptions of usefulness are linked to acceptance and usage behaviour (Chen and Chan, 2011). Positive perceptions of technology's usefulness or advantages are suggested to drive acceptance (Martia-Garcia et al., 2013). Similarly, Goher, Mansouri and Fadlallah (2017) posit that if individuals do not perceive a technology as useful, they are unlikely to use it. TAM 3 details factors influencing PU such as image, job relevance, output quality, and result demonstrability, which this study aims to validate in the context of technology adoption in safety risk assessment in the airline industry and explore the inclusion of more constructs.

3.2. Data Collection and Instrumentation

Data were collected through an online questionnaire using Qualtrics. Professional survey platforms, such as Qualtrics have gained popularity among researchers designing non-interactive online experiments, with increasing evidence suggesting that it is now used more frequently than SurveyMonkey (Molnar, 2019). Parsons, Mota, and Quan (2015) note that Qualtrics offers more advanced options for survey distribution and respondent tracking compared to most other tools.

The author made preliminary contact with companies to explain the purpose of the study and to request survey participants. Email invitations were subsequently sent to airline safety representatives, who then forwarded the invitations to other team members involved in safety risk assessment. The email included an invitation to participate in the study, a link to the questionnaire hosted on Qualtrics, and contact information for the researchers and their institution. Data collection occurred between April and May 2024. Although the questionnaire link remains active, the data collected and collated during this period were used for the preliminary analysis to obtain indicative results for this paper. The responses were anonymous, and minimal personal information was collected. All data were first exported in XLSX format and then converted to other formats, such as SPSS, for analysis.

4. RESULTS

The internal consistency of the instrument was assessed by determining the Cronbach alpha values for each theoretical variable. Table 1 below shows the construct question areas and their corresponding Cronbach alpha values.

Table 1. Cronbach values for different variables.

Question Area	Cronbach alpha value
Satisfied with current risk assessment tools	0.972
PU of technology to enhance quantitative determination of probability of safety occurrences	0.936
Barriers to the use of technology in quantitative determination of probability of safety occurrences	0.971
Organisational acceptance versus individual acceptance of technology in quantitative determination of probability of safety occurrences	0.700

According to Hair et.al., (2019), in exploratory studies, values above 0.6 are acceptable so there is no major concern about inconsistency.

4.1. Demographics Data Collection and Instrumentation

Currently, data has been collected from 60 participants across five different continents. Table 2 below shows the ages of respondents.

Table 2. Ages of respondents.

Age (Years)	Number of participants
20-30	4
31-40	9
41-50	10
51-60	21
Over 60	1

The median age of participants is 41-50 years. There were no respondents from Antarctica and Australia/Oceania. 13 of these participants did not meet the eligibility criteria, and their responses were classified as non-respondents in the Qualtrics dataset.

60% of the participants have a master's degree or higher. 70% have worked in airline safety risk analysis for more than 4 years. Additionally, 34% of the participants are currently working as safety managers. Table 3 below shows the experience that participants have in safety risk assessment:

Table 3. Participants' experience in risk assessment.

Number of years of experience in safety risk assessment	Number of participants
Less than 2	3
More than 2 but less than 4	12
More than 4 but less than 6	12
More than 6 but less than 8	4
More than 8 but less than 10	5
10 or more	11

This indicates that the participants are experienced in safety risk assessment, and their judgments can be considered reliable.

4.2. Satisfaction with Current Risk Assessment Methods

The analysis of participant responses revealed a predominant reliance on safety risk matrices, with 60% of respondents indicating their usage. Satisfaction levels were generally around 65% across several dimensions, including accuracy, reliability, continuous improvement, objectivity (62%), improvement of image (60%), and meeting safety objectives. However, areas of lower satisfaction, with satisfaction rates around 55% were identified, particularly in 'relevance in determining the probability of safety occurrences', 'speed of action' and 'result demonstrability'. 60% of participants expressed that their current tools lacked the capacity for quantitatively determining probabilities of safety risk occurrences. Additionally, 64% of respondents reported a lack of utilisation of any technological aids for quantifying safety risk probabilities. An overwhelming 87% of participants acknowledged the potential benefits of quantitatively determining probabilities of safety occurrences. Participants made observations such as 'Probability is assigned a number at the user's discretion,' highlighting the subjective nature of probability assessment in airline SRM. This indicates a notable gap between current practices and perceived needs within the safety risk assessment domain.

4.3. Perceived Usefulness of Technology in Safety Risk Assessment

The participants' responses indicated that their evaluations of the potential enhancements provided by technology in various dimensions of safety risk assessment such as reliability, continuous improvement, speed of action, objectivity, improvement of image, relevance, and meeting safety objectives exceeded their evaluations of the current tools. When comparing the capability of currently used tools to those that can make use of probabilistic tools, the mean percentage of responses indicating 'strongly agree' or 'somewhat agree' increased from 62% to 85%.

Participants' perceptions of how technology could enhance specific areas of safety risk assessment were significantly positive. Notably, there were marked increases in perceived improvements in objectivity (25% increase), speed of action (30% increase), result demonstrability (32% increase), and fostering continuous improvement (21% increase).

4.4. Potential Barriers to the Usage of Technology in Quantitatively Determining Probability of Safety Occurrences

The assessment of potential barriers to the utilisation of technology for quantitatively determining the probability of safety occurrences involved examining various attributes, including data privacy and security, reliability of technology, procurement costs, running costs, user and organisational acceptance, pace of technological change, market awareness of available tools, complexity of technology, and staff IT proficiency and experience.

Analysis of respondents' data revealed four primary barriers with high levels of agreement ('strongly agree' or 'somewhat agree'): procurement costs (94%), running costs (91%), organisational acceptance (91%), and lack of awareness of technology tools in the market (91%). This insight offers valuable understanding regarding the likelihood of technology adoption in safety risk assessment practices.

Furthermore, integrating these findings into the TAM, particularly within the PU construct, could enhance its predictive power. Specifically, factors such as costs, organisational acceptance, and willingness to embrace technology may need to be considered in TAM formulations to accurately gauge technology acceptance within this domain.

4.5. Is there a Difference between Individual and Organisational Acceptance of Technology?

The data gathered from respondents indicates notable levels of agreement ('strongly agree' or 'somewhat agree') in several areas: individuals demonstrate a quicker adoption of technology compared to organisations (87%), and organisations are most likely to adopt technology if recommended by regulators (89%).

Conversely, there were lower agreement levels ('strongly agree' or 'somewhat agree') in the following areas: the regulators are enforcing technology usage in determining safety occurrence probabilities (47%), perceived equivalence between individual and organisational technology acceptance (57%), and existence of active promotion of technology usage in safety risk assessment by organisations (68%).

These results suggest that organisational acceptance of technology in safety risk assessment, as well as the influence of regulatory bodies like civil aviation authorities, may significantly impact technology acceptance within this domain. Notably, these factors are not adequately addressed in current TAMs, highlighting a potential area for further research and model refinement.

5. DISCUSSION

The aim of this research is to investigate the factors influencing aviation personnel involved in safety risk management to adopt technology for determining the probability of safety occurrences. Building upon existing research, this study is grounded in the TAM and explores the potential enhancement of the model to incorporate factors relevant to safety risk assessment in the dynamic aviation environment. The factors identified in this study align with those reported in previous research on TAM in aviation, such as Wang et al. (2016) and Fussell (2020), while also examining additional factors. These include the costs of procurement and operation, organisational acceptance of technology, and the influence of regulatory bodies.

To achieve this goal, a questionnaire was administered to assess the factors influencing aviation personnel in adopting technology for determining safety risk probabilities. Participants were first asked to evaluate the tools currently used for this purpose and then to rate a hypothetical technology-based tool capable of quantitatively determining safety risk probabilities. Technologies considered in this context encompass tools utilising BNs, machine learning, modelling, and similar techniques. Most participants indicated that technology has the potential to significantly enhance safety risk assessment and support continuous improvement.

The preliminary survey findings indicate that airlines predominantly rely on risk matrices for risk assessment, despite increasing literature highlighting their limitations, such as dependence on subject experts, lack of continuous improvement, and inadequate adaptability to evolving information. Such tools limitations may negatively impact aviation safety.

This research focuses exclusively on the PU construct of the TAM 3 model. As suggested by Davis (1989), PU and PEU are crucial determinants of technology acceptance. Once the factors affecting technology acceptance in SRM are identified, the tools developed to update safety risk as new information becomes available can be evaluated. This evaluation will allow for an assessment of the PEU of such tools and subsequent updates to the TAM model.

Most respondents agree with the subjective norms proposed by TAM, which have been corroborated and corroborated by other researchers. They reported a mean agreement of 85% regarding factors such as image, job relevance, output quality, and result demonstrability. However, they also acknowledged the barriers to technology acceptance in SRM. These findings highlight the ned for targeted strategies such as firmer guidance and regulation from International Civil Aviation Organisation (ICAO) and relevant authorities to address these barriers and enhance technology acceptance in aviation SRM.

6. CONCLUSION

The preliminary study aimed to investigate the factors influencing airline personnel in adopting technology for quantitatively determining safety occurrence probabilities. Utilising TAM3's subjective constructs as a foundation, this research expanded theoretical and practical understanding by incorporating additional factors relevant to the aviation industry's risk management practices. This study offers the potential to extend the TAM by integrating factors pertinent to technology adoption within SRM. A distinguishing feature of this research is its focus on the regulatory influence within the aviation sector, recognising its critical role in shaping technology acceptance. Additionally, the study emphasises importance of considering the financial implications, including the procurement and operational costs of the technology software, as integral factors in the adoption process.

The adoption of technology-driven tools for safety risk assessment holds promises for enhancing safety measures through continuous improvement and real-time updating of probabilities. By addressing a crucial gap in understanding technology acceptance in safety risk assessment, this study contributes to both academia and industry practice. Moreover, the perceptions gleaned regarding regulators' potential role in promoting technology adoption offer valuable guidance for resource allocation in an industry prioritising safety within constrained financial resources. Overall, this research provides preliminary insights into understanding of technology adoption in aviation SRM and underscores the potential advantages of embracing technological advancements to bolster safety standards in the aviation sector. Future research should focus on developing user-friendly tools for quantitative risk assessment, with subsequent exploration of their PEU.

7. LIMITATIONS

Some limitations should be acknowledged in this preliminary study. First, the sample size is relatively small, which limits the ability to draw persuasive quantitative conclusions. Consequently, generalisations cannot be made from these preliminary results. Additionally, data collection was confined to a short period, which may not capture the full spectrum of variables over time. Moreover, this preliminary study focused solely on one construct of the TAM: PU. It did not address PEU, which is also a critical factor in the model. Furthermore, the preliminary study's scope was limited to a specific group of airline safety risk assessment specialists. For broader applicability, it is important to include larger and more diverse groups of participants. Including other stakeholders, such as competent civil aviation authorities, ground handling companies, and maintenance service providers, would enrich the research and provide more robust insights into the field. This preliminary study, however, provides areas for future research.

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