

## Research Paper

# Adoption of the Stimulus–Organism–Response (S-O-R) Model in Hospitality and Tourism Research: Systematic Literature Review and Future Research Directions

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**Abstract:** This paper presents a systematic literature review (SLR) and recommends future research directions of the Stimulus–Organism–Response (S-O-R) model in the hospitality and tourism field. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was utilised to identify and analyse journal articles published in hospitality and tourism journals (2020 Scimago Journal and Country Rank (SJR)) from the year 2001 until 2021. The review reveals that the S-O-R model has been adopted mainly in hospitality management research focusing on hotel and restaurant settings. Most researchers have applied different attributes of environmental stimuli as independent variables and stimulus factors depending on their study setting and objectives. The paper also highlights the role of organism in the S-O-R model. Additionally, the study proposes directions for future studies of the S-O-R model within the hospitality and tourism field, by suggesting entry points for new researchers planning to adopt the extended S-O-R model in future hospitality and tourism research.

**Keywords:** Stimulus–Organism–Response (S-O-R) model, hospitality, tourism, systematic literature review

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## Introduction

Tourism and hospitality are multidisciplinary fields that cannot depend on a single disciplinary theory. Hence, the application of consumer psychology and behaviour theories has received growing interest from hospitality and tourism researchers, industry professionals, and policymakers (Stergiou & Airey, 2018; Thirumoorthi & Wong, 2015). The extensive subject area includes consumer behaviour, motivation influences, image and risk perception, satisfaction, sustainability, and tourism demand amongst others (Kirilenko & Stepchenkova, 2018). As a result, tourism and hospitality researchers have employed various fundamental theories to support their studies. One of the well-known theories commonly adopted by researchers in tourism and hospitality studies is the Stimulus – Organism – Response (SOR) Model by Mehrabian and Russel (1974).

Mehrabian and Russel's S-O-R model is regarded as a relevant underpinning theory in human actions and behavioural studies (Nunthiphatprueksa & Suntrayuth, 2018). Empirically, most researchers employ the extended S-O-R model as the underpinning theory to examine the cause and effects among three main variables in their studies' structured conceptual framework. Kim et al. (2020) also stated that the S-O-R model is widely used to evaluate consumers' perceptions and behavioural intentions within a single integrated framework. The existing studies also prove the model's flexibility, allowing a range of variables to be incorporated and examined in research (Ngah et al., 2019). Overall, the S-O-R model has proven to be a useful and flexible theoretical framework for investigating the complex interplay between stimuli, organisms, and responses in human behaviour. Its widespread use and adaptability highlight its value as a foundational theory for research in various fields.

Even though the S-O-R theory has seen a growing interest among social science researchers (Jang & Namkung, 2009), adopting its model in hospitality and tourism research is often criticised for lacking theoretical foundations and generating fragmented understandings. Besides, to the best of the authors' knowledge, a proper systematic review of S-O-R theory applications and its attributes in hospitality and tourism settings is lacking. This contributes to behavioural science researchers' limited adoption of the S-O-R model. Nonetheless, there has been a surge in S-O-R model adoption among tourism and hospitality researchers. They have applied the S-O-R model to evaluate tourist activities and other related tourism components which could affect future tourist behaviour, for instance, accommodations (Balaji et al., 2019; Chang, 2016; Choi & Kandampully, 2019; Gupta et al., 2019; Jani & Han, 2015; Loureiro et al., 2013; Lockwood & Pyun, 2019; Mody et al., 2017; So et al., 2020; Su et al., 2017), shopping activities (Hew et al., 2018), pilgrimage or religious purposes (Lee et al., 2021) as well as MICE (meetings, incentives, conferences and exhibitions) (Kim et al., 2020; Siu et al., 2012). Notably, most researchers have modified the S-O-R model's application to suit their own study context and incorporated diverse factors into the integrated framework (Jeong et al., 2020; Kim et al., 2020).

Hence, this study aims to present current gaps and offer new research directions for the field's advancement, outlining promising directions regarding potential research areas, contents and predominant characteristics of the S-O-R model. Specifically, this paper elaborates on the role of each component of the S-O-R and the variables applied by researchers previously. Furthermore, the study identifies the S-O-R model gaps and suggests applications for future research in the hospitality field. In addition, the review provides new ideas and research directions from the different perspectives of the tourism field.

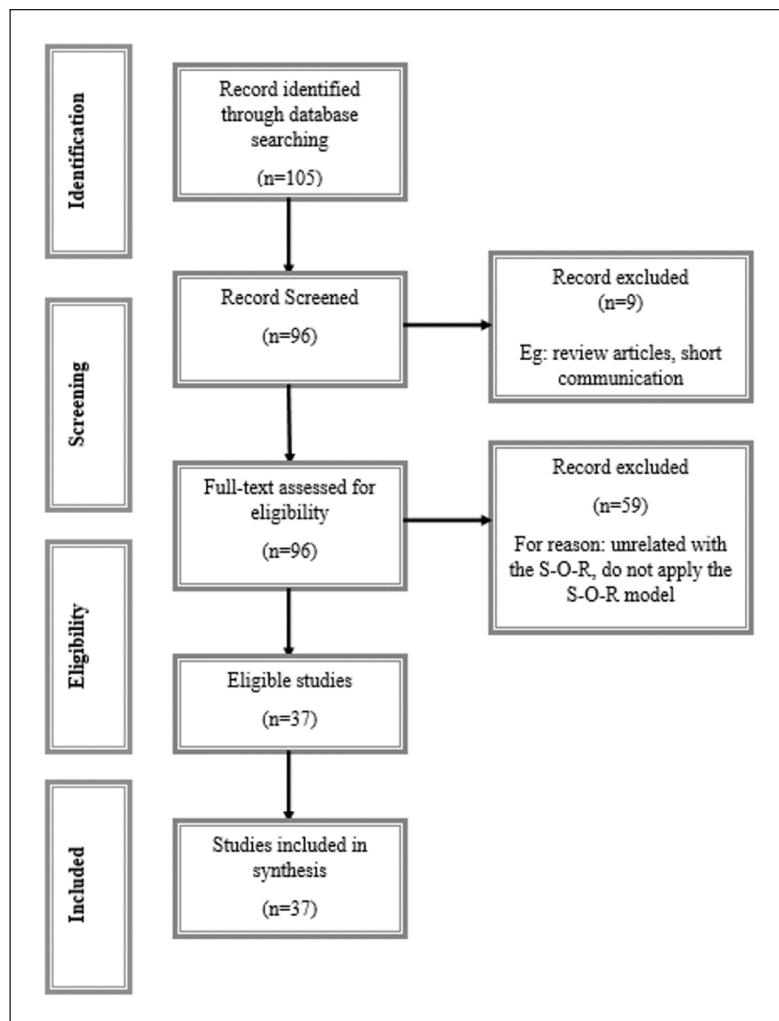
The article is structured as follows: Section Two reviews the S-O-R literature in hospitality settings. Next, Section Three reports the research methodology and criteria used to perform the literature analysis. Section Four reports on the trends and areas of interest of the S-O-R research domain, and finally, Section Five provides the concluding remarks and recommendations for future research activities.

## Methodology

The authors employed a systematic literature review (SLR) to assess the S-O-R literature with respect to hospitality and tourism settings. Sánchez-Rebull et al. (2018) posited that the SLR method summarises published papers and offers other researchers a guide in conducting studies on similar or different topics in the future. In addition, Tranfield et al. (2003) claimed that SLR benefits practitioners and managers by preparing a reliable knowledge base that accumulates knowledge gained from previous studies. Over the years, SLR has become a popular method to analyse literature, especially in tourism and hospitality studies (Prayag et al., 2019). Past SLR papers that have been published on tourism and hospitality topics include risk and gender (Yang et al., 2017), service quality (Park & Jeong, 2019), customer satisfaction (Sanchez-Rebull et al., 2018), social media marketing (Lin et al., 2020), mix-method research (Khoo-Lattimore et al., 2019), as well as virtual and augmented reality (Yung & Khoo-Lattimore, 2019). Notably, this paper is the first attempt at an SLR of the extended Mehrabian and Russel's S-O-R model in the hospitality and tourism field.

The SLR was conducted through a few stages to overcome some of the weaknesses and limitations of conservative literature reviews. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) adapted from Yang et al. (2017) was employed for this paper. The PRISMA methodology is often preferred over other existing techniques in several disciplines, especially tourism publications, in recognition of its comprehensiveness and increased consistency across reviews (Janjua et al., 2021; Pahlevan-Sharif et al., 2019). Pickering and Byrne (2014) explained that the PRISMA systematic review process consists of a five-step review protocol: (1) define the research question by determining the aims of the review and formulating research questions; (2) formulate the review protocol by identifying search terms as well as databases and literature selection criteria; (3) search literature by finding

the databases for the literature and screening search outcomes against the criteria before refining exclusion and inclusion criteria; (4) extract literature with structured summary tables, appraise literature quality and enter bibliographic information; and the final stage (5) synthesise, identify gaps and report findings. The PRISMA flowchart of the S-O-R model's SLR is presented in Figure 1.



**Figure 1.** PRISMA flowchart for Mehrabian and Russel's S-O-R model review  
(adapted from Yang et al., 2017)

The author retrieved research articles that applied Mehrabian and Russel's S-O-R model. The keywords "stimulus-organism-response" or "S-O-R", including "tourism"

and “hospitality”, were utilised as the key search terms. To ensure the quality of the review, research articles published in leading journals listed in Scopus Sources Lists (2020) were selected for the literature review. Specifically, the selection of the journals was cross-checked based on the 2020 Scimago Journal and Country Rank (SJR) within the tourism, leisure and hospitality management fields. This aligns with Oh and Kim’s (2017) justification that highly ranked published journals are benchmarked to provide the right direction in the accuracy of any research discipline.

Only original research articles published in English were considered to ensure the quality and effectiveness of the review. The authors compiled research articles published from 2001 until 2021 (as of February 2021), excluding conference papers, book series, commercial publications, and magazine articles. Specifically, out of the initial 130 sources, 105 papers were identified during the first screen attempt based on the keyword search. In the screening process, 59 research papers were excluded, and only 37 research articles or papers were retained for the next review stage (Appendix 1).

The selected papers included in this study are from five leading tourism and hospitality journals. These are (i) *Tourism Management*, (ii) *Journal of Travel Research*, (iii) *Annals of Tourism Research*, (iv) *International Journal of Hospitality Management* and (v) *International Journal of Contemporary Hospitality Management*. Based on the trend analysis, the S-O-R application is more common in hospitality management research compared to tourism management research.

The selected articles related to the hospitality industry focus on green hotels (Balaji et al., 2019; Gupta et al., 2019), resorts (Chang, 2016), spa hotels (Loureiro et al., 2013), hotel-like hospital rooms (Suess & Mody, 2018), luxury hotels (Choi & Kandampully, 2019; Su et al., 2017), Airbnb (Mody et al., 2017; So et al., 2020) and city hotels (Jani & Han, 2015; Lee, 2020; Lockwood & Pyun, 2019). Meanwhile, there were 11 studies that applied the extended S-O-R model in various thematic settings like Chinese restaurants (Liu & Jang, 2009), theme restaurants (Kim & Moon, 2009), full-service restaurants (Tsaur et al., 2015), casual dining (Lin et al., 2020; Tantanatewin & Inkarojrit, 2018) and upscale restaurant (Jang et al., 2012), chain restaurant (Chang, 2013), luxury restaurant (Chen et al., 2015) and online food ordering (Ahn & Seo, 2018; Brewer & Sebby, 2021) as the current trend of food purchasing. The summary of the S-O-R research trends is illustrated in Table 1.

**Table 1.** S-O-R research trends in hospitality and tourism

Field of knowledge	Study setting	No of published papers/research articles
Tourism	Tourism destinations	3
	Tourism activities (shopping, religious, online review)	3

**Table 1.** (con't)

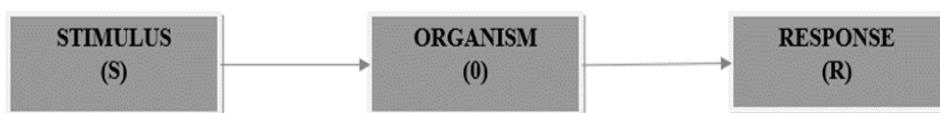
Field of knowledge	Study setting	No of published papers/research articles
Hospitality	Accommodation (hotel, Airbnb, resort)	17
	Restaurant	11
	MICE (sport event, convention centre)	2
	Online review	1

### Study Findings

#### Stimulus (S) – Organism (O) – Response (R) Model

In the early years of evaluating consumer behaviour, Jacoby (2002) stated that the model initially focused on the Stimulus (S) and Response (R) perspectives only. The S-R relationship refers to the input and output without considering the individual's internal evaluation. In this regard, Mehrabian and Russel (1974) claimed that environmental stimulus could influence an individual's responses, often derived from their perceptions and feelings towards a product. Most scholars and researchers commonly agree that stimulus refers to external environmental cues that can influence people's perception of a product, service, or destination (Kang & Namkung, 2019). Subsequently, the S-R model was later changed as more studies on social sciences were extensively conducted, particularly from the psychological perspective.

The Organism (O) component was soon included in the S-R model as the component related to the internal evaluation of an individual. Organism was perceived as an essential perspective to predict people's responses (Nunthiphatprueksa & Suntrayuth, 2018). Kim et al. (2020) explained that Mehrabian and Russel (1974) initially focused only on the emotional elements of Organism (O), which was later expanded by Bitner (1992) to incorporate cognition and physiology. The Organism can be conceptualised as the internal process that reflects one's emotional or internal state evaluation which becomes the stimulus factor's outcome (Emir et al., 2016). The Organism plays a critical role in the extended S-O-R model to explain further consequences generated from the stimulus factor, to predict the final response and to mediate between variables.

**Figure 2.** The extended S-O-R model by Mehrabian and Russel (1974)

Meanwhile, response refers to the stimulus' and the organism's assessment outcome, which relates to the individual's intention or actual behaviour. Most researchers analyse the final output as a dependent variable from a different perspective, depending on the research objective(s). For example, Eroglu et al. (2001) postulated that the final response output could be positive or negative feedback. Practically, a response is perceived as a vital dimension for organisations to determine the effectiveness of certain marketing initiatives. Besides, it serves as the ultimate goal for organisations to sustain their performance (Lee, 2020). Such input would help organisations reassess their marketing strategies to stimulate people's perceptions, beliefs, and inner feelings.

The extended S-O-R model has been adapted to examine consumer behaviour, primarily offline or physical attributes (e.g., restaurants, hotels, museums, and transportation) and online attributes (website and information quality) within the tourism and hospitality context. Goi et al. (2014) claimed that the S-O-R application is vital for organisations designing stimuli to enhance the consumer's experience as the final response. Furthermore, the assessments of people behaviour are carried out regularly to cater to and accommodate changes in socio-demographics, technological advancements, economic conditions, perceived risks and many more aspects. Taking cognisance of this, tourism and hospitality researchers take the implications of these paradigm shifts as opportunities to investigate further people's perceptions and behaviour using the extended Mehrabian and Russel's S-O-R model.

From the tourism industry's perspective, the extended S-O-R is employed to examine people's perception and behaviour in specific tourist destinations or countries such as ancient cities (Lin et al., 2019), advanced countries (Kim et al., 2020), mountain destinations (Su & Swanson, 2017) or even the liminal experiences in the capital city of 'Yanyu' in China (Zhang & Xu, 2019). Furthermore, researchers have also applied the S-O-R model to evaluate tourist behaviour in shopping tourism (Hew et al., 2018), pilgrimage or religious tours (Lee et al., 2020), as well as MICE settings (Kim et al., 2020; Siu et al., 2012).

## **S-O-R Adoption**

### ***Stimulus***

The review found that stimulus factors were mostly treated as the organism's independent variables and antecedents. In the tourism context, researchers have examined tourist perceptions based on their travel experiences to specific destination features or physical appearances of the venue, such as ambience, environment, design and symbolisms (Gupta et al., 2019; So et al., 2020; Zhang & Xu, 2019). Meanwhile, several studies in the hospitality field have investigated servicescape as the environmental stimuli introduced by Bitner (1992) or, in other words, the

physical environment of hotels, restaurants and even convention centres as the precedent factor. For example, atmospheric cues that comprise ambience, aesthetic quality, decoration, exterior environment, aroma, design and colour. The impressive décor and unique design of properties are validated as stimuli able to influence customer's emotions, satisfaction levels and future intentions (Chen et al., 2015; Choi & Kandampully, 2019; Hemsley-Brown & Alnawas, 2016; Jani & Han, 2013; Lin et al., 2020; Nanu et al., 2020; Suess & Mody, 2018). On that note, these empirical findings presume that tourism and hospitality organisations can build a good image by establishing attractive and unique features that lure people to visit their destinations or establishments.

Furthermore, stimulus factors are assessed based on people's authentic experiences and interactions during their visits. Lee et al. (2020) discovered that the authentic experience and perceived benefits of the Dajia Mazu pilgrimage attendees are the precedents of support for tourism development at that destination. From a different perspective, authentic experiences based on the spectator's passion as a stimulus factor have been proven to predict excitement at a golf event in Korea (Kim et al., 2019). Another study by Lin et al. (2019) adopted tourist interaction and self-disclosure as the external stimuli for tourist satisfaction levels. Meanwhile, Lin et al. (2020) examined the effect of the social servicescape of casual restaurants in the United States on nonverbal customer interactions toward their emotions, satisfaction, and loyalty intention. The nonverbal interactions are related to kinesics, proxemic, paralanguage and physical appearance of customers. Alternatively, Mody et al. (2017) analysed the experiences of Airbnb and the hotel as an environmental stimulus towards internal and final responses. These researchers adapted escape experiences related to the experience economy dimensions such as perceived entertainment, education, escapism and aesthetics. In brief, social-psychological elements derived from people's authentic experiences, interactions and presence could be the focus of environmental stimuli by enhancing an overall situation at destinations or hospitality establishments.

In the extended S-O-R model, employee hospitality behaviour, company reputation and Corporate Social Responsibility (CSR) have been analysed as the predictor of the effectiveness of hospitality practices. Chang (2013) postulated that corporate reputation related to an organisation's credibility is crucial in shaping people's perception and loyalty towards it. Staff behaviour, professionalism, and aesthetic labour also significantly affect customers' emotions, emotional brand attachments, and loyalty towards hospitality establishments (Chen et al., 2015; Hemsley-Brown & Alnawas, 2016; Tsaur et al., 2015). Specific CSR efforts are also perceived as effective marketing strategies to tap into target markets. Specifically, a green hotel's CSR and green practices can stimulate existing customers' positive emotions and behaviour (Gupta et al., 2019; Su et al., 2017; Su & Swanson, 2019).

Another recent study claimed that green hotel attributes such as customer benefits, energy and water-saving efficiency and green landscape can lead to positive guest responses (Balaji et al., 2019). As such, good hospitality practices have been proven to enhance positively visitor satisfaction and future behavioural intentions.

Besides attractive physical appearance and good hospitality practices, researchers have also examined the role of food quality and foodservice creativity as a unique stimulus factor. Surprisingly, Chen et al. (2015) discovered that food quality in the luxury restaurant environment insignificantly affects customer's emotions and loyalty. Food quality involves food attractiveness and healthy food. On the other hand, Leong et al. (2020) only focused the two constructs, Stimulus – Organism (S-O), to examine the effect of cuisine creativity on customers' emotional states. Their results show mixed relationships for each dimension of food creativity: perceived value, aesthetics, and uniqueness. It can be presumed that the dimensions of food quality can be treated as external stimuli from the service supplier side, which then influence the internal and final responses within the integrated framework of the S-O-R.

Seven published research articles evaluated the quality of online platforms and technological devices to determine their effectiveness as an external stimulus factor. According to Hew et al. (2018), Mobile Social Tourism (MST) shopping as the local online platform in Malaysia could enhance people's purchase intention. The dimensions of the MST platform that were studied included perceived mobility, social presence, system and service quality. Chen et al. (2017) analysed the role of perceived information level (risk and benefits) from opaque-selling hotel websites towards consumers' perceived value and booking decisions. Other recent hospitality studies demonstrated that online review websites adopted information quality and credibility as the stimulus to influence booking or purchase intention. The credibility of online hotel reviews were examined from different perspectives such as source, receiver and the information itself (Chakraborty, 2019). Besides that, Zhu et al. (2020) adapted the S-O-R model to assess the effect of intrinsic information quality and social presence dimension of online reviews in e-commerce websites on trust, satisfaction, and purchase intention.

Besides the online platform or website, technology devices could also provide better visualisation and perception of the destination in advance. Some recent research articles evaluated current technology usage like virtual reality (VR), which is treated as an authentic experience perspective that highly affects responses and behavioural intentions (Kim et al., 2020). On the impact of technology device usage in hospitality, Ahn and Seo (2018) investigated the effect of a restaurant's self-service as the antecedent and stimulus factor to enhance consumer's perception and behavioural intention. The quality dimensions were derived from functionality, enjoyment, design and customisation. A recent study by Brewer and Sebby (2021)

adapted marketing and social stimuli to investigate internal evaluation and response relationships as the final output. Marketing stimuli in their study refers to visual and informative online order menus. In contrast, social stimuli relate to the perceived risk of the COVID-19 pandemic, which could influence the desire for food, perceived convenience and purchase intention. In brief, this implies that information and communication technology (ICT) aspects are essential in stimulating people's perceptions, emotions and future responses.

### ***Organism***

Over the years, researchers have applied several variables to evaluate the organism's role within the S-O-R model. The organism is treated as the consequence of environmental stimuli and a predictor of the final response. The review shows that the organism has been evaluated from different dimensions of emotions based on tourist experiences. Indeed, most published research articles evaluated the organism's role from the affective or feeling perspective, which comprises the Pleasure–Arousal–Dominance (P-A-D) scale (Choi & Kandampully, 2019; Leong et al., 2020). In addition, several studies focused solely on emotion as the organism (Chang, 2016; Jani & Han, 2015; Kim & Moon, 2009; Leong et al., 2020; Lin et al., 2020). Meanwhile, others examined specific dimensions of the affective state such as arousal and pleasure, to measure its role as the organism within the framework (Lockwood & Pyun, 2019; Zhang & Xu, 2019).

On the other hand, emotional states were evaluated in different contexts, such as affection, relaxation, excitement, enjoyment, and desire toward a destination, hospitality outlet, or a particular product. Studies include perceived enjoyment based on Airbnb stay experience (So et al., 2020), affective states of convention centre's servicescape and satisfaction level (Siu et al., 2012), relaxation and pleasure elements of hotel spa (Loureiro et al., 2013), excitement and attendees' interaction for sporting event based on sport service environment (Kim et al., 2019), desire for food and perceived convenience of offline menu ordering (Brewer & Sebby, 2021), as well as brand affection, passion and self-brand connection of visitors (Hemsley-Brown & Alnawas, 2016). The role of emotion as the organism becomes complicated when researchers consider assessing it with other sub-variables. Such studies included various attributes such as perceived value (Jang et al., 2012; Liu & Jang, 2009), perceived service quality (Kim & Moon, 2009), satisfaction (Nanu et al., 2020) as well as destination and customer company identification (Su et al., 2017; Su & Swanson, 2017). Hence, it can be summarised that while the organism can be evaluated solely from emotional dimensions, cognitive perception also develops people's experiences.

Besides emotion, trust is another dimension of the organism that acts as the consequence of stimulus and antecedent to the final response. Some studies analysed trust and other dimensions as the mediating variable in the extended S-O-R model. For example, perceived trust and perceived value in restaurant settings (Chang,

2013), trust and identification with green hotels (Balaji et al., 2019), as well as trust and satisfaction with online reviews (Zhu et al., 2020). Alternatively, researchers applied other organism constructs to suit their study setting, either offline or online. For instance, the organism is also evaluated from different perspectives, such as perceived well-being (Suess & Mody, 2018), perceived well-being and self-brand connection with the hotel (Lee, 2020), satisfaction from upscale hotel environment (Choi & Kandampully, 2019), perceived risk, perceived benefits and value assessment (Chen et al., 2017), extraordinary outcomes, memorability of escape experience and perceived credibility of online reviews (Chakraborty, 2019).

Within the digital context, the organism is primarily evaluated from people's inner feelings based on their user experience. Research done in Malaysia on mobile social tourism shopping applications reports the positive role of perceived usefulness and enjoyment as a mediator between environmental stimuli and shopping intention (Hew et al., 2018). The finding is in line with So et al. (2020) on the role of perceived enjoyment as the emotional assessor of Airbnb staying experience in an offline context. On the other hand, another recent study examined the cognitive and affective responses as the organism dimensions of authentic experiences of Virtual Reality usage and as antecedents to technology attachment and visit intention. Kim et al. (2020) found that cognitive elements such as perceived benefits and affective states show positive relationships with each other as the organism dimensions. This indicates that emotional elements play an essential role in assessing the effectiveness of technology devices and their applications in future behaviour.

Based on these findings, the role of the organism as a mediating variable is worth discussing and investigating further in future research. Twenty-nine published research articles have analysed the organism as mediators between independent and dependent variables in the extended S-O-R model. On the other hand, another seven studies solely focused on evaluating the organism as the consequence of stimulus and precedent towards the final response. The seven studies comprise both online context (Ahn & Seo, 2018; Kim et al., 2020) and offline context (Chakraborty, 2019; Choi & Kandampully, 2019; Lee, 2020; Mody et al., 2017). Based on the literature, this paper postulates evaluating an organism as a mediator is dependent on its relevance to fulfilling the study's objectives. Moreover, the organism's role as a mediating variable in the extended model remains questionable. However, it is worth determining its requirements within the integrated framework of the extended S-O-R theoretical model.

### ***Response***

Response refers to the consequence of a stimulus or organism that could be evaluated in different study settings either prior to, during or after visitation/post-purchase behaviour. As mentioned earlier, response is undoubtedly involved in people's

intention and actual behaviour, which commonly relates to Icek Azjen's Theory of Planner Behaviour (TPB). In their study, Mody et al. (2017) claimed that behavioural intention is the most common manifestation of attitudinal loyalty in tourism and hospitality literature. Empirical studies have examined responses from various behavioural dimensions (intention or actual) derived from stimulus and organism directly or indirectly in the extended S-O-R model. In the tourism context, response is assessed through behavioural intention constructs such as visit intention with Virtual Reality activity engagement (Kim et al., 2020), purchase intention from an online platform (Hew et al., 2018) or repurchase intention and recommendation for staying at Airbnb and hotel (So et al., 2020) as well as patronage intention that comprised preference to stay at a green hotel, recommendation and willingness to pay extra (Gupta et al., 2019).

Meanwhile, in the hospitality field, the final response is assessed through behavioural intention constructs or dimensions based on people's experience with certain products or services offered by establishments. In the restaurant setting, the response was assessed through behavioural intentions, which involved repeat dining or repeat visits (Kim & Moon, 2009; Tsaur et al., 2015) together with other dimensions such as spread of word-of-mouth or recommendation to others (Jang et al., 2012; Liu & Jang, 2009) and purchase intention by using online ordering (Brewer & Sebby, 2021). Similarly, behavioural intention in hotel studies is treated as the consequence of stimulus or organism. It has been evaluated using various dimensions like the intention to book (Nanu et al., 2020), purchase intention together with information inquiries (Chen et al., 2017), and purchase intention via online review websites (Chakraborty, 2019; Zhu et al., 2020), likelihood to choose or stay and willingness to pay a premium (Balaji et al., 2019; Suess & Mody, 2018), spreading word-of-mouth, recommendation to others and continued use (Chang, 2016; Choi & Kandampully, 2019; Mody et al., 2017).

Alternatively, the behavioural intention in the S-O-R model was analysed in a positive or negative way. Ahn and Seo (2018) examined behavioural intention to embrace or avoid using self-service restaurant technology derived from the consumers' internal organism. Another research done by Tantanatewin and Inkarojrit (2018) considered the decision to enter a restaurant as another construct of positive behavioural intention as the final response. An earlier study adapted the desire to stay as reflecting the behaviour towards a convention centre, preceding service quality, affective state, and satisfaction (Siu et al., 2012). Besides, studies also investigated favourable response such as helping and spreading positive word-of-mouth to others about a sports events as a positive behaviour within the model of a specific setting like consumer citizenship (Kim et al., 2019) as well as acceptance of green practices by hotels (Su et al., 2017). On that note, well-known scholars such as Zeithaml et al. (1996) support and treat behavioural intention constructs as a response since

behavioural intention could be favourable or unfavourable based on people's previous experiences and perceptions.

Researchers have also evaluated certain specific attitudes that tourists could display as the final response based on specific study settings. For instance, responsible environmental behaviours such as complying with local environmental rules, protecting the area and attending environmental activities (Su & Swanson, 2017), supporting sustainable development at tourism destinations (Hung Lee et al., 2020), tourist engagement and satisfaction of tourism experience (Lin et al., 2019) and liminal experience derived from romance and relaxation, a chance encounter, sense of loss and aberration (Zhang & Xu, 2019). Regarding satisfaction, studies examined this sub-variable as a response enticed by environmental stimuli and emotional states of hotel services (Brunner-Sperdin et al., 2012) together with word-of-mouth (Loureiro et al., 2013). In short, these studies reveal diverse significant results or findings on the relationships between stimulus or organism directly and indirectly towards response as the output.

Beyond behavioural intention constructs, researchers have also analysed responses from the loyalty perspective towards hospitality brands related to future attitudes or behaviour aspects. For example, studies have examined loyalty based on consumer's intention to repurchase, revisit in future and recommendations to others (Chang, 2013; Chen et al., 2015; Hemsley-Brown & Alnawas, 2016; Jani & Han, 2015; Lee, 2020). According to Lin et al. (2020), non-verbal interactions and emotions positively influence people's satisfaction levels based on experience and loyalty to a particular restaurant. In their research article, Hemsley-Brown and Alnawas (2016) stated that behavioural loyalty could be described as a form of behaviour involving retaining brands, repeated purchases, and spending on specific brands. It can be summarised that responses can be assessed from basic behavioural intention constructs and other attitude outcome and behaviour, which can be appropriately adapted according to the particular study objectives.

### **Integrating the Moderating Variable in the S-O-R model**

The inclusion of moderating variables within the extended S-O-R model can be seen in Kim and Moon's 2009 study about the servicescape of restaurant theme types. Using a multigroup simultaneous path analysis, they tested the moderating effect of two different restaurant theme types: strong and weak entertainment purposing. Their results demonstrated that a strong entertainment purposing type strongly influences pleasure feeling and revisit intention. In contrast, a weak entertainment purposing type has a greater effect on the relationship between perceived service quality and revisit intention. Later studies looked at types of hospitality properties as the moderator within the entire research framework. Jang et al. (2012) found that atmosphere influences people's emotions and perceived value when visiting upscale

restaurants. Overall, food quality and an authentic atmosphere are essential for consumers who want to experience casual restaurants. On the other hand, another study conducted in China found that both economy and luxury hotels pose an insignificant moderate effect on the relationship between perceived CSR activities with emotion and customer-company identification (Su et al., 2017).

Other common moderating variables examined are visitation frequency and familiarity with destinations. Using a multigroup analysis (MGA) from PLS-SEM, a study reported that perceived service quality is a stronger stimulus for repeat guests with regard to emotional brand and loyalty towards a hotel compared to first-timers (Hemsley-Brown & Alnawas, 2016). Similarly, using path analyses, Su and Swanson (2017) discovered exciting results on the relationship between variables from the perspective of two tourist groups. In short, visitation frequency does not empirically moderate positive emotional and tourist destination identification towards environmentally responsible behaviour. However, first-time and repeat visitors demonstrated significant differences in the influence of destination social responsibility and emotional states on tourist-destination identification as well as environmentally responsible behaviour. From a different perspective, tie strength, which involves familiarity and closeness among tourists, it is established that self-disclosure on perceived cohesion and intimacy is stronger when tourists in a group are strangers to each other (Lin et al., 2019).

The moderating effect can also be analysed by comparing high and low levels of perception. Researchers compared the level of expectation of a luxury restaurant (Chen et al., 2015) and the gadget-loving propensity level at an interactive self-service restaurant (Ahn & Seo, 2018). Findings reveal that high perceptions of certain products or services moderate emotional states and future behaviour more than low perceptions. However, a few studies reported that low perceptions could have a more significant impact than high perceptions (Chen et al., 2015) and generate positive emotions in behaviour towards restaurant self-service technology (Ahn & Seo, 2018). In his study, Chang (2016) adapted service climate and employee engagement as the moderating variables in the service supplier context. He found that cross-level dimensions significantly moderate the framework's relationships. Using different MGA paths, studies found that online users perceive positive reviews as critical information to influence trust and purchase intention in e-commerce compared to negative reviews (Zhu et al., 2020). Practical-wise, these findings can help organisations design their promotion efforts on product features and working practices that cater to people's emotions accordingly.

Personality factors were also utilised as the moderating variable in the extended S-O-R model. Personal or personality factors included perceived value for money and sacrifice towards convention centre servicescape (Siu et al., 2012), personal norms which comprised feelings of obligation and positive moral conviction to the green

hotel (Balaji et al., 2019) as well as personality traits that influence loyalty for a hotel (Jani & Han, 2015). Briefly, these researchers discovered a significant effect of the perception level as the moderator, in influencing the relationship among variables within the research framework. In one study, Siu et al. (2012) revealed that the level of perceived sacrifice insignificantly moderates satisfaction and customers' desire to stay. In another study, the value for money consideration positively moderated the relationship between satisfaction and propensity to stay in a convention centre. Another recent study on green hotels examined two moderating variables: personal and social norms (Balaji et al., 2019). It found that potential guests display stronger personal norms than social norms, indicating that green hotel adoption is more of a personal decision than one that is related to social pressure. Jani and Han (2015) analysed five big personality traits and verified that extraversion, openness and agreeableness possess a moderating effect within the S-O-R framework.

The review also revealed that many researchers examined the extended S-O-R model's moderating effect. Some of these moderating variables included different types of tourists or consumers (Hemsley-Brown & Alnawas, 2016; Su & Swanson, 2017), types of hospitality outlets (Jang et al., 2012; Kim & Moon, 2009; Su et al., 2017), personality factors (Balaji et al., 2019; Jani & Han, 2015; Siu et al., 2012) and internal perception level (Ahn & Seo, 2018; Chen et al., 2015; Lin et al., 2019; Zhu et al., 2020). Even though the moderator is commonly incorporated and tested in tourism and hospitality research, Ro (2012) claimed that further investigation into its role will help researchers deduce a more specific strength or direction of the relationship between the independent and outcome variables (intentions and loyalty). The summary of published research articles in the five leading tourism and hospitality journals on the extended Stimulus–Organism–Response (S-O-R) model is tabulated in Table 2.

**Table 2.** Summary of reviewed research articles from selected journals

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
1	The effect of destination social responsibility on tourist environmentally responsible behavior: Compared analysis of first-time and repeat tourists	Su and Swanson (2017) Hew et al. (2018)	Destination social responsibility	Consumption emotion and tourist destination identification	Environmentally responsible behaviour	Visitation frequency

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
2	Mobile social tourism shopping: A dual-stage analysis of a multi-mediation model	Hew et al. (2018)	Environmental stimuli (perceived mobility, social presence, system and service quality)	Perceived usefulness, perceived enjoyment	Shopping intention	–
3	A structural model of liminal experience in tourism	Zhang and Xu (2019)	Tourscape	Emotional arousal	Liminal experience	Destination familiarity
4	All that glitters is not green: Creating trustworthy ecofriendly services at green hotels	Gupta et al. (2019)	Green service encounter	Trust	Repatronage intention	–
5	What makes Airbnb experiences enjoyable? The effects of environmental stimuli on perceived enjoyment and repurchase intention	So et al. (2020)	Airbnb experience (contextual, physical and social)	Perceived enjoyment	Repurchase intention	–
6	How authentic experience affects traditional religious tourism development: Evidence from the Dajia Mazu Pilgrimage, Taiwan	Lee et al. (2020)	Authentic experience	Perceived benefits and perceived cost	Support for sustainable development	–

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
7	Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model	Kim et al. (2020)	Authentic experience	Cognitive and affective response (Not tested as mediator)	Attachment VR and visit intention	–
8	Impacts of tourist-tourist interaction on tourism experience: The mediating role of cohesion and intimacy	Lin et al. (2019)	Tourist self-disclosure	Perceived cohesion and perceived intimacy	Tourist engagement and satisfaction of tourism experience	Initial tie strength
9	The effects of dining atmospherics: An extended Mehrabian–Russell Model	Liu and Jang (2009)	Dining atmosphere	Perceived emotions and perceived value	Behaviour intentions	–
10	Customers' cognitive, emotional, and actionable response to the servicescape: A test of the moderating effect of the restaurant type	Kim and Moon (2009)	Servicescape	Pleasure feeling and perceived service quality	Revisit intention	Restaurant type (strong and weak entertainment purposing)
11	Effects of ethnic authenticity: Investigating Korean restaurant customers in the US	Jang e al. (2012)	Dining factors	Customer's emotion and perceived value	Behavioural intentions	Restaurant segments (upscale and casual restaurant)

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
12	The impact of the servicescape on the desire to stay in convention and exhibition centers: The case of Macao	Siu et al. (2012)	Perceived quality of servicescape	Affect and satisfaction	Desire to stay	Personal factors (perceived sacrifice and value for money consideration)
13	The effect of atmospheric cues and involvement on pleasure and relaxation: The spa hotel context	Loureiro et al. (2013)	Atmospheric cues and involvement	Relaxation and pleasure	Satisfaction and word-of-mouth	–
14	Influence of environmental stimuli on hotel customer emotional loyalty response: Testing the moderating effect of the big five personality factors	Jani and Han (2015)	Hotel ambiance	Guest emotion	Loyalty response	Five personality factors (neuroticism, extraversion, openness, agreeableness, and conscientiousness)
15	Positive emotions and behavioral intentions of customers in full-service restaurants: Does aesthetic labor matter?	Tsaura et al. (2015)	Aesthetic labour, food quality, service quality, atmospheric	Positive emotion	Behavioural intention	–

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
16	Effect of servicescape on customer behavioral intentions: Moderating roles of service climate and employee engagement	Chang (2016)	Perceived servicescape	Customer's emotion	Behavioural intentions	Service climate and employee engagement
17	Consumer responses to interactive restaurant self-service technology (IRSST): The role of gadget-loving propensity	Ahn and Seo (2018)	Perceived quality of interactive restaurant self-service technology	Cognitive and affective state (not tested as mediator)	Behaviour intention (approach and avoidance)	Gadget loving
18	The influence of emotional response to interior color on restaurant entry decision	Tantanatewin and Inkarojrit (2018)	Interior color	Pleasure – Arousal – Dominance (PAD) scale	Entry decision	–
19	The effect of atmosphere on customer engagement in upscale hotels: An application of S-O-R paradigm	Choi and Kandampully (2019)	Hotel atmosphere	Customer satisfaction (not tested as mediator)	Customer engagement (willing to suggest and word of mouth)	–
20	How do customers respond to the hotel servicescape?	Lockwood and Pyun (2019)	Servicescape	Emotions (pleasure and arousal) (not tested as mediator)	Behaviour (favourable and propensity to spend)	–

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
21	Examining structural relationships among sport service environments, excitement, consumer-to-consumer interaction, and consumer citizenship behaviors	Kim et al. (2019)	Consumer passions and aesthetic scenery	Excitement and consumer interaction	Consumer citizenship behaviour (helping and word-of-mouth)	–
22	Investigating the importance of positive hotel design	Lee (2020)	Positive design (corporate social responsibility to environment, escapism, and compatibility)	Well-being and self-brand connection (not tested as mediator)	Brand loyalty	–
23	The effect of cuisine creativity on customer emotion	Leong et al. (2020)	Cuisine creativity	Emotional state	–	–
24	The effect of hotel lobby design on booking intentions: An intergenerational examination	Nanu et al. (2020)	Atmospheric hotel design	Satisfaction and emotion	Intention to book	–
25	The effect of online restaurant menus on consumers' purchase intentions during the COVID-19 pandemic	Brewer and Sebby (2021)	Online ordering menu and perceived risk of COVID-19	Desire for food and perceived convenience of online food ordering	Purchase intention	–

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
26	How reputation creates loyalty in the restaurant sector	Chang (2012)	Corporate reputation	Perceived trust and perceived value	Customer satisfaction and customer loyalty	–
27	It is all about the emotional state: Managing tourists' experiences	Brunner-Sperdin et al. (2012)	Service environment, social surrounding, leisure experience, situational	Emotional states	Satisfaction	–
28	The effects of luxury restaurant environments on diners' emotions and loyalty Incorporating diner expectations into an extended Mehrabian-Russell model	Chen et al. (2015)	Luxury restaurant environment (food quality, service quality, other customers, atmospheric)	Perceived emotion (Not tested as mediator)	Loyalty	Dinner's expectation level
29	Service quality and brand loyalty: The mediation effect of brand passion, brand affection and self-brand connection	Hemsley-Brown and Alnawas (2016)	Staff behaviour and quality of physical environment	Brand passion, brand affection and self-brand connection	Brand loyalty	Visitors category (first-time vs repeat visitors)
30	Hotel like hospital rooms' impact on patient well-being and willingness to pay: An examination using the theory of supportive design	Suess and Mody (2017)	Supporting design: hospitality in healthcare	Perceived well-being	Patient's behavioural intentions	–

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
31	Unveiling the role of information levels in consumers' evaluative process on opaque-selling hotel websites	Chen et al. (2017)	Level of perceived information	Perceived risk, perceived benefits and value assessment	Purchase intentions and information inquiries	–
32	The accommodation experiencescape: a comparative assessment of hotels and Airbnb	Mody et al. (2017)	Dimensions of the experience economy	Extraordinary outcomes and memorability	Behavioural intentions	–
33	How does perceived corporate social responsibility contribute to green consumer behavior of Chinese tourists: A hotel context	Su et al. (2017)	Perceived Corporate Social Responsibility	Emotion and customer-company identification	Green consumer behaviour	Hotel type (economy hotel and luxury hotel)
34	Perceived credibility of online hotel reviews and its impact on hotel booking intentions	Chakraborty (2019)	Source, message and receiver	Perceived credibility of online reviews	Hotel booking intentions	–
35	Green hotel adoption: A personal choice or social pressure?	Balaji et al. (2019)	Perception of green hotel attributes	Identification with green hotels and trust toward green hotels	Attitude toward green hotels, willingness to pay a premium and intention to stay	Personal norms and social norms

**Table 2.** (con't)

No	Title	Author/ Year of Publication	Stimulus Variable	Organism Variable	Response Variable	Moderating Variable
36	How online reviews affect purchase intention: A new model based on the stimulus-organism-response (S-O-R) framework	Zhu et al. (2020)	Perceived information quality and social presence	Trust and satisfaction	Purchase intention	Emotional polarity
37	Impact of nonverbal customer-to customer interactions on customer satisfaction and loyalty intentions	Lin et al. (2020)	Non-verbal interaction (kinesics, proxemics, para language and physical appearance)	Emotion	Satisfaction with experience and loyalty intention on restaurant	–

### Future Research Directions

The review demonstrates that the organism is treated as the consequence of a stimulus and acts the predictor of the final response. When Jang and Namkung (2009) confirmed that atmospherics and service attributes produce a favourable future behaviour as the final response through positive emotions, they demonstrated the organism's mediating effect. However, the organism's role as a mediator remains arguable with limited empirical studies (Ahn & Seo, 2018; Brunner-Sperdin et al., 2012; Chakraborty, 2019; Choi & Kandampully, 2019; Kim et al., 2020; Lee, 2020; Mody et al., 2017). Thus, we suggest future research to extend the investigation of the organism's role as a mediating variable within the S-O-R framework by adapting other internal evaluation aspects derived from cognitive perception and the Pleasure–Arousal–Desire (PAD) scale of tourism and hospitality products or services.

Regarding the adaptation of variables in the extended S-O-R model, this study proposes evaluating the stimulus factor in different contexts, such as a uniquely authentic experience of servicescape dimensions or specific tourism destination attributes such as niche hospitality service quality and people's interactions during their visitation. Besides, environmental stimuli can be derived from interesting ambiences or physical features like "lung-washing" destinations, spooky tours, revolving restaurants, and themed cafes that researchers can consider. As past studies

focused on green hotel attributes and practices (Balaji et al., 2019; Gupta et al., 2019; Su et al., 2017), future hospitality researchers could adopt the S-O-R model in robotic service, food truck services, food quality (ethnic food, healthy food, street food), virtual and augmented reality and even recognition technology. Perceived information quality is another vital variable commonly related to technology usage. Future studies can employ social quality (presence and engagement) as an influential stimulus factor for online platforms (Nunthiphatprueksa & Suntrayuth, 2018). It is no doubt that emerging technology could change people's travel behaviour. Thus, further investigation on the usage of technology applications and devices as the external stimuli in the extended S-O-R model from different perspectives would be worthwhile to confirm their effectiveness on people's perception and behaviour.

Generally, the tourism and hospitality industry is complex, consisting of a range of components and diverse segments. Therefore, future research may consider adapting the extended Mehrabian and Russel's S-O-R model as the underpinning theory for the different sectors of this industry. Numerous interesting tourism attractions continue to develop and emerge in recreation and entertainment (island, highland, national park, theme and amusement park), accommodation or lodging (theme hotel, homestay, caravan site or camping ground), local grassroot and MICE events, food and beverages (self-service kiosk, food delivery companies, street food) as well as ancillary travel services (airlines, tour operators or agents, cruises, trains, tourist information centre, e-hailing). Additionally, this review paper identified existing knowledge gaps and proposes other moderating variables to be measured in the extended S-O-R model, such as demographic profile (millennials, gender, income level), perception level based on current issues (perceived risk of COVID-19) as well as technology usage familiarity.

## Conclusion

This paper examined and surmised how the S-O-R theory has been applied in tourism and hospitality settings. More specifically, it highlights knowledge gaps and suggests new research directions for the field's advancement, outlining potential research areas, contexts and predominant characteristics of the S-O-R model. The study context has been explained extensively in this review paper by emphasising the utilisation of the extended Mehrabian and Russel's S-O-R model. In the past 21 years, hospitality researchers have applied different attributes of environmental stimuli as independent variables and stimulus factors depending on their study setting and objectives. It can be summarised that physical appearance, good hospitality services, and practices can enhance people's internal evaluation and influence their future behaviour. Furthermore, this study highlights the organism's role in the cause-and-

effect context and acknowledges its role as a mediator in the relationship between stimulus and response. More importantly, empirical findings on the final response are essential to identify stimulus factors and organism's effect on people's future behaviour.

Ultimately, the review paper outlines entry points for new researchers by addressing gaps, submitting suggestions based on the classification of the extended S-O-R model concerning the research area, characterisation of the models, and adaptation of current and potential industry components as variables. However, only five leading journals in tourism and hospitality from the Scopus database have been included in this review. Thus, the authors recommend including more appropriate research articles published in other high-ranking journals in both fields. This can lead to more comprehensive findings and reveal different dimensions of the extended S-O-R model application in hospitality studies.

From a practical perspective, this study provides insightful findings for tourism and hospitality stakeholders to better understand the concept of the extended S-O-R theory. Policy makers are able to analyse the effects of stimulus factors on people's knowledge and emotional evaluation that leads to their final response. In this respect, they can use the research findings to guide them in developing policies that focus on the development, conservation, and marketing of tourism products and services. Moreover, this study assists industry players such as travel agents, hoteliers, restaurant owners, theme parks and event organisers in identifying destination attributes that could influence customers' minds and behaviour. Based on the works of the extended S-O-R model, practitioners can easily evaluate and explain the performance of their organisations in terms of service quality, tourism destination experience, destination attributes, corporate social responsibility implementation or even online information quality. They can re-strategise accordingly to improve their products and services, which are essential to entice positive tourist perceptions and intentions.

The extended S-O-R theory has evolved across the tourism and hospitality field. Yet, this study revealed that the evaluation of moderating variables such as type of hotels or restaurants, type of tourists and familiarities is still very much lacking within the theoretical framework. Thus, researchers and practitioners might take this opportunity to investigate other external factors that presumably can influence people's intentions and actual behaviour. For instance, they may consider examining the perceived risk of COVID-19 as a recent health and travel threat worldwide.

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