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Do stress and anxiety influence users' intention to make restaurant reservations through mobile apps?

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ABSTRACT

Today, people live in the age of new diseases, such as stress and anxiety, and these diseases can affect users' decision making regarding different products and services. Another important variable that can affect decision making is the use of mobile applications for marketing purposes. However, despite the importance of the aforementioned factors, relevant academic research on the impact of these variables on decision making has been scarce. The present study fills this gap in the literature using the technology acceptance model and integrating stress and anxiety variables. To this end, a sample of 672 customers of Spanish restaurants is analyzed. After carrying out a descriptive analysis of the sample and the variables, the structural equation model is used. In particular, the partial least squares model is used to test the hypotheses. The paper concludes with a discussion of how the results of the present study contribute to previous research on stress and anxiety, along with technology acceptance model variables, on decision making. In particular, the results have shown that there is no direct relationship between stress and perceived usefulness, and perceived ease of use, and attitude towards using. Although the relationship between stress and anxiety, perceived usefulness and attitude towards using, perceived usefulness and stress, and other relationships raised in the hypotheses have been confirmed.

1. Introduction

Nowadays, most urban population live in a fast-paced environment full of stressors and pressure. This lifestyle has resulted in a dramatic increase of stress and anxiety, which are considered to be major diseases of the 21st century (Devane et al., 2005; O'Connor, 2006). For instance, Bandelow and Michaelis (2015) pointed out that societal, economical, or environmental changes have led to an increase in the number of anxiety disorders.

In recent years, the number of people suffering from stress has dramatically increased in Spain (CinfaSalud, 2017). In medical research, stress is classified depending on its duration into the following three categories: acute stress, acute episodic stress and chronic stress (Colligan & Higgins, 2006). Furthermore, stress is categorized depending on the settings where it emerges. Correspondingly, researchers talk about work-related stress, day-to-day stress, or stress related to low socio-economic status (Gottschalk et al., 2020). The most characteristic signs of stress include anxiety, confusion, difficulty in concentrating, repetitive thoughts, unnecessary worrying, and so forth.

Furthermore, as it has been illustrated in preceding studies, new technologies have drastically changed people's lives (Bryson, 2019; Hanafizadeh et al., 2017), and that adoption of these new technologies has had an important impact on economic growth (Hall & Khan, 2003; Niebel, 2018), business development (Aste et al., 2017; Martincevic & Kozina, 2018) and society in general (Bryson, 2019; Makridakis, 2017).

Among the newly emerged technologies that have revolutionized society are various mobile applications (apps) that have recently come into wider use (Harrison et al., 2013; Wang et al., 2013). Overall, apps are defined as "end-user software applications that are

Abbreviations: TAM, Technology Acceptance Model; PLS, Partial Least Squares; SEM, Structural Equation Model; AVE, Average Variance Extracted; HTMT, Heterotrait-monotrait ratio; IF, Inflation Factor

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designed for a cell phone operating system and which extend the phone's capabilities by enabling users to perform particular tasks" (Purcell et al., 2010, p.1).

Therefore, there is a relationship between mobile phones as a platform and apps as useful software for the customers (Schmitz et al., 2016). Since apps can be used by people on the move, they provide significant advantages to their users in terms of portability, location awareness, accessibility, quick and easy use (Baker-Eveleth & Stone, 2020; Harrison et al., 2013). Due to these advantages, the number of app downloads worldwide has significantly increased (Palau-Saumell et al., 2019). In this context, more and more companies are trying to attract more customers through facilitating purchase of their goods or services through apps.

As a transformative element in the tourism and hospitality industry, new technologies reshape the interactions between tourism companies (hospitality, restaurants, attractions) and different segments of tourism. In this way, it should be highlighted that during the COVID-19 pandemic, tourism activity is perceived through stress and anxiety, thus, it is seen as a risky activity (Qiu et al., 2020). This also applies to the usage of technologies in tourism, which are an integral part of the new interactions between technological tourism applications and the perceived value of maintaining digital connectivity; due to the current uncertainty, the use of these new technologies can also induce anxiety (Dickinson et al., 2016).

From the perspective of tourism destinations, numerous new technologies, including the Internet of Things (IoT) (Ribeiro-Navarrete et al., 2021; Saura et al., 2021a), autonomous devices, artificial intelligence (AI) (Saura et al., 2021), or virtual reality, can help to decrease users' negative feelings of stress and anxiety and provide a positive adoption of these technologies for the tourism destinations development (Buhalis et al., 2019). In addition, the uncertainty associated with the use of the new technologies can be solved through the use of Big Data, quantitative analysis, sentiment analysis (Saura et al., 2022), adoption, and innovation of all segments (Sigala et al., 2019).

Furthermore, from the tourists' perspective, several previous studies have examined the concept of perceived negative emotions elicited by the use of new technologies as tourists' perception of risks when dealing with new tools is a major determinant of tourists' behavior (Femenia-Serra et al., 2019). Overall, tourists' behavior includes different emotional approaches to the usage of any technology during their tourist customer journey (Saura et al., 2022a). In the context of the current COVID-19 pandemic, a novel trend of "untact" tourism has emerged. In this trend, new technologies are used to decrease human contact when travelling, which changes users' perceptions and preferences regarding the technologies applied in the tourism and hospitality industry (Bae & Chang, 2020). As argued by several authors, the individualist characteristics of modern tourists who want to avoid unnecessary contact with others have resulted in their preference for "untact" technological consumption facilitated by technological innovation (Lee & Lee, 2020). In fact, this new type of consumption has elicited both negative feelings (investigated in the present study) and positive feelings (from an early adoption of seamless technological experiences).

At present, the openness of the technology adoption within the tourism and hospitality industry extends to new frontiers within the industry, as, for example, in using technologies to create personalized souvenirs through 3D printers (Anastasiadou & Vettese, 2019). Within the tourism industry, apps have also become a key strategic element in the hospitality industry (Palau-Saumell et al., 2019). The hospitality sector is a crucial sector of the Spanish economy (Martínez-Navalón et al., 2019), and the contribution of this sector to the country's economy has continuously grown over the last decades. According to Moreu de Cózar et al. (2018), as of 2015, there were over 270,000 restaurants in Spain. Based on this estimate, it can be concluded that the restaurant sector makes a sizeable contribution to the economic growth of the country.

Taking into account all the above, the main objective of this study is to analyse the influence of the variables stress and anxiety on the intention to use mobile apps to make restaurant reservations. To this end, we use the technology acceptance model (TAM) and complement it with several other variables so that to make the model more comprehensive. Overall, the TAM variables have been extensively investigated in different areas (Davis, 1989; Indarsin & Ali, 2017); however, none of previous studies have examined these variables in the context of the Spanish hospitality sector. The present study focuses on the analysis of a dataset comprising the responses of 672 users/customers of Spanish restaurants from Mondoñedo (Lugo), Albacete and Murcia. Upon a descriptive analysis of the sample and variables, we apply the structural equation model (SEM) that has its origin in the variances. Specifically, among several available models, we use the partial least squares (PLS) model.

The results of the present study demonstrate that the relation between stress and anxiety, perceived usefulness and attitude towards using, perceived usefulness and stress, perceived ease of use and perceived usefulness, attitude towards using and behavioral intention to use, and behavioral intention to use and actual system use are significant. However, no confirmatory evidence was obtained for the significant relationships between stress and perceived usefulness, on the one hand, and perceived ease of use and attitude towards using, on the other hand.

The remainder of this paper is organized as follows. In Section 2, we provide a literature review on the restaurant sector and mobile apps, as well as formulate the hypotheses to be tested in the present study. The data collection and the research methodology are presented in Section 3. Section 4 reports the results and discussion. Finally, conclusions are drawn in Section 5.

2. Literature review and hypothesis development

2.1. Literature review

In the last several years, the use of mobile apps has increased exponentially (Guan et al., 2016; Tam et al., 2018). The reasons behind this ever-growing use of apps are many and varied. By using apps, people can check the weather, get the news, study, do shopping, make reservations, or take care of their bank transaction or payments (Delgado et al., 1999; Hoehle & Venkatesh, 2015). Accordingly, mobile apps are changing the way we live, communicate, and do business (Schmitz et al., 2016). Due to app use, many of our daily activities can be done more quickly and easily (Enriquez & Casas, 2013).

In view of the advantages offered by the use of mobile apps, companies are increasingly trying to create new company-owned apps to enhance the customer experience, and at the same time promote their products and services (Schmitz et al., 2016). This allows these companies to create better individual experiences for their users. In fact, several previous studies reported confirmatory evidence on the usefulness of mobile apps in people's daily lives (Linnhoff & Smith, 2017; Taylor & Levin, 2014). Accordingly, consumers increasingly use their mobile apps (Schmitz et al., 2016). For instance, in 2019, 204 billion apps were downloaded to users' connected devices (Statista, 2020), which was almost 45% more than in 2016. By 2022, the number of downloads is expected to grow to 258.2 billion (Palau-Saumell et al., 2019).

This increase in the number of mobile downloads has also occurred in the travel and hospitality industry where the usage of tourism-oriented mobile apps has considerably gown in the last decade (Castañeda et al., 2019). Previous research on the use of technologies in tourism has discussed the strengths and weaknesses of using mobile apps to smoothen tour visits and tourism communications (Rashid et al., 2020). This body of work investigated both positive and negative consequences and feelings perceived by tourists. However, there is a broad consensus among scholars that tourism

apps have become an effective and helpful group of tools that enhance tourism experience. Such tools include, among others, augmented reality (Rahimi et al., 2020) or any other relevant technologies, all of which are of a particular interest to investigate.

Aware of these trends, tourism industry companies attempt to engage consumers in the apps market as the extensive use of mobile apps provides new opportunities for them (Tarute et al., 2017). From the consumers' point of view, the use of mobile apps also provides many advantages to users in terms of time efficiency, expenses, and effort (Baker-Eveleth & Stone, 2020; Harrison et al., 2013) Accordingly, the relationship between the usefulness of mobile apps and how users user them has been extensively investigated (Chen et al., 2017; Kang, 2014). For instance Lee et al. (2019) demonstrated that customers habits have the strongest influence on their intention of further use of mobile apps. Furthermore, the variables like motivation, price-saving orientation, social influence, perceived ease of use, perceived usefulness and security were also found to be related to intention to use mobile apps (Kang, 2014; Schmitz et al., 2016).

In this context, it is also important to take into consideration the current pandemic reshaping factor, and the current situation triggers a new reality for restaurants, which has been adversely during the pandemic (Dub et al., 2020), particularly due to visitors' lack of confidence on health safety and security (Hu et al., 2020). Today, both local clients and tourists have to cope with the changes related to booking restaurant experience. In this regard, several recent studies provide new insights on this new experience, such as a study that explored clients' preferences of being allocated in private dining rooms in restaurants (Kim & Lee, 2020). Therefore, the present study widens Kim and Lee's (2020) framework by providing an innovative perspective of how user acceptance of mobile apps modifies the booking experience at an earlier stage.

Taking into account the usefulness of mobile apps for companies, the present study also aims to analyze customers' attitude toward using these mobile apps to make restaurant reservations. This sector was selected for research due to its importance for the Spanish economy (Martínez-Navalón et al., 2019; Moreu de Cózar et al., 2018). In addition, the Spanish gastronomy has a positive impact on the tourism sector, contributing over a third of the total profit of the tourism industry (Moreu de Cózar et al., 2018).

In the Spanish restaurants' industry, it is particularly relevant to provide benchmarked insights that can become a great source of data findings about tourism behavior on restaurants, since Spain is ranked as the most competitive country in the world in terms of tourism (Gómez-Vega & Picazo-Tadeo, 2019). Accordingly, the results of the present study are a valuable source for further studies conducted in any country in world where the restaurant industry is relevant within the travel and tourism industry. In the next section, we will formulate the hypotheses on different variables and their correlation with customers' attitude towards using mobile apps.

2.2. Hypothesis development

Today, mobile devices are the most used technology tools to access the Internet (Milrad & Spikol, 2007; W.K., 2005). Mobile device users can download and run mobile apps anywhere and anytime (Goldsmith, 2014). The usability of these mobile apps is strongly determined by the context of use, including both and external and internal factors that influence customers (Enriquez & Casas, 2013). For instance, there are several apps that allow customers to purchase certain products of certain brands without leaving home (Narang & Shankar, 2016). Among other advantages, this enables users to save time when using mobile apps.

Overall, there are several factors that condition customers' use of certain apps. Among them, stress and anxiety, intention to purchase, or decisions related to perceived values are important variables that influence customers' preferences (Lee et al., 2011; Sanchez et al., 2006). People may have an uncomfortable feeling of not having enough time to do everything they need to do, which causes stress and anxiety. Importantly enough, in medicine, the relationship between stress and anxiety has been studied for many years (Smoller, 2016; Thapar et al., 2009). In addition to medicine, these two variables have been extensively studied in the area of psychology, noting the increase in studies in the period or post COVID-19 (Lázaro-Pérez et al., 2020; Rodríguez et al., 2020).High anxiety about everyday life or the environment surrounding a person generates stress. Therefore, stress is typically considered to be one of the most common sources of anxiety, which implies a direct relationship between these two variables (Bardeen et al., 2013). For instance, Fan et al. (2015) found that high job stress is associated with greater symptoms of anxiety and depression among both men and women, independent of ethnicity. In another study, Robinson et al. (2015) established that stress can precipitate the onset of mood and anxiety disorders.

However, none of previous studies has investigated the direct relation of stress and anxiety regarding attitudes towards using mobile apps. To fill this gap in the literature, in the present study, we formulate the following hypothesis:

H1: Stress would have a positive influence on anxiety associated with using mobile apps

Next, perceived usefulness refers to (not) using an app taking into account whether such use will help people to perform their job better (Davis, 1989). The importance of this variable for the adoption of a technology vas has been extensively studied in the last several decades (Amin et al., 2014; Ramayah & Ignatius, 2005). There are several factors that influence a customer's decision to use specific technologies, in general (Cheng & Mitomo, 2017; Igbaria et al., 1994) and mobile apps, in particular (Enriquez & Casas, 2013). Not coincidentally, stress is one of the important factors that interfere with the process of decision making (Lee et al., 2011). Similarly, another prediction we will test is whether stress has a negative influence on the customers' perception of usefulness of mobile apps to make restaurant reservations. Thus, the following hypothesis is formulated:

H2: Stress would have a negative influence on perceived usefulness of mobile apps.

According to Thompson et al. (1991), attitudes involve users' beliefs, feelings, and behaviors towards objects or actions. Hence, based on the information that users have about a particular object, they form either positive or negative beliefs about it (Goodhue, 1988). Several previous studies have reported the positive effect of perceived usefulness of an object/entity on user attitudes towards using that object/entity (Indarsin & Ali, 2017; Na & Hong, 2008). However, a study on e-marketing of SMEs has concluded that perceived usefulness does not influence users' attitude towards using (Kanchanatanee et al., 2014). Accordingly, the next hypothesis to be tested in the present study is as follows:

H3: Perceived usefulness would have a positive influence on attitude towards using mobile apps.

Another important factor that influences users' use of new technologies is customers' perceived ease of use (Schnall et al., 2015). Davis (1989) defines perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort" (p. 320). Perceived ease of use has been extensively studied in different fields, particularly in marketing (Hansen et al., 2018; Venkatesh & Davis, 1996). For instance, Ramayah and Ignatius (2005) determined that customers' perceived ease of use plays a major role in Internet shopping. However, people who are under stress have a problem with efficiently handling new technologies, making decisions, or concentrating on a task (CinfaSalud, 2017; Robinson et al., 2015), which

can negatively affect their perceived ease of use. With this in mind, the following hypothesis will analyze whether there is a negative correlation between stress and perceived ease of using mobile apps to make restaurant reservations.

H4: Perceived ease of use would have a negative influence on stress.

The variables of perceived ease of use and perceived usefulness are the main components of the TAM model (Davis et al., 1989; Schnall et al., 2015). According to Davis (1989), perceived ease of use and perceived usefulness are basic determinants of user behavior. Several previous studies have investigated the importance of these variables in different areas, such as online shopping (Ramayah & Ignatius, 2005), satisfaction (Amin et al., 2014), continuance intention (Baker-Eveleth & Stone, 2015), intention towards using (Suki & Suki, 2011), and so forth. For instance, Hussain et al. (2016) found that perceived usefulness and perceived ease of use are positively related to users' acceptance of interactive mobile maps. With this in mind, with the following hypothesis, we will analyze whether these two variables are positively related in the context of using mobile apps to make restaurant reservations.

H5: Perceived ease of use would have a positive influence on perceived usefulness.

The variable of the TAM model perceived ease of use (Davis, 1989) is one of the most important factors that influence users' acceptance and usage behavior of information technologies (Venkatesh, 2000; Venkatesh & Davis, 1996). Another variable that conditions users' behaviour to use information technologies is attitude towards using them (Kanchanatanee et al., 2014; Thompson et al., 1991). Attitude towards using is defined as users' positive or negative feelings to perform a given behavior (Fisbein & Ajzen, 1975) and is considered as the most significant factor that affects customer satisfaction (Lee et al., 2015). Therefore, with the following hypothesis, we will study whether user perceived ease of use has a positive influence on attitude towards using mobile apps to make restaurant reservations.

H6: Perceived ease of use would have a positive influence on attitude towards using mobile apps.

In the original TAM model, the dependent variable was behavioral intention to use computer technologies (Davis, 1989); in the present study, we use this variable with regard to using mobile apps to make restaurant reservations. As demonstrated by Lee et al. (2015), attitude towards using is an important factor for customer satisfaction while using mobile apps. Therefore, for companies, its important to analyze customer behavior and predict their attitudes towards products and services improvement (Chen et al., 2017). Apart from this, Taylor and Levin (2014) established that there is a positive correlation between customers' attitudes and behaviors for purchasing and information sharing. Based on this evidence, using the following hypothesis, we will test whether attitude towards using has a positive impact on behavioral intention to use mobile apps to make online restaurant reservations.

H7: Attitude towards using would have a positive influence on behavioral intention to use mobile apps.

In a study on computerized support system, Davis (1989) was the first to integrate in the TAM model the dependent variables of behavioral intention to use and actual system use. The results of testing the model showed the direct and positive influence of behavioral intention to use on actual system use. Subsequently, these variables have been extensively studied in different areas (Jackson et al., 1997; Zhu et al., 2017), and are considered to be the most important predictors of user behavior in different contexts. Accordingly, with the following hypothesis, we will test whether behavioral intention to use has a positive influence on the actual system use of mobile apps to make restaurant reservations.

H8: Behavioral intention to use has a positive influence on actual system use

The research model proposed in the present study is shown in Fig. 1. In this research, we integrate the TAM model with other variables, like stress and anxiety, associated with using mobile apps to make restaurant reservations.

3. Research method and data analysis

3.1. Instrument construction and data collection

For data collection, a questionnaire was developed based on different measurement scales. We specifically focused on previously proposed scales concerned with electronic reservations and

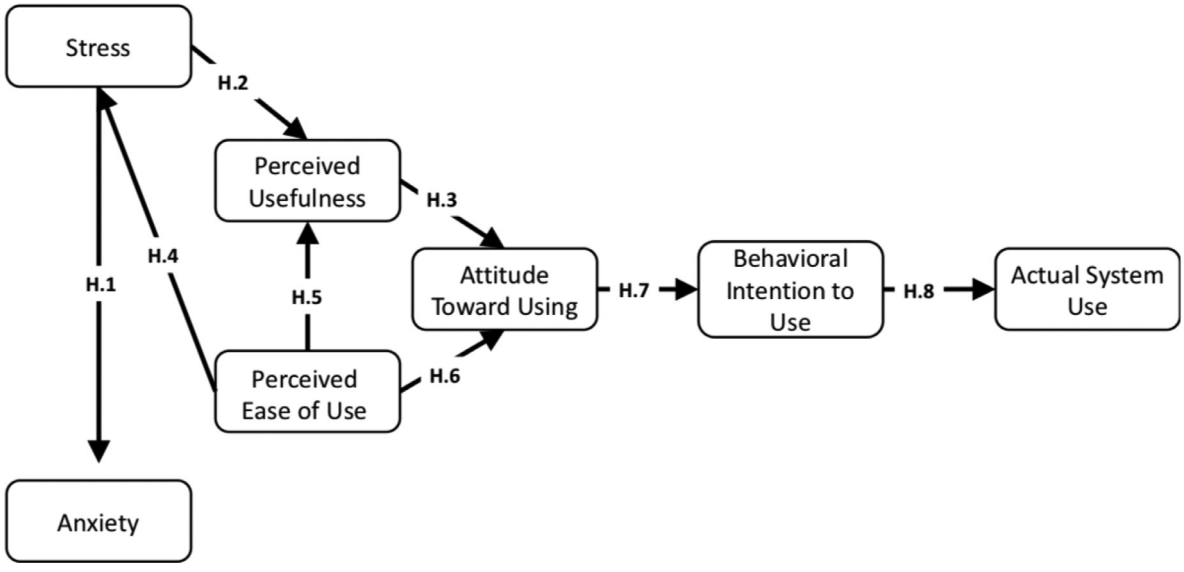

Fig. 1. Proposed research modelSource: Authors.

measurement of user anxiety and stress (Allen & Seaman, 2007). Based on these two sources, we created a new scale that relates the TAM model with anxiety and stress associated with using mobile apps to make reservations in restaurants.

The questionnaire was created on a freely accessible platform and was self-administered online. The information about the questionnaire was disseminated through email and social networks (WhatsApp, Twitter, Facebook, and Instagram) mainly to customers of hotel and catering establishments located in Mondoñedo (Lugo), Albacete and Murcia. These three areas belong to the rural areas of Spain, where in recent years an increase in depopulation has been observed. We believe that it is important to analyse these areas of Spain as most studies focus on the metropolitan areas of the country. That is why there is a lack of studies that analyse consumer behaviour in rural areas.

Before filling in the questionnaire, the participants were requested to watch a video that explained what restaurant reservation apps look like. The purpose was to allow anyone who had doubts about these types of apps to have a clear opinion about them. The questionnaire was divided into two sections. The first section included the items to be rated on a 5-point Likert scale (Allen & Seaman, 2007), which is strongly recommended for online and face-to-face surveys. This scale makes it possible to perceive the degree of sentiment of the respondents, which helps to obtain a greater degree of nuance in analyzing the items (Matas, 2018). The endpoints of the scale ranged from "Strongly Agree" (5) to "Strongly Disagree" (1).

The data were collected in the period from July to October 2019. A total of 697 respondents filled in the questionnaire. Of these, 25 responses were incomplete and thus were discarded. Table 1 summarizes demographic characteristics of the participants. As it can be seen in Table 1, most of the participants were male (56.25%), aged between 31 and 45 years old (42.7%), had a bachelor's degree (46.7%), and had less than a year of experience using mobile apps for restaurant reservations (43.2%).

3.2. Data analysis

The data analysis was carried out using the partial least squares (PLS) technique to estimate the structural equation model (SEM). This technique of data analysis is based on the variances and makes it possible to statistically test the hypotheses underlying the study model (Martínez-Navalón et al., 2019). PLS-SEM calculates and quantifies the direct and indirect effects of some variables on other variables (Hair et al., 2018). Remarkably enough, the PLS is one of the most common analytical techniques used in social science studies (Martínez-Navalón et al., 2020; Reinartz et al., 2009). In fact, Henseler et al. (2009) recommended using the PLS when the aim of the research is to predict relatively new events (Chin & Newsted, 1999). For the validation of the measurement scale and the analysis of the structural model, the software Smart PLS 3 was used. Smart PLS 3 is the most powerful software allowing to graphically analyze the model using a variety of statistical methods.

Table 1
Demographic characteristics of the study participants(n=672).

Classification variable	Variable	Frequency	Percentage
Gender	Female	291	43.30%
	Male	378	56.25%
	Other	3	0.45%
Age	<18	3	0.45%
	18–30	246	36.61%
	31–45	287	42.71%
	46–55	127	18.90%
	56–65	3	0.45%
	>65	6	0.89%
Level of education	High school	300	44.64%
	Bachelor	314	46.73%
	Master	54	8.04%
	Ph.D.	4	0.60%
Online booking experience	<1 year	290	43.15%
	1–3 years	213	31.70%
	4–5 years	139	20.68%
	6–7 years	25	3.72%
	>7 years	5	0.74%

Source: Authors

4. Results

Analysis with the PLS-SEM unfolds in the following two steps. First, the measurement scale is validated. Second, the proposed structural model is evaluated, showing whether or not there is consistency in the formulated hypotheses (Hair et al., 2014).

4.1. Measurement model

In order to validate the measurement scale, the relationship between the items and their variables should be taken into account. In other words, it should be established whether the composition of this variable is formative or reflective (Martínez-Navalón et al., 2019). In this particular case, all the items are related to their variable in a reflective way, so the analyses of individual reliability, composite reliability, convergent validity and discriminant validity were applied.

Individual reliability or item reliability is done by examining the loads (λ) or simple measurement correlations of the indicators with their respective variable. Loads explain the shared variance between the variable and its indicators. The value of the loads should be greater than the variance error. The most commonly used criterion for load analysis was proposed by Carmines y Zeller (1979) who set the cut-off threshold at 0.707, which was taken to indicate that all items with lower loads should be removed (Luo et al., 2010). However, there have been arguments that this rule should not be applied overly strictly in investigating new or under-researched phenomena (Chin, 1998). For instance, Hair et al. (2011) argued that, if the items are relevant to the investigation and do not have loads lower than 0.4, they should be retained and subsequent analyses on the validation of the scale should be performed. In our results, most of the loads– except for 4 loads that were very close to that cut-off index—exceeded 0.707. Therefore, we decided to keep all items in our first analysis.

Furthermore, consistency of a variable is studied through the CR and the composite reliability analysis (CR, Composite Reliability). These analyses measure the consistency of a variable through its indicators (Götz et al., 2010). The lower limit for the acceptance of reliability of the variables sets Cronbach's alpha and Composite Reliability between 0.6 and 0.7; however, most authors use the criteria of Nunnally and Bernstein (1994) who set the cut-off threshold at 0.70 as a minimum level for "modest" reliability in the early stages of an investigation and to 0.8 and 0.9 for the advanced stages.

As it can be observed in Table 2, in the present study, all constructs exceeded the cut-off threshold of 0.7, confirming the internal consistency of the latent variables. However, since there were indicators with a value exceeding 0.95, Dijkstra-Henselesr (rho_A) analysis (Dijkstra & Henseler, 2015) was also performed. This analysis guarantees a greater robustness to the study since this is the only measure of constant reliability. The cut-off point for this criterion is 0.7 (Hair et al., 2019). As in our previous analyses, the items also exceeded the requirements of the Dijkstra-Henseler's (rho_A) indicator.

Upon completion of the analysis of individual reliability and composite reliability, we performed the analysis of convergent validity to evaluate whether the indicators belong to a single variable (Henseler et al., 2009). The Average Variance Extracted

Table 2
Measurement items.

Construct	Items	Correlation loading	CA	rho_A	CR	AVE
Stress	(ST1) Using mobile apps to make restaurant reservations is a concern for me.	0.885***	0.916	0.890	0.921	0.897
	(ST2) I feel like I can't control the important things when using mobile apps to make restaurant reservations.	0,901***				
	(ST3) When I use mobile apps to make reservations in restaurants, I feel that things do not go as I would like them to.	0.850***				
	(ST4) When I use mobile apps to make restaurant reservations, I feel that the difficulties accumulate and I cannot overcome them	0.840***				
	(ST5) Using mobile apps to make restaurant reservations makes me feel nervous and stressed.	0.892***				
Anxiety	(AN1) I hesitate to use mobile apps to make restaurant reservations because I might make mistakes.	0.828***	0.920	0.880	0.920	0.834
	(AN2) Using mobile apps to make restaurant reservations is a little intimidating for me.	0.818***				
	(AN3) I feel insecure about using mobile apps to make restaurant reservations.	0.823***				
Perceived ease of use	(PEU1) Learning to use mobile apps to make restaurant reservations is easy for me.	0.750***	0.820	0.839	0.872	0.580
	(PEU2) Interaction with mobile apps for restaurant reservations is clear and understandable.	0.830***				
	(PEU3) I find the mobile apps for restaurant reservations flexible to interface with them.	0.751***				
	(PEU4) I find mobile apps for restaurant reservations easy to use.	0.836***				
	(PEU5) Interacting with mobile apps to make restaurant reservations requires no mental effort.	0.625***				
Perceived usefulness	(UP1) Using apps to make restaurant reservations improves my day-to-day performance.	0.857***	0.843	0.849	0.890	0.619
	(UP2) Using mobile apps to make reservations in restaurants allows me to better organize my day-to-day activities.	0.816***				
	(UP3) Using mobile apps to make restaurant reservations would increase my productivity in my daily tasks.	0.824***				
	(UP4) Using mobile apps to make restaurant reservations increases my work efficiency.	0.727***				
	(UP5) I find it useful to use mobile apps to make restaurant reservations.	0.697***				
Attitude towards using	(AU1) Using mobile apps to make restaurant reservations is positive for my life.	0.780***	0.842	0.843	0.895	0.680
	(AU2) Using mobile apps to make restaurant reservations increases my productivity at work.	0.870***				
	(AU3) Using mobile apps to make restaurant reservations improves my effectiveness at work.	0.863***				
	(AU4) Using mobile apps to make restaurant reservations would be good for my family.	0.781***				
Behavioral intention to use	(BIU1) I will recommend the use of mobile apps to make restaurant reservations to my family and friends.	0.847***	0.818	0.824	0.882	0.654
	(BIU2) I hope to improve my quality of life by using mobile apps to make restaurant reservations.	0.656***				
	(BIU3) I intend to use mobile apps to make restaurant reservations as often as necessary.	0.871***				
	(BIU4) I hope to use mobile apps to make restaurant reservations in the coming months.	0.842***				
Actual system use	(ASU1) Using mobile apps to make restaurant reservations is beneficial to my budget.	0.779***	0.710	0.721	0.804	0.580
	(ASU2) The use of mobile apps to make restaurant reservations is clear and understandable.	0.824***				
	(ASU3) I find that downloading or buying mobile apps for restaurant reservations is easy.	0.672***				

Note: CA = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted; *** p-value < 0.001
Source: Authors

(AVE) measurement model (Fornell & Larcker, 1981) has been used to begin this analysis; it is recommended that the AVE should be greater than or equal to 0.50. Table 2 shows how all analyzed items are reliable, explaining over 50% of the variance of their own variables (Hair et al., 2018).

Finally, it was necessary to carry out the discriminant validity study to determine that the validation of the instruments was complete and correct. This analysis indicates to what extent one variable differs from another one. To this end, two methods are most commonly used.

The first one is the criterion proposed by Fornell and Larcker (1981) which analyzes the amount of variance that a variable captures from its indicators; this amount has to be greater than the variance the given variable shares with another variable (Hair et al., 2019). Secondly, in order to carry out the discriminant validity analysis, the study of the Heterotrait-monotrait ratio (HTMT) is used. This ratio represents the average of the heterotrait-heteromethod correlations in relation to the average of the monotrait-heteromethod correlations (Henseler et al., 2016).

As can be seen in Table 3, all tested variables achieved discriminant validity. With regard to the first criterion (Fornell & Larcker, 1981), all correlations were lower than those (AVE) found in the main diagonal, as well as in (HTMT) where the ratio was below 0.90 (Gold et al., 2001; Henseler et al., 2015).

4.2. Structural model analysis

Upon validation of the measurement scale, we evaluated the proposed structural model. To this end, we assessed the model's predictive capabilities and the relationships between the variables. Prior to that, we also ensured that there was no structural multicollinearity between the background variables of each of the endogenous variables (Cassel et al., 1999; Hair et al., 2018). Hair et al. (2014, p.170) indicated that there would be signs of multicollinearity from a variance Inflation factor (VIF) of 0.5. In the present study, all VIFs of the structural model were below 1.26, indicating that multicollinearity was practically non-existent.

In the structural model analysis, we focused on the magnitude and significance of the following coefficients: Path coefficients (β), R^2

Table 3
Measurement model and discriminant validity.

	Fornell-Larcker criterion							Heterotrait-monotrait ratio (HTMT)						
Constructs	ASU	AN	AU	BIU	PEU	UP	ST	ASU	AN	AU	BIU	PEU	UP	ST
ASU	0.762													
AN	−0.080	0.891						0.280						
AU	0.490	0.171	0.825					0.617	0.215					
BIU	0.552	0.065	0.647	0.808				0.733	0.152	0.783				
PEU	0.589	−0.27	0.297	0.363	0.761			0.838	0.307	0.337	0.425			
UP	0.470	0.095	0.756	0.593	0.330	0.786		0.620	0.128	0.895	0.718	0.384		
ST	−0.145	0.799	0.127	0.015	−0.336	0.048	0.892	0.296	0.875	0.161	0.152	0.362	0.133	

Note: ST = Stress; AN = Anxiety; UP = Perceived usefulness; PEU = Perceived ease of use; AU = Attitude towards using; BIU = Behavioral intention to use; ASU = Actual system sse
Source: Authors

values (variance explained), effect size f^2, and Q^2 test in order to measure the predictive relevance of the model (Roldán & Sánchez-Franco, 2012).

First, predictive capacity of the model was analyzed. Predictive capacity is the basic measure to determine the predictability of endogenous variables is R^2, which is defined as the amount of variance of the variable explained by the model. When analyzing the predictive power of the model in terms of variance, it should be divided into three blocks: 0.67 relevant, 0.33 moderate, and 0.19 weak (Chin, 1998; Hu & Bentler, 1998).

The latent variables proposed in the model that are not endogenous do not have an R^2 value, which, in the present study, was the case of the perceived ease of use variable. Table 4 reports the R^2 values of all endogenous variables. As can be seen in Table 4, all values exceeded 0.1, which confirms that the predictive value of the model was optimal (Hair et al., 2013).

The variables anxiety and attitude towards using had a moderate predictive value, very close to the relevant one, while behavioral intention to use had a moderate medium predictive level, and the variables actual system use, perceived usefulness and stress had a weak predictive value.

The relevance of the model should also be studied by means of redundancy indexes with cross validation (Q^2) (Chin, 2010). Originally proposed by Chin (2010), this model indicates that, if Q^2 indices are higher than the model, it has predictive relevance. Therefore, and taking into account both criteria, we can conclude that the model has an optimal predictive level and a substantial part of the variance of the variables is explained by it (Fornell & Larcker, 1981).

Upon the assessment of the predictive relevance of the model, we proceeded to evaluate whether the hypotheses were supported by the results, and if their Path Coefficients (standardized regression coefficients) complied with what was stated in the justification of the hypotheses (Hair et al., 2011). According to the results, H6 had to be rejected, as the relationship between perceived ease of use and attitude toward using was not significant (Hair et al., 2018). Similarly, H2 also had to be rejected because contrary to expected the relation was positive, not negative. In contrast, H1, H2, H3, H4, H5, H7, and H8 were supported by the results (see Table 4).

As for the size of the f^2 effect, the degree to which an exogenous variable helps to explain a given endogenous construct in terms of R^2 is evaluated (Cohen, 1988). Cohen's (1988) heuristic rule sets the following metrics to classify such effects: between 0.02 and 0.15 as small effect, 0.15 and 0.35 as moderate effect, and above 0.35 as large effect. In the present study, for H1, H3, H5, H7, and H8, the effect was large, while for H4, the effect was small. Research model results are summarized in Fig. 2.

5. Conclusions and discussion

In this study, we investigated the influence of stress and anxiety on the use of mobile applications to make restaurant reservations. Our results make an important contribution to past research on the topic, as none of previous studies has explored the impact of stress and anxiety using the extended TAM model. Of a total of 8 hypotheses proposed in the model used, 6 were supported by the results of data analysis.

Specifically, our results demonstrated a significant relationship between stress and anxiety, since stress can generate anxiety when users who attend restaurants use mobile applications to make reservations (H1). That the stress would have a negative influence on perceived usefulness of mobile apps was not supported by results (H2);

Table 4
Hypotheses testing.

	Path coeff (β)	Statistics t (β/STDEV)	p	f^2	Supported
H1. Stress □ Anxiety	0.799	26.753	0,000	1.770	YES
H2. Stress □ Perceived usefulness	0,180	2.726	0.003	0.033	NO
H3. Perceived Usefulness □ Attitude toward using	0.738	20.815	0.000	1.136	YES
H4. Perceived ease of use □ Stress	−0.336	4.670	0.000	0.127	YES
H5. Perceived ease of use □ Perceived usefulness	0.390	6.426	0.000	0.159	YES
H6. Perceived ease of use □ Attitude toward using	0.053	0.953	0.170	0.005	NO (n.s)
H7. Attitude towards using □ Behavioral intention to use	0.647	13.228	0.000	0.959	YES
H8. Behavioral intention to use □ Actual system use	0.552	9.472	0.000	0.442	YES

R^2: Actual system use = 0.307; Anxiety = 0.639; Attitude towards using = 0.604; Behavioral intention to use = 0.489; Perceived ease of use = 0.139; Stress = 0.113
R^2 adjusted: Actual system use = 0.303; Anxiety = 0.637; Attitude towards using = 0.600; Behavioral intention to use = 0.487; Perceived ease of use = 0.130; Stress = 0.108
Q^2: Actual system use = 0.167; Anxiety = 0.498; Attitude towards Using = 0.339; Behavioral intention to use = 0.309; Perceived usefulness = 0.079; Stress = 0.086
Note: For n=10,000 subsamples; n.s. = Not significant
Source: Authors

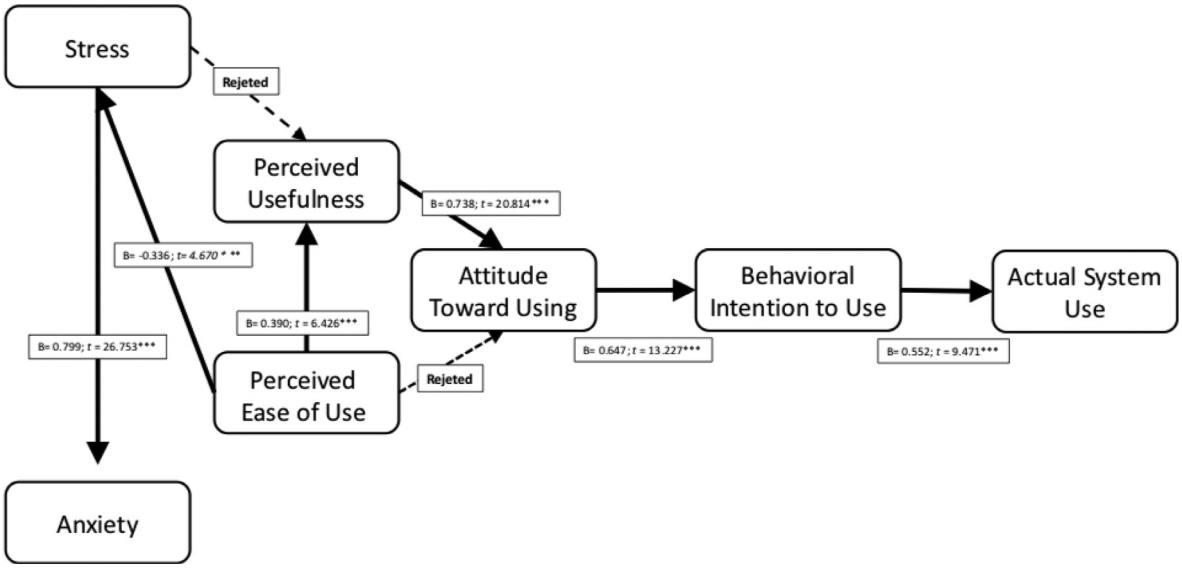

Fig. 2. Final research modelSource: Authors.

that is, this finding is important as it suggests that stress does not affect the usefulness of mobile apps in the hospitality and tourism industry. Several previous studies, including Taylor and Levin (2014), arrived at similar conclusions.

Furthermore, we found a significant relationship between the perceived utility and the attitude towards using mobile apps to make restaurant reservations (H3), suggesting that perceived usefulness of mobile apps to make restaurant reservations influences user attitudes towards using those apps. These conclusions are consistent with the results reported by Sanchez et al. (2016) and Schnall et al. (2015) where similar applications were discussed, although not in the restaurant sector.

With regard to the relationship found between perceived ease of use and stress (H4), our results confirmed that the perceived utility of use has a positive influence on the stress generated by using restaurant reservation applications. This finding suggests that using apps may generate stress in users by imposing on them the feeling of responsibility for making a reservation before going to a restaurant. This idea is supported by several scholars who pointed out that the feeling of responsibility for finding a place to reserve can generate stress (see also Robinson et al., 2015).

Furthermore, our results also confirmed a positive relationship between the perceived utility of use and perceived utility of restaurant reservation applications (H5). This link highlights the perceived usefulness of using these apps. However, the relationship between perceived utility of use and attitude towards using (H6) was not supported by the results of our data analysis, suggesting that the perceived utility of use is not powerful enough to change users' attitudes. In fact, using restaurant reservation apps explicitly entails user's responsibility for making the reservation which may make some users feel uncomfortable.

Next, our results also showed a significant relationship between the attitude to using apps and behavioral intention to use them (H7). Based on this finding, it can be concluded that users' willingness to use apps to make reservations is linked to their behavioral intentions.

Finally, regarding the hypothesized link between behavioral intention to use and actual system use (H8), our results confirmed this relationship, suggesting that users' intentions are very likely result in actual behavior. This finding provides important implications restaurant managers in terms of organizing their reservation management and restaurant organization systems.

5.1. Theoretical implications

The results of the present study offer important theoretical implications for further research on stress and anxiety associated with using mobile apps in the restaurant sector. First, our findings provide novel insights since stress and anxiety through the use of mobile apps have not been previously investigated. Therefore, our results may be applied in future research to investigate users' stress and anxiety associated with using other devices (than smartphone apps) in the hospitality industry. Second, the model proposed in the present study can be extended in future research based on our review of the literature and the reported results. Third, this study contributes to tourism literature with a deeper understanding of the global technology phenomena, providing concrete results which offer an important reference point from the technology-based perspective.

5.2. Industry and practical implications

In recent years, the hospitality industry has been affected by numerous technological changes. Therefore, results obtained regarding users' emotions associated with the use of such new technologies would allow hospitality entrepreneurs to carefully consider all factors that are associated with the use of these technologies and how they can influence in the success of their business.

More specifically, the hospitality industry players could use the results of the present study to resolve their doubts regarding the effectiveness of reservation apps, which can improve both the organization in the restaurant, the reservation structure and employee management as well as other activities that these types of applications can perform.

This study also offers practical implications for the tourism and hospitality industry since they may need to consider the technology adoption as a new paradigm that would adapt tourists' feelings to the perceived risks around their need to travel within the current uncertain situation. Around this concept, restaurants and hospitality industry can use the results of the present study to employ a more adequate approach to tourists' emotions, adjust new strategies, and maximize tourists' trust in new technologies.

5.3. Limitations and future lines of research

The present study has several limitations related to the time horizon analyzed, the analysis technique that was used, and our

employment of the previously proposed TAM model. In further research, it would be necessary to investigate stress and anxiety associated with the use of restaurant reservation applications on devices other than smartphones, such as tablets, computers, and IoT. It would also be interesting to investigate whether the COVID-19 pandemic has led to dramatic changes in how local populations and tourists adopt the new technologies, as well as to explore whether the virus pandemic has generated more stress and anxiety among users of these apps for the purpose of restaurant bookings.

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