Virtual reality in tourism: adoption scepticism and resistance

Tat-Huei Cham, Garry Wei-Han Tan, Eugene Cheng-Xi Aw, Keng-Boon Ooi, Teck-Weng Jee and Chuen-Khee Pek

Abstract

Purpose – Since its inception, virtual reality (VR) technologies have been widely applied in the tourism industry, given their competitive advantages in offering users a novel experience that makes an artificial environment or scene feel like the real world. As a result, VR has been reported as a highly sought-after technology, as it can offer a new way to engage tourists and enhance their travel experience. However, the adoption of VR by senior tourists (who are one of the potential groups of tourists) is still relatively low in the tourism context. Against this backdrop, this study aims to respond to the deficiency in the literature by examining the impact of barriers that contribute to senior tourists’ resistance and scepticism towards VR in tourism.

Design/methodology/approach – Using a cross-sectional approach, the data for this study was collected from 600 eligible senior tourists through survey questionnaires. To obtain valid and reliable responses, a purposive sampling technique with screening criteria was undertaken in this study. Upon data cleaning, the data analysis was performed on 546 samples using statistical software packages such as SPSS and the AMOS covariance-based structural equation modelling technique.

Findings – Grounded on the innovation resistance theory, the outcome of this study put forward the significance of technical and psychological barriers in explaining senior tourists’ resistance and scepticism towards the use of VR in tourism. In particular, perceived risk, perceived incompatibility, technology anxiety, inertia and a lack of human interaction were found to be associated with senior tourists’ scepticism and resistance towards using VR for tourism, which could directly influence their non-adoption intention and the success of virtual tourism. However, perceived complexity was not found to have a significant relationship with resistance. Moreover, both scepticism and resistance were reported to influence non-adoption intentions on VR.

Originality/value – This study is one of the few studies that examined the less explored territory of the tourism literature concerning the non-adoption of contemporary innovation (i.e. VR technology) for virtual tourism purposes. Moreover, this study also focuses on the perspective of senior tourists, which represents a promising market segment in the tourism sector. This study successfully contributed to the existing literature by offering empirical insights and highlighting the barriers that lead to users’ scepticism and resistance towards using VR for tourism, which could directly influence their non-adoption intention and the success of virtual tourism.

Keywords Resistance, Scepticism, COVID-19, Virtual tourism, Non-adoption intention, Virtual technology (VR)

Paper type Research paper

虚拟现实技术下的旅游业: 应用怀疑与抵制

摘要

研究目的: 自问世以来, 虚拟现实 (VR) 技术已在旅游业中得到广泛应用因为它在为用户提供新颖体验方面具有竞争优势, 使人工环境或环境感觉像真实世界。由于 VR 可以提供一种新奇的方式来吸引游客并提升他们的旅行体验，它被视为一项备受追捧的科技。然而，在旅游背景下，老年游客（潜在游客群体之一）对 VR 的采用率仍然较低。在此背景下，本研究旨在通过探究导致老年游客对 VR 技术产生抵制和怀疑的原因来回应文献中的不足。

研究设计/方法: 基于横断面方法，本研究通过问卷调查从 600 名符合条件的老年游客中收集了数据。为了获得有效和可靠的答复，本研究采用了具有高度标准化的目标抽样技术。数据清理后，本研究使用 SPSS 等统计软件包和基于 AMOS 模型方程建模技术对 546 个样本进行了数据分析。

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Resumen

Propósito: Desde sus inicios, las tecnologías de realidad virtual (RV) se han aplicado ampliamente en el sector turístico, dadas sus ventajas competitivas al ofrecer a los usuarios una experiencia novedosa que hace que un entorno o escena artificial parezca el mundo real. Como resultado, la RV ha sido considerada una tecnología muy solicitada, ya que puede ofrecer una nueva forma de involucrar a los turistas y mejorar su experiencia de viaje. Sin embargo, la adopción de la RV por parte de los turistas senior (que son uno de los grupos potenciales de turistas) aún es relativamente baja en el contexto del turismo. El presente estudio se propuso responder a este déficit en la literatura examinando el impacto de las barreras que contribuyen a la resistencia y el escepticismo de los turistas mayores hacia la RV en el turismo.

Diseño/metodología/enfoque: Utilizando un enfoque transversal, los datos para este estudio se recopilaron de 600 turistas de la tercera edad elegibles a través de una encuesta mediante cuestionario. Para obtener respuestas válidas y fiables, se llevó a cabo una técnica de muestreo intencional con criterios de selección. Una vez depurados los datos y eliminados los sujetos no válidos, se procedió a su análisis en una muestra de 546 individuos utilizando paquetes de software estadístico como SPSS y la técnica de modelado de ecuaciones estructurales basada en la covarianza AMOS.

Hallazgos: En el marco de la teoría de la resistencia a la innovación, los resultados del estudio ponen de manifiesto la importancia de las barreras técnicas y psicológicas para explicar la resistencia y el escepticismo de los turistas de la tercera edad hacia el uso de la RV en el turismo. En concreto, el riesgo percibido, la incompatibilidad percibida, la ansiedad tecnológica, la incertidumbre y la falta de interacción humana se asociaron con el escepticismo y la resistencia de los turistas mayores hacia el uso de la RV en el turismo. Sin embargo, no se encontró ninguna relación significativa entre la complejidad percibida y la resistencia. Además, tanto el escepticismo como la resistencia influyen en las intenciones de no adoptar la RV.

Originalidad/valor: Este estudio es uno de los pocos que examinan el territorio menos explorado de la literatura turística en relación con la no adopción de la innovación contemporánea (es decir, la tecnología de RV) para fines de turismo virtual. Además, esta investigación también se centra en la perspectiva de los turistas senior, que representan un segmento de mercado prometedor en el sector turístico. El presente estudio contribuye con éxito a la literatura existente al ofrecer una perspectiva empírica y poner de relieve las barreras u obstáculos que provocan el escepticismo y la resistencia de los usuarios hacia el uso de la RV con fines turísticos, lo que podría influir directamente en su intención de no adoptar y en el éxito del turismo virtual.

Palabras clave: Tecnología virtual (RV), Turismo virtual, Escepticismo, Resistencia, Intención de no adopción, COVID-19

Tipo de papel: Trabajo de investigación

1. Introduction

Virtual reality (VR) technologies, a subset of an emerging and promising phenomenon known as “Metaverse”, are gaining rapid momentum in the tourism sector, given their unbounded potential to enhance the tourism experience (Bec et al., 2021; Buhalis and Karatay, 2022; Buhalis et al., 2023a; Koohang et al., 2023). VR allows tourism marketers to promote virtual tourism, provide destination information innovatively, deliver authentic tourism experiences and create tourism policies (Bogicevic et al., 2019). Moreover, the importance of VR is also reflected in its direct impact on tourists’ on-site travel experience and post-travel behaviour (Bec et al., 2021). Notably, the past literature has documented VR as a key area of research in tourism studies (Merkx and Nawijn, 2021; Talwar et al., 2022;...
For example, recent studies have examined the impact of VR on consumer response to various aspects of tourism, including sites, destinations and activities (Bogicevic et al., 2019) as well as the overall tourism experience (Loureiro et al., 2020). Although virtual reality has been hailed as a game changer in the tourism industry, its popularity among tourists is still in its early stages. While VR research is widely available across the literature, little is known about tourist resistance and scepticism towards adopting this emerging technology, especially among senior tourists.

The senior travel market has evolved into a global phenomenon whereby given the growing propensity for seniors to travel (Liew et al., 2021; Möller et al., 2007). The significance of senior tourists in the tourism industry should be emphasised, as this group of tourists generally has higher purchasing power, more savings, more time to spend on travel and leisure and more flexibility to travel (Han et al., 2015; Liew et al., 2021). However, the literature indicated that inadequate consideration has been given to the senior travel market (Liew et al., 2021) and age-related research towards the rejection of contemporary innovations in the tourism context (Ramos-Soler et al., 2019). The dearth of empirical evidence in this context reflects a research gap that warrants further exploration, especially from the lens of VR technology adoption. Understanding the causes for scepticism and resistance among senior tourists would help tourism operators/agencies, destination marketing organisations and VR platform providers to overcome existing adoption barriers for tourism purposes.

The present study aims to examine the factors that lead to the sense of scepticism and resistance among senior tourists towards the adoption of VR in tourism. It is crucial to address this gap, given the potential impact of VR and senior tourists on the tourism industry. In particular, understanding these factors could help policymakers, industry players and other relevant stakeholders effectively leverage the potential of virtual tourism, which is a promising market nowadays. Following a preliminary investigation with the experts and an extensive review of the literature, psychological and technical factors were found to be the common barriers that caused the non-adoption of VR among senior tourists. Hence, this study was designed to assess the effect of technical and psychological factors on resistance and scepticism of senior tourists towards VR usage for tourism purposes, as well as the subsequent impact on their intention not to adopt virtual tourism. The findings of the current study are expected to provide inclusive viewpoints as neglected by the past studies in understanding the non-adoption intention of VR in the tourism context, particularly from the lens of senior tourists.

2. Review of literature and hypothesis development

2.1 Resistance and scepticism towards using an innovation – virtual reality

Grounded on the foundation of innovation resistance theory (IRT), resistance towards innovation can be explained as an individual’s behavioural resistance to the potential changes in their belief upon the adoption of a particular innovation (Hew et al., 2019). IRT argued that resistance to innovation could be further categorised into two forms, namely:

1. passive resistance, which indicates users’ doubt towards the benefits offered by innovation; and

2. active resistance, which assesses the shortcomings linked to the innovation’s attributes (Heidenreich and Handrich, 2015).

The past literature has indicated that resistance often occurs when consumers are unable to acknowledge the values and benefits of technological innovation (Cham et al., 2022a). The common resistance to technological innovation adoption includes risk and functional and psychological barriers (Hew et al., 2019).
On the other hand, scepticism is a general belief that reflects users’ overall evaluation of an innovation, which portrays the feeling of doubt about the benefits the innovation could offer (Jahanmir and Lages, 2016). Individuals will usually consider internal (i.e. personal characteristics of the users) and external (i.e. the features and functions of the technology) attributes to evaluate and decide innovation adoption. Mani and Chouk (2018) reported that scepticism is vital in influencing consumers’ resistance to using smart services and adopting new innovative technologies. The evidence above demonstrated that both scepticism and resistance are the key elements determining the non-adoption of innovation, including VR.

2.2 Factors that lead to scepticism and resistance towards virtual reality

2.2.1 Technical barriers. According to Ram and Sheth (1989), innovation requires long learning and development process before consumers could accept it if the innovation requires thorough changes to users’ routines. Consumers will encounter difficulties and usage barriers if the adoption of innovation conflicts with their usage patterns (Ram and Sheth, 1989). Specifically, users of technological innovations usually focus on the gains and benefits of the innovation to maintain or improve their consumption experience quality (Cham et al., 2020a; Heidenreich and Handrich, 2015). The technological innovation that is complicated to operate would invite the feeling of scepticism and resistance among users, influencing their adoption of the innovation (Hew et al., 2019). As VR is relatively established in tourism, the present study accentuated the effect of perceived complexity, perceived incompatibility and perceived risk of VR in influencing the adoption behaviour among senior tourists.

Ram and Sheth (1989) argued that all innovation would somehow embody potential side effects and uncertainty that users cannot anticipate. The perceived risk for the present study is defined as the adverse consequences and uncertainties associated with the use of VR technology (Coldham and Cook, 2017). The literature has consistently indicated the significance of the negative relationship between the level of uncertainty resulting from perceived risks on the level of innovation acceptance (Cham et al., 2020a; Hew et al., 2019; Röth and Spieth, 2019). Coldham and Cook (2017) found that perceived risks resulting from VR create hesitations and dissociation towards using the technology. In a similar vein, the study by Park and Tussyadiah (2017) argued that perceived risks associated with mobile booking technology have a significant impact on tourists’ behavioural decision-making for their trips. Building on this discussion, the current study was set to discover the association between risks and senior tourists’ resistance and scepticism towards using VR for tourism purposes.

According to IS literature, complexity is one major issue related to technology adoption (Hew et al., 2019). Following Vishwakarma et al. (2020), perceived complexity of using VR can be defined as the degree to which the innovation is seen as challenging to comprehend and adopt. Past studies have indicated that the perceived complexity of an innovation is a significant determinant of the user’s acceptance and adoption (Cham et al., 2022a; Heidenreich and Handrich, 2015). It was argued that users would tend not to use an innovation that requires substantial mental effort, which could be frustrating or time-consuming (Huang et al., 2021). Echoing this proposition, it was reported in the tourism literature that perceived complexity of the technology will influence the tourists’ purchase decision from travel websites and travel agencies (Vishwakarma et al., 2020). For instance, Vishwakarma et al. (2020) found that the likelihood of tourists adopting VR is determined by the complexity (e.g. difficulty in learning and using the technology). Considering that VR can be complicated in terms of usage and operation, particularly for senior tourists, they are likely to reject it as a substitute for conventional travel.
In addition, prior studies concerning technological adoption have indicated the importance of compatibility in promoting innovation (Mani and Chouk, 2018). Grounded on the proposition by Loureiro et al. (2020), perceived incompatibility is defined as the mismatch of VR benefits against the users' expectations. It was reported that perceived incompatibility of an innovation might happen if there is an inconsistency between the benefits of the technology against the users' needs and expectations, which may make users reject it (Cham et al., 2022a). Past studies have consistently reported that incompatibility causes uncertainty linked to innovation, which principally has a predictive role that influences users' perceived convenience, benefits and usage intention (Tsai et al., 2019). A similar sentiment is also being shared in the perspective of VR in tourism (Beck et al., 2019; Loureiro et al., 2020), whereby incompatibility affects tourists' resistance towards adopting the innovation. Given the above, the hypotheses below are stipulated:

H1a. Perceived risk directly influences senior tourists’ scepticism to use virtual reality for tourism purposes.

H1b. Perceived complexity directly influences senior tourists’ scepticism to use virtual reality for tourism purposes.

H1c. Perceived incompatibility directly influences senior tourists’ scepticism to use virtual reality for tourism purposes.

H2a. Perceived risk directly influences senior tourists’ resistance to use virtual reality for tourism purposes.

H2b. Perceived complexity directly influences senior tourists’ resistance to use virtual reality for tourism purposes.

H2c. Perceived incompatibility directly influences senior tourists’ resistance to use virtual reality for tourism purposes.

2.2.2 Psychological barriers. Psychological barriers to innovation adoption can be explained as the obstacles that arise from the mismatch of the benefits of the innovation against users’ perceptual and cultural beliefs (De Bellis and Johar, 2020). Heidenreich and Handrich (2015) argued that psychological barriers will exist if there is a conflict between innovation with a consumer's values, individual usage patterns and social norms. The potential change in the current lifestyle because of the use of innovation would invite negative outcomes in terms of negative buzzes, subversions and rejection (Cham et al., 2020b; Huang et al., 2021). The presence of uncertainty surrounding the technology would create fear among the users, contradict their pre-established cognitions regarding the technology and perceive the change resulting from the technology to be radical (Mani and Chouk, 2018). Moreover, the psychological aspect is a crucial determinant of consumers’ adoption of VR technology (De Bellis and Johar, 2020; Cham et al., 2022a). The present study expands the scenario mentioned above to investigate the explicit roles of technological anxiety, inertia and lack of human interaction towards VR adoption behaviour among senior tourists.

From the lens of social cognitive theory, anxiety is argued to be an important determinant that drives one’s behavioural intention (Pillai and Sivathanu, 2020). Technology anxiety in this study is conceptualised based on the study by Demoulin and Djalassi (2016) as the tourists’ sense of distress towards using VR technology for tourism purposes. According to Cham et al. (2022a), users’ anxiety about technology usage is reflected based on the shortcoming in terms of their ability and readiness to use technology-related tools. The elderly are expected to experience higher anxiety when adopting new technology (Cham et al., 2022a). This scenario is plausible, as elders have a higher tendency to adopt new technologies if they perceive the existing one is suitable and sufficient for their use (Ryu et al., 2009; Talukder et al., 2021). The level of anxiety about technology usage is argued to be higher in a virtual environment like VR because of the uncertainty associated with the technology (Tsai et al., 2019). Technology anxiety was the stumbling block for AI-based
chatbot adoption in tourism and hospitality settings, given the inability of the technology to replace human support and assistance (Pillai and Sivathanu, 2020). Considering that VR is an innovative technology with no spatial and temporal boundaries, it is anticipated that senior tourists would experience a higher level of anxiety towards VR usage in tourism compared to conventional tourism.

In addition, inertia in this study is defined as senior tourists’ tendency to undertake substantial efforts to keep the status quo of the existing decision and lifestyle (Cimperman et al., 2016). It was found that individuals who rely on past behaviour in their decision-making may have a lower tendency to adopt new technology (Talukder et al., 2021). Thus, individuals with inertia tend to rely on past behaviour rather than considering the existing information available to them to frame their perception and intention towards certain technology. According to Cimperman et al. (2016), people are likely to feel attached and continuously use the incumbent system even if better incentives and alternatives are available. It was reported that consumers’ decisions to change their existing routines resulting from technology usage strongly correlate to their cognitive acceptance of the change (Mani and Chouk, 2018). As such, individuals with a high sense of inertia tend to resist and perceive new technological innovations sceptically. Inertia was reported to have a negative impact on tourists’ adoption intention of smart technology in the tourism context, which they will choose not to use it if they feel “attached” to the existing way of doing things and the change is stressful (Lim et al., 2022). Likewise, Cimperman et al. (2016) in their study reported that elderlies often indicate their reluctance to change concerning new technology-based services. Based on the above evidence, it is anticipated that a similar outcome is expected for senior tourists in adopting VR as a substitute for conventional tourism products/services.

In the context of innovation adoption, past studies have reported that innovation must be compatible with the user’s existing values, norms and beliefs to stimulate adoption (Huang et al., 2021). Lim et al. (2021) argued that human contact and interaction are one of the major determinants of the success of an innovation. With reference to the suggestion by Mani and Chouk (2018), the lack of human interaction in the present study is conceptualised as the absence of human interaction between the virtual reality developer and the users of the system. The evidence from the literature has found that the absence of human contact is a factor that drives one to avoid the use of new technologies (Mani and Chouk, 2018). This idea is relevant to the context of the present study, whereby human interaction is crucial, especially for senior tourists to acquire immediate help whenever they encounter an issue with VR usage. Moreover, the tourism literature documented that technology (i.e. robots, AI, chatbots, etc.) is incapable of replacing human relationships grounded on genuine human interaction and principles of love (Christou et al., 2020). Therefore, the evidence above put forward that the lack of human interaction could lead to the rejection of using VR in tourism. The following hypotheses are developed:

\[ H3a. \text{ Technology anxiety directly influences senior tourists' scepticism to use virtual reality for tourism purposes.} \]

\[ H3b. \text{ Inertia directly influences senior tourists' scepticism to use virtual reality for tourism purposes.} \]

\[ H3c. \text{ Lack of human interaction directly influences senior tourists' scepticism to use virtual reality for tourism purposes.} \]

\[ H4a. \text{ Technology anxiety directly influences senior tourists’ resistance to use virtual reality for tourism purposes.} \]

\[ H4b. \text{ Inertia directly influences senior tourists’ resistance to use virtual reality for tourism purposes.} \]

\[ H4c. \text{ Lack of human interaction directly influences senior tourists’ resistance to use virtual reality for tourism purposes.} \]
2.3 The interrelationship between scepticism, resistance and non-adoption intention

The adoption of a new technology entails a great change in users’ lifestyles, thus largely depending on the extent to which the technology can fulfil users’ requirements and expectations (Jahanmir and Lages, 2016). According to Hajiheydari et al. (2021), the perceptual difference resulting from technology adoption and users’ initial expectations could yield a cognitive rejection, thereby creating resisting behaviours among them. For instance, Cham et al. (2022a) found that the resistance towards mobile payment among the elderly directly impacts their non-adoption of the innovation. Similarly, Trequattrini et al. (2016) discovered that users will be sceptical of technology if it underperforms in comparison to its benefits or falls short of the users’ expectations. According to previous research, scepticism positively affects resistance and non-adoption behaviour among innovation users (Hajiheydari et al., 2021; Trequattini et al., 2016). For instance, the study by Hajiheydari et al. (2021) found that resistance to the Internet of Medical Things could lead to users’ resistance to use. Based on the evidence discussed above, it is anticipated that a similar outcome could apply to senior tourists when it comes to VR adoption in tourism. Hence, the hypotheses below are stipulated:

- **H5.** Senior tourists’ scepticism directly influences their non-adoption intention of virtual reality for tourism purposes.
- **H6.** Senior tourists’ scepticism directly influences their resistance to use virtual reality for tourism purposes.
- **H7.** Senior tourists’ resistance directly influences their non-adoption intention of virtual reality for tourism purposes.

Drawing from the reviewed literature, the proposed research model is illustrated in Figure 1:

3. Research methodology

3.1 Instrument and sampling

The measurement scales used were measured with a six-point Likert scale, ranging from 6 representing strongly agree and 1 representing strongly disagree. The list of measurement items is presented in Appendix. The data were collected from 600 senior tourists through a self-administered survey questionnaire via online-survey platforms (e.g. Qualtrics and Google Forms). A purposive sampling technique with screening criteria was undertaken to secure
valid and reliable responses from the respondents. These criteria include the respondents who are 55 years old or older, who have not used VR for tourism purposes before and who are actively engaged in tourism activities. Only those respondents who fulfilled these criteria were qualified to participate in this study. A total of 546 cases were retained after the process of data cleaning (e.g. normality checking, missing data detection, outliers assessment and multicollinearity assessment). The profile of the respondents was presented in Table 1.

3.2 Dealing with common method bias

The threat of common method bias was addressed using procedural and statistical remedies (Cham et al., 2022b; Chin et al., 2012; Loh et al., 2021; Low et al., 2021). As for the procedural remedy, the researchers conducted a pre-test and pilot test and incorporated a detailed cover sheet for the questionnaire to reduce ambiguity linked to the questionnaire and increase the response accuracy of the respondents. As for the statistical remedy, the researchers have conducted Harman’s single-factor analysis and learned that the variance of a single factor is less than 40%, indicating that common method bias is not an issue in this research.

4. Data analysis

4.1 Measurement model assessment

The analysis of the measurement items’ validity was assessed through the discriminant and convergent validity of the constructs. A model is regarded as fit if the normed Chi-square ($\chi^2$/df) < 0.3, root mean square error of approximation (RMSEA) ≤ 0.08, goodness of fit (GFI) ≥ 0.90, Tucker–Lewis (TLI) ≥ 0.90 and parsimony normed fit (PNFI) > 0.50. The model fit outcome of the measurement model found that $\chi^2$/df = 1.375, RMSEA = 0.026,

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Respondents’ demographic profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Descriptions</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
</tr>
<tr>
<td></td>
<td>Single</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
</tr>
<tr>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>Educational level</td>
<td>Primary school</td>
</tr>
<tr>
<td></td>
<td>Secondary school</td>
</tr>
<tr>
<td></td>
<td>Diploma/professional certificate</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s degree</td>
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<td></td>
<td>Postgraduate degree</td>
</tr>
<tr>
<td>Occupation</td>
<td>Self-employed</td>
</tr>
<tr>
<td></td>
<td>Government sector employee</td>
</tr>
<tr>
<td></td>
<td>Private sector employee</td>
</tr>
<tr>
<td></td>
<td>Retiree</td>
</tr>
<tr>
<td>Monthly frequency in searching for tourism information</td>
<td>1–3 times</td>
</tr>
<tr>
<td></td>
<td>4–6 times</td>
</tr>
<tr>
<td></td>
<td>7–9 times</td>
</tr>
<tr>
<td></td>
<td>More than 10 times</td>
</tr>
<tr>
<td>Annual expenses on tourism activities before COVID-19 pandemic</td>
<td>Less than RM 2,000</td>
</tr>
<tr>
<td></td>
<td>RM 2,001–RM 4,000</td>
</tr>
<tr>
<td></td>
<td>RM 4,001–RM 6,000</td>
</tr>
<tr>
<td></td>
<td>RM 6,001–RM 8,000</td>
</tr>
<tr>
<td></td>
<td>RM 8,001–RM 10,000</td>
</tr>
<tr>
<td></td>
<td>RM 10,001 and above</td>
</tr>
</tbody>
</table>

Source: Table by authors
GFI = 0.944, TLI = 0.975 and CFI = 0.979, which shows that the measurement model for this study was considerable fit.

In addition, the convergent validity was determined based on three criteria proposed by Hair et al. (2010), namely, the values of average variance extracted (AVE), loadings and composite reliability. The measurement model passed the following criteria: the value of loading should be greater than 0.60, the value of constructs’ composite reliability is greater than 0.70 and the value of AVE is greater than 0.50. An item of the construct of resistance was deleted from further analysis, as its loading value is below the recommended value (e.g. 0.60). Hence, convergent validity was established.

In terms of discriminant validity, the findings illustrated in Table 3 revealed that the values of maximum shared variance are lower than the AVE of the respective constructs; and the squared roots of AVE value for the entire constructs (in italics) are larger than the value of the off-diagonal components (in bold) in the corresponding rows and columns, suggesting that discriminant validity of the constructs was established as per the suggestion by Fornell and Larcker (1981) (Tables 2 and 3).

4.2 Structural model assessment

The structural model for the present study is found to offer an adequate model fit with $\chi^2$/df = 1.446, RMSEA = 0.029, GFI = 0.941, TLI = 0.970 and CFI = 0.975. The result of the hypotheses testing is described in Table 4. Specifically, the findings revealed that perceived

### Table 2
The output of mean, standard deviation, skewness, kurtosis and result of convergent validity assessment

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>FL</th>
<th>CR</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-adoption intention</td>
<td>3</td>
<td>4.63 to 4.70</td>
<td>0.727 to 0.802</td>
<td>-0.784 to -0.206</td>
<td>0.783 to 2.474</td>
<td>0.718 to 0.854</td>
<td>0.822 to 0.608</td>
<td></td>
</tr>
<tr>
<td>Perceived complexity</td>
<td>3</td>
<td>4.49 to 4.58</td>
<td>0.665 to 0.707</td>
<td>-0.775 to -0.333</td>
<td>0.397 to 1.736</td>
<td>0.680 to 0.813</td>
<td>0.791 to 0.559</td>
<td></td>
</tr>
<tr>
<td>Perceived risk</td>
<td>4</td>
<td>4.64 to 4.77</td>
<td>0.781 to 0.881</td>
<td>-0.911 to -0.350</td>
<td>0.559 to 1.669</td>
<td>0.706 to 0.804</td>
<td>0.836 to 0.562</td>
<td></td>
</tr>
<tr>
<td>Perceived incompatibility</td>
<td>3</td>
<td>4.62 to 4.69</td>
<td>0.681 to 0.718</td>
<td>-0.150 to 0.024</td>
<td>0.154 to 0.377</td>
<td>0.631 to 0.826</td>
<td>0.755 to 0.511</td>
<td></td>
</tr>
<tr>
<td>Technology anxiety</td>
<td>3</td>
<td>4.81 to 4.85</td>
<td>0.618 to 0.731</td>
<td>-0.436 to -0.035</td>
<td>-0.186 to 1.220</td>
<td>0.720 to 0.763</td>
<td>0.782 to 0.545</td>
<td></td>
</tr>
<tr>
<td>Inertia</td>
<td>3</td>
<td>4.74 to 4.91</td>
<td>0.627 to 0.696</td>
<td>-0.916 to -0.213</td>
<td>0.335 to 4.114</td>
<td>0.677 to 0.767</td>
<td>0.779 to 0.541</td>
<td></td>
</tr>
<tr>
<td>Lack of human interaction</td>
<td>3</td>
<td>4.59 to 4.66</td>
<td>0.620 to 0.682</td>
<td>-0.741 to -0.393</td>
<td>1.734 to 3.056</td>
<td>0.652 to 0.830</td>
<td>0.805 to 0.582</td>
<td></td>
</tr>
<tr>
<td>Scepticism</td>
<td>3</td>
<td>4.62 to 4.67</td>
<td>0.638 to 0.664</td>
<td>-0.028 to 0.002</td>
<td>-0.003 to 0.050</td>
<td>0.601 to 0.850</td>
<td>0.780 to 0.547</td>
<td></td>
</tr>
<tr>
<td>Resistance*</td>
<td>4</td>
<td>4.71 to 4.82</td>
<td>0.619 to 0.696</td>
<td>-0.498 to 0.176</td>
<td>-0.325 to 2.141</td>
<td>0.684 to 0.784</td>
<td>0.807 to 0.512</td>
<td></td>
</tr>
</tbody>
</table>

Notes: SD = standard deviation; CR = composite reliability; AVE = average variance extracted and FL = factor loading; *represent an item being dropped because of low loading (<0.60)
Source: Table by authors

### Table 3
The result of discriminant validity assessment

<table>
<thead>
<tr>
<th>Constructs</th>
<th>AVE</th>
<th>MSV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-adoption intention</td>
<td>0.608</td>
<td>0.518</td>
<td>0.788</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived complexity</td>
<td>0.559</td>
<td>0.272</td>
<td>0.498</td>
<td>0.748</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk</td>
<td>0.562</td>
<td>0.097</td>
<td>0.217</td>
<td>0.137</td>
<td>0.749</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived incompatibility</td>
<td>0.511</td>
<td>0.203</td>
<td>0.438</td>
<td>0.451</td>
<td>0.074</td>
<td>0.715</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology anxiety</td>
<td>0.545</td>
<td>0.228</td>
<td>0.477</td>
<td>0.346</td>
<td>0.311</td>
<td>0.272</td>
<td>0.738</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inertia</td>
<td>0.541</td>
<td>0.272</td>
<td>0.415</td>
<td>0.522</td>
<td>0.113</td>
<td>0.329</td>
<td>0.369</td>
<td>0.736</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of human interaction</td>
<td>0.582</td>
<td>0.267</td>
<td>0.488</td>
<td>0.517</td>
<td>0.167</td>
<td>0.255</td>
<td>0.325</td>
<td>0.498</td>
<td>0.763</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scepticism</td>
<td>0.547</td>
<td>0.518</td>
<td>0.720</td>
<td>0.467</td>
<td>0.245</td>
<td>0.401</td>
<td>0.410</td>
<td>0.447</td>
<td>0.432</td>
<td>0.743</td>
<td></td>
</tr>
<tr>
<td>Resistance*</td>
<td>0.512</td>
<td>0.261</td>
<td>0.511</td>
<td>0.425</td>
<td>0.250</td>
<td>0.422</td>
<td>0.433</td>
<td>0.454</td>
<td>0.448</td>
<td>0.510</td>
<td>0.716</td>
</tr>
</tbody>
</table>

Notes: AVE = average variance extracted; MSV = maximum shared variance; aThe off-diagonal entries in bold represent the variance shared between constructs; bThe diagonal entries in italics represent the values of squared root of the average variance extracted
Source: Table by authors
risk, perceived incompatibility, technological anxiety, inertia and the lack of human interaction were reported to be positively associated with both senior tourists’ resistance and scepticism towards the use of VR in tourism. However, perceived complexity (i.e. \( H1b \)) was revealed to have a direct impact only on scepticism (\( \beta = 0.161 \) and \( p < 0.05 \)). Additionally, scepticism directly influences resistance (\( \beta = 0.173 \) and \( p < 0.001 \)). The path analysis outcomes also indicated that both resistance (\( \beta = 0.197 \) and \( p < 0.001 \)) and scepticism (\( \beta = 0.651 \) and \( p < 0.001 \)) lead to the non-adoption of VR among senior tourists. Hence, the findings indicated that \( H5 \), \( H6 \) and \( H7 \) were supported. In the nutshell, all the hypotheses in this study are supported except \( H2b \).

5. Discussion and implications of the findings

Grounded in the innovation resistance theory, this study provides a comprehensive overview of senior tourists’ perception towards the adoption of VR in the tourism context. In particular, the outcome of the analysis shows a few noteworthy findings. It was revealed that both technical and psychological barriers were found to have a significant effect on the resistance and scepticism towards the use of VR in tourism among senior tourists, which in turn have a significant influence on their non-adoption intention. Primarily, technical factors such as perceived risk and perceived incompatibility were found to have a significant influence on senior tourists’ sense of resistance and scepticism towards the use of VR technology in tourism. The outcomes of this study are consistent with the prior studies (Hajiheydari et al., 2021; Trequattrini et al., 2016). The outcome is plausible, as the uncertainties associated with VR technology have been seen as the reason older tourists choose not to adopt it for tourism purposes. A similar finding has been found, whereby the complexities and limitations of operating VR cause senior tourists to perceive the technology as incompatible, making them resist and feel sceptical about it (Loureiro et al., 2020). However, contrary to our expectations, it is interesting to know that the perceived complexity of VR by senior tourists only impacts their sense of scepticism, which induced that complexity does not have an outright effect on the senior tourists’ resistance towards VR usage but rather an outcome of scepticism.

Secondly, the present study uncovered the substantial influence of psychological barriers on senior tourists’ scepticism and resistance towards using VR. Specifically, the findings revealed the predictive roles of technological anxiety, inertia and a lack of human interaction.
interaction, supporting the findings from previous literature (De Bellis and Johar, 2020; Huang et al., 2021). Furthermore, the findings indicated that the potential disruptive change brought about by VR could cause anxiety and uneasiness among senior tourists who lack knowledge of how to use the technology (Ramos-Soler et al., 2019). Consistent with the argument from the theory of fear acquisition, technology anxiety is the result of the uncertainty of fear and loss of control among the users towards using technology (Li and Huang, 2020). Moreover, the potential resistance among senior tourists towards the change of the existing situation (i.e. inertia) may also lead to the rejection of VR usage because of the presence of uncertainty arising from the technology (Mani and Chouk, 2018). This scenario is plausible, as senior tourists may prefer to avoid migrating to the new invention because of their complacency, comfort and experience with the existing technologies.

In addition, it is interesting to find out from this study that senior tourists rely on human interaction when it comes to VR usage. Consistent with the prior literature (Lim et al., 2021), this scenario is plausible, as a lack of human interaction may affect their VR experience, especially when they need immediate assistance operating the technology. Aside from health concerns, the absence of human or peer assistance and support is a significant factor that prevents many seniors from participating in mainstream technology, which is often regarded as “sophisticated” (Cham et al., 2022a). Furthermore, the findings also articulated that both resistance and scepticism were interrelated and had a significant direct effect on senior tourists’ non-adoptions of VR. The results are in line with the innovation resistance theory and previous research (Beck et al., 2019; Ramos-Soler et al., 2019), which suggest that senior tourists may be less likely to use VR because they feel uncertain and doubtful about it. To further explain, these points of view are also backed by Kahneman and Tversky’s (1992) “prospect theory”, which articulated that individuals are generally more sensitive towards losses rather than gains. Hence, this spells out that senior tourists are prompted to opt out of virtual tourism if they are doubtful and do not see any benefits within the VR system.

From a practical perspective, the verdicts of the present study demonstrated the consequence of perceived risk, perceived incompatibility, technological anxiety, inertia and lack of human interaction in VR in influencing one’s non-adoption intention on VR tourism. VR tech companies must emphasise the importance of their overall product design to encourage the use of VR technology for tourism purposes among senior tourists. For example, VR tech companies should consider using user-friendly apps or tools with well-marked buttons and easy-to-follow instructions to ease the usage of VR among users. In terms of accessibility, VR tech companies can make VR devices easier for older tourists to use by adding speech-activated tools, real-time customer service, bold fonts and larger text sizes. Moreover, the concern over risk and uncertainties surrounding the use of VR for virtual tourism can be countered through supportive policies, education and training. Given the complexity of VR platforms, it is suggested that policymakers look into the governance of virtual tourism by making policies to regulate it. Having supportive laws and regulations will improve the level of confidence among users towards the adoption of VR in tourism. Besides, government agencies and tech companies should also work jointly to promote workshops or training designed to promote digital skills and literacy among the elderly as long-term goals. The initiative can help educate, advance interest and improve the understanding level among senior tourists towards using VR. Moreover, the advocacy of VR technology could also help tour operators/agencies and destination marketing organisations effectively promote a destination, allowing them to showcase realistic 360-degree views of the place. The availability of VR technology also enables potential tourists to get to know the destination and everything about it before their visit, which is critical for their decision-making process.

The study contributed multifold to the theory and literature of VR and tourism. Firstly, this study is one of the few that focuses on the causes of senior tourists’ aversion to using VR for
tourism purposes. This study shows that there are still problems with getting older people to use it. Beyond the idea outlined in IRT, the present study adds value to the IRT realm and tourism literature by delving into the importance of technical and psychological factors in addressing the intention not to adopt VR in virtual tourism. Secondly, this study validates the significance of both resistance and scepticism and its impact on the non-adoption of VR in virtual tourism among senior tourists, which is relatively under-examined to date. The present study served as one of the founding papers that advocates the role of resistance and scepticism in influencing users’ decisions towards the non-adoption of contemporary innovation (i.e. VR) among elderlies which is lacking from the tourism standpoint. Thirdly, the present study approaches VR adoption in the tourism phenomenon from the perspective of the older generation cohort (i.e. senior tourists) (Cham et al., 2022a). The findings hereby orchestrated the importance of inputs from the elderlies (i.e. senior tourists), as this potential group of individuals possessed significant spending resources and, thus, significantly impacted the success/failure of innovations. The theoretical contributions above expand the body of knowledge by emphasising the dark side of technology adoption among tourists, which profoundly contributes to understanding tourists’ behaviour and their patterns of technology use.

6. Conclusion, limitations and suggestions for future research

The current study is constrained by a few shortcomings. Firstly, the absence of open-ended questions might restrict the respondents’ expression of thought on VR usage in tourism, which is crucial for the theoretical development in this emerging research area. Secondly, the respondents comprised only senior tourists aged 55 years old and above. Hence, the discoveries from the present study are not generalisable to other tourists from different generational cohorts. It is recommended for future research to consider the qualitative method to gauge a better understanding of the senior tourists’ perception of the adoption/rejection of contemporary technological innovations in the tourism context. Moreover, future research should gather further input from other nationalities and generational cohorts to learn about their perceptual and cognitive differences. Apart from that, future research should also explore how metaverse could influence the behaviour of senior tourists. In conclusion, the current study has contributed to the literature body in the context of tourism and technology management by emphasising the significance of perceived risk, perceived incompatibility, technological anxiety, inertia and lack of human interaction in the context of VR adoption for virtual tourism. These discoveries manifestly indicated the psychological and technological aspects are critical in gauging and understanding the resistance and scepticism of tourists towards the adoption of VR in tourism, especially from the perspective of elderlies. Additionally, future research should also focus on examining the impact of the metaverse in the tourism context, considering its ability to provide tourists with almost real experiences before their actual visit to the destination (Buhalis et al., 2023b; Dwivedi et al., 2022a; Dwivedi et al., 2022b). Finally, closer attention should be emphasised by all the relevant parties in this area to understand the potential of technologies in transforming tourism after the pandemic.

References


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### Table A1  Measurement items for the constructs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived risk (Source: Cham et al., 2022a, 2022b)</td>
<td>1. Using VR technology in tourism will steal my private information  &lt;br&gt; 2. If I used VR technology in tourism, then I would feel psychologically uncomfortable  &lt;br&gt; 3. I assume that the use of VR technology in tourism is dangerous because of privacy and safety issues  &lt;br&gt; 4. I feel that VR technology in tourism may have detrimental implications</td>
</tr>
<tr>
<td>Perceived complexity (Source: Schiopu et al., 2021)</td>
<td>1. Learning to use VR technology in tourism is difficult for me  &lt;br&gt; 2. I find it difficult to use VR technology in tourism for my needs  &lt;br&gt; 3. It is difficult for me to become skilful in using VR technology in tourism</td>
</tr>
<tr>
<td>Perceived incompatibility (Source: Mani and Chouk, 2018)</td>
<td>1. I believe that using VR technology in tourism will not fit well with my lifestyle  &lt;br&gt; 2. I believe that using VR technology in tourism will not fit well with the way I participate in tourism activities  &lt;br&gt; 3. I believe that using VR technology in tourism will not be completely compatible with my current situation</td>
</tr>
<tr>
<td>Technological anxiety (Source: Guo et al., 2013)</td>
<td>1. I feel afraid to use VR technology for tourism purposes  &lt;br&gt; 2. I feel nervous about using VR technology for tourism purposes  &lt;br&gt; 3. I feel uncomfortable with VR technology for tourism purposes</td>
</tr>
<tr>
<td>Inertia (Source: Hajiheydari et al., 2021)</td>
<td>1. I generally consider the change in ways of travelling as a negative thing  &lt;br&gt; 2. I would rather use the existing way of travelling than try new ones  &lt;br&gt; 3. In my opinion, the existing way of travelling is good for me</td>
</tr>
<tr>
<td>Lack of human interaction (Source: Mani and Chouk, 2018)</td>
<td>1. I feel that VR technology in tourism lacks human contact  &lt;br&gt; 2. There is a lack of personal attention from the supporting staff for VR technology in tourism  &lt;br&gt; 3. I feel that there is a lack of interaction between users and the supporting staff of VR technology in tourism</td>
</tr>
<tr>
<td>Scepticism (Source: Hajiheydari et al., 2021)</td>
<td>1. I am sceptical about the use of VR technology in tourism  &lt;br&gt; 2. I do not think VR technology in tourism will be successful  &lt;br&gt; 3. I doubt that VR technology in tourism can do what it promises</td>
</tr>
<tr>
<td>Resistance (Source: Cham et al., 2022; Hajiheydari et al., 2021)</td>
<td>1. In sum, the use of VR technology in tourism would cause problems that I do not need  &lt;br&gt; 2. I would be making a mistake by using VR technology for tourism purposes  &lt;br&gt; 3. There are too many uncertainties associated with VR technology in tourism  &lt;br&gt; 4. The VR technology in tourism is not for me  &lt;br&gt; 5. I opposed the use of VR technology for tourism purposes.</td>
</tr>
<tr>
<td>Non-adopti0n intention (Source: Cham et al., 2022; Hajiheydari et al., 2021)</td>
<td>1. I do not have the intention to use VR technology for tourism purposes in the future  &lt;br&gt; 2. I would not recommend others use VR technology for tourism purposes  &lt;br&gt; 3. I will not use VR technology for tourism purposes in the future</td>
</tr>
</tbody>
</table>

**Note:** *represents item that has been dropped through CFA*
About the authors

Tat-Huei Cham is an Associate Professor and Deputy Dean at the UCSI Graduate Business School, UCSI University, Malaysia. Dr Cham is also currently a Visiting Professor at Tashkent State University of Economics (Uzbekistan) and IQRA University (Pakistan). His research interests focus on medical tourism, marketing, advertising, consumer behaviour, branding and technology management. His publications are seen in various international journals that include Journal of Hospitality Marketing and Management, Journal of Hospitality and Tourism Research, International Journal of Tourism Research, Internet Research, Journal of Retailing and Consumer Services, Journal of Business Research, International Journal of Bank Marketing, etc. In addition, he is currently serving as the Editor-in-Chief for the Journal of Marketing Advances and Practices and an editorial review board member for several international journals.

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Role and responsibility:

- Conception or design of the work: Tat-Huei Cham, Garry Wei-Han Tan, Eugene Cheng-Xi Aw and Keng-Boon Ooi.
- Data collection: Tat-Huei Cham and Chuen-Khee Pek.
- Data analysis and interpretation: Tat-Huei Cham, Garry Wei-Han Tan and Eugene Cheng-Xi Aw.
- Drafting the article: Tat-Huei Cham, Garry Wei-Han Tan, Eugene Cheng-Xi Aw, Keng-Boon Ooi, Teck-Weng Jee and Chuen-Khee Pek.
- Critical revision of the article: Tat-Huei Cham, Garry Wei-Han Tan, Eugene Cheng-Xi Aw, Keng-Boon Ooi, Teck-Weng Jee and Chuen-Khee Pek.
- Final approval of the version to be published: Tat-Huei Cham, Garry Wei-Han Tan, Eugene Cheng-Xi Aw, Keng-Boon Ooi, Teck-Weng Jee and Chuen-Khee Pek.