

Adoption of Tourist Mobile Applications

Motivating Factors for their Use, an Exploratory Study in Spanish Millennials

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Abstract: The objective of this article is to examine factors that affect the attitude to and use of tourist mobile applications. In line with previous studies, an empirical model that integrates variables of a technological nature and others related to the design and architecture of tourist apps was proposed. An online survey of 156 millennials in Spain was carried out and the data were analysed using the partial least squares methodology. The results validated the hypotheses proposed in the model, achieving a high level of statistical prediction. The results supported that, when choosing a tourist mobile application, tourists take into consideration design aspects, such as visual design and navigation design; personal aspects, such as perceived personal outcome expectations, perceived enjoyment and subjective norm; and operational aspects, such as effort expectations, performance expectations, and conversion rate.

Keywords: Tourist mobile applications, Tourism, Tourist Behaviour, Technology

Introduction

The fourth industrial revolution, which revolves around the latest ICT information and communication technologies, has permeated all sectors; the disruptive innovations it has generated have transformed interaction and daily processes, especially in regards to the company-client relationship ([Kuazaqui, 2018](#)).

Technological developments have significantly changed the lives of people and companies, improving certain aspects of the market, including accessibility, competitiveness, information, and its impact on consumer decisions ([Wei et al., 2019](#); [Zwillenberg, Field & Dean, 2014](#)).

This is why customer relationships are largely supported through ICTs and the Internet, which are the most effective mechanisms for connection in a globalised world ([Day, 2011](#)). According to the digital density index, the use of ICTs will increase by 1.25 trillion euros of the GDP of the main economies of the world ([Fundación Orange, 2016](#)).

In the last decade, the massification of the smartphone has been exponential, generating an increase in, and development of, applications (APPs) that offer different services and utilities to users ([Frey, Xu & Ilic, 2017](#)). Comprising 90% of the total in regards to strategic importance, APP technology has been the greatest development towards company success ([Fundación Orange, 2016](#)).

An 'app' is defined here as a mobile application on a smartphone/tablet that is used for purchases or the completion of some transaction that may result in a purchase ([Newman, Wachter & White, 2018](#)). The development and consolidation of tourist APPs in recent years have become great tools for world tourism; different services and applications, such as information search, reservations, and purchase of tickets, among others, are of great help for the tourist.

The growth of tourist APPs is largely due to two essential aspects, according to Morosan & DeFranco ([2016](#)): (1) A tourist is in constant interaction with the (online-physical) ecosystem; and (2) APPs can offer more services and promotions through the Internet.

The tourism sector has transferred many processes that were previously achieved physically to a digital format. Today, more than 95% of travellers use digital resources during the course of their trips ([Fundación Orange, 2016](#)).

The usefulness of APPs in tourism is broad: they can be used as an intermediation mechanism, a mechanism for a direct relationship with the client (to contract or buy tourist services or products, for example), or as a means of attaining information and the comparison of information. Additionally, APPs also save time and money, and they increase convenience for tourists ([Xu, Huang & Li, 2019](#)).

Some studies have found that even the feelings generated by APPs are factors in an individual's decision to use such technology, in relation to the experience, identity, and social interactions that they allow ([Ding & Chai, 2015](#)). There are even applications that have become their own brand ([Chen, Lu & Gong, 2019](#)), such as the famous Trivago, Waze, and TripAdvisor.

This dynamic has generated an increase in tourist-related mobile applications for smartphones (APPs) worldwide ([Xu, Huang & Li, 2019](#)).

The tourism sector in Spain is first in Europe and second in the world in regards to financial profitability: its income of approximately 57,866 million euros represented 11.7% of the GDP in 2015 ([Fundación Orange, 2016](#)).

However, many facets of the tourism sector in Spain make it extremely difficult for these technologies to develop; it is a very atomised and competitive sector that struggles with financing, has uncertainty about the digital sector, maintains ignorance of the benefits and advantages of digitisation, and has a deficient ICT infrastructure ([Fundación Orange, 2016](#)).

There are several studies that have focused on the reasons tourists use tourist APPs ([Morosan & DeFranco, 2016](#)); however, the use of these technological applications is still in the introduction and development phases ([Leon, 2018](#)) and tourist behaviour regarding the use of these APPs has not been analysed in depth. While some studies have found that APPs improve customer engagement ([Marino & Lo Presti, 2019](#)), most do not consider all the variables that could be generating the adoption of this technology. In regards to Spanish populations, the only study of relevance is that of Palau-Saumell *et al.* ([2019](#)), which considered the adoption of APPs in restaurants; however, the only variables that were analysed were those related to the UTAUT-2 theory.

Therefore, there is a need to go deeper into this line of research to more fully understand the reasons that persuade tourists to use a mobile application. The main objective of the present study is to analyse the adoption of tourist mobile applications among Spanish millennials. More specifically, this study aims to explore a causal-relational model that groups together most of the variables that have been generally validated in previous studies as a contributing factor to peoples' use of tourist-related APPs.

Literature Review and Research Hypotheses

People's attitudes towards the use of mobile applications are largely governed by their mood and ethical considerations, as well as their frequency of use and familiarity with the APPs, their technological addictions, the costs of the technology, and the real, physical aspects of the environment ([Carter & Yeo, 2016](#)).

Different studies were built from the technological adoption models proposed in previous specific studies regarding tourist APPs ([Castañeda, Martínez-Heredia & Rodríguez-Molina, 2019](#); [Chen, Lu & Gong, 2019](#); [Cheng & Jin, 2019](#); [Choi, Wang & Sparks, 2018](#); [Escobar-Rodríguez & Carvajal-Trujillo, 2014](#); [Hui, Wan & Ho, 2007](#); [Lu *et al.*, 2015](#); [Mohsin, Lengler & Subramonian, 2017](#); [Morosan & DeFranco, 2016](#); [Munar & Jacobsen, 2014](#); [Okumus & Bilgihan, 2014](#); [Palau-Saumell *et al.*, 2019](#); [Stochi, Michaelidou & Micevski, 2019](#); [Wu, Tao & Yang, 2009](#); [Xu, Huang & Li, 2019](#)).

This study proposes a model from the previous studies that integrates the major aspects that a tourist can consider when adopting and using a tourist APP. Each variable and its relationship of incidence in the adoption of tourist APPs are presented below.

Social cognitive theory and technology adoption theories

According to social cognitive theory (SCT), human actions are the product of triadic, dynamic, and reciprocal interactions among personal, behavioural, and environmental factors ([Compeau, Higgins & Huff, 1999](#)). This theory proposes that behaviour is a system of self-regulation, where external influences mediate and provide a basis for an action ([Lu et al., 2015](#)). The intention to use a tourist APP will therefore be the best sign to show that a tourist would use this technology on their trips. Therefore, our first hypothesis can be summarised as the following:

H1: The behavioural intention of tourists influences APP use.

Subsequently, the theories of technological adoption, grouped within the unified UTAUT (the unified theory of acceptance and use of technology) and UTAUT2 models, and the determinants of usage and intention technology, including performance expectancy, effort expectancy, social influence and facilitating conditions ([Venkatesh, Thong & Xu, 2012](#)), have facilitated many tests on significant variables in the adoption of APPs ([Tak & Panwar, 2017](#)).

It has been proven that a subjective norm has to do with the influence of the close group and leaders or social referents in the use of a tourism APP ([Tak & Panwar, 2017](#)); for example, TripAdvisor is a mechanism for consultation among tourists, allowing the user to see the comments of others about their tourist experiences. In other studies, however, it was not significant ([Castañeda, Martínez-Heredia & Rodríguez-Molina, 2019](#)). This leads us to our two-part second hypothesis:

H2a: A subjective norm influences the behavioural intention of a tourist APP.

H2b: A subjective norm influences the use of a tourist APP.

Effort expectations are one of the key variables in any analysis of technological adoption, since the user's ease in learning how it functions and subsequent use are positively valued in their decision-making ([Venkatesh, Thong & Xu, 2012](#)).

Several studies highlight the significance of effort expectations in the adoption of APPs and tourist APPs, for example, the benefits that these technologies have in facilitating the purchase of tickets, tickets to shows, and reservations, among other useful actions for tourism ([Castañeda, Martínez-Heredia & Rodríguez-Molina, 2019](#); [Hew et al., 2015](#); [Kim et al., 2016](#); [Leon, 2018](#); [Marino & Lo Presti, 2019](#); [Newman, Wachter & White, 2018](#); [Stocchi, Michaelidou](#)

& Micevski, 2019; Tak & Panwar, 2017), thus contributing to our two-part third hypothesis in this study:

H3a: Effort expectations influence the behavioural intention to use a tourist APP.

H3b: Effort expectations influence the use of a tourist APP.

Performance expectations make up another important variable in the adoption processes of APPs, relating to the benefits offered by the application to tourists, such as saving time and convenience. In the case of tourism, time is money, and these benefits are added value when tourist services are offered. Several studies have significantly validated this variable (Chen, Lu & Gong, 2019; Ding & Chai, 2015; Hew *et al.*, 2015; Leon, 2018; Xu, Huang & Li, 2019), which leads us to our two-part fourth hypothesis:

H4a: Performance expectations influence the attitude towards using a tourist APP.

H4b: Performance expectations influence the use of a tourist APP.

Hedonic motivations, or perceived enjoyment, are yet another variable that the UTAUT-2 model has significantly validated for the adoption of APPs (Hew *et al.*, 2015; Tak & Panwar, 2017; Verkasalo *et al.*, 2010; Wang *et al.*, 2016). This characteristic is associated with the state of mind in which the tourist seeks to use the APP. Therefore, tourist APPs that provide enjoyment may be more desirable, thus producing our fifth hypothesis:

H5: Perceived enjoyment influences the behavioural intention to use a tourist APP.

Another important factor is people's expectations of results on an action; in other words, people anticipate the likely consequences of their prospective actions and are more likely to adopt actions that will produce the desired results rather than actions that could bring undesired results (Lu *et al.*, 2015).

Previous studies confirmed that expectations of results influence the adoption of technology by individuals, and those expectations of performance results had more influence than expectations of personal results (Lu *et al.*, 2015). On the other hand, however, Lin and Hsu (2015) found that the expectations of personal results were still positive factors in technological adoption. Regarding the adoption of tourist APPs specifically, the authors found that the perceived personal outcome expectations were also influential factors. This leads us to the sixth hypotheses:

H6a: Perceived personal outcome expectations influence the performance expectations to use a tourist APP.

H6b: Perceived personal outcome expectations influence perceived enjoyment of using a tourist APP.

H6c: Perceived personal outcome expectations influence the behavioural intention to use a tourist APP.

Usability variables and APP design

Other variables related to the functions, navigability, and usability of the APP were also integrated, adapted from studies related to tourism and other e-commerce services ([Kapoor & Vij, 2018](#); [Lu et al., 2015](#)).

Information design is related to the structure and content of information offered by the application to the user. Several studies have proven its importance in the adoption of tourist APPs, since useful, quality information generates more usability and improves trust and loyalty ([Ji et al., 2006](#); [Kapoor & Vij, 2018](#); [Peters et al., 2016](#)). This concept produced our seventh hypothesis:

H7: Information design influences the behavioural intention to use a tourist APP.

Visual design is one of the most important variables regarding the use of APPs and includes everything related to consistency, aesthetics, images, colours, fonts, shapes, animations, icons and backgrounds ([Kapoor & Vij, 2018](#)). Visual design is especially important within the field of tourism, since the visual design has a high impact on consumer behaviour; likewise, it is possible that the visual design generates higher expectations regarding the results of APP use ([Chang et al., 2016](#); [Kapoor & Vij, 2018](#); [Nah, Eschenbrenner & DeWester, 2011](#); [Wells, Valacich & Hess, 2011](#)). Therefore, our eighth hypothesis is that:

H8: Visual design influences the behavioural intention to use a tourist APP.

Navigation design refers to the organisation and structural design of pages and content, as well as the ease, speed, efficiency, and effectiveness of navigation within the APP ([Kapoor & Vij, 2018](#)). Several studies have proven its importance in the use of APPs ([Chang et al., 2016](#); [Kapoor & Vij, 2018](#)), which leads us to our ninth hypothesis:

H9: Navigational design influences the behavioural intention to use a tourist APP.

Finally, conversion rate refers to the achievement of an action through the use of the tourist application. There are different conversion rates, such as the purchase of tourist products and services, the reservation of services, the use of online services, and the ability to obtain useful information (a tourist review, for example), among many others. It has been shown to be yet another valuable factor regarding the use of tourist applications ([Iskandar & Sia, 2020](#); [Kapoor & Vij, 2018](#); [Stocchi, Michaelidou & Micevski, 2019](#)), which leads us to our tenth and final hypotheses:

H10a: Conversion rate influences the performance expectations of using a tourist APP.

H10b: Conversion rate influences the behavioural intention to use a tourist APP.

The relationships between features of an APP and the model hypotheses are shown in Figure 1.

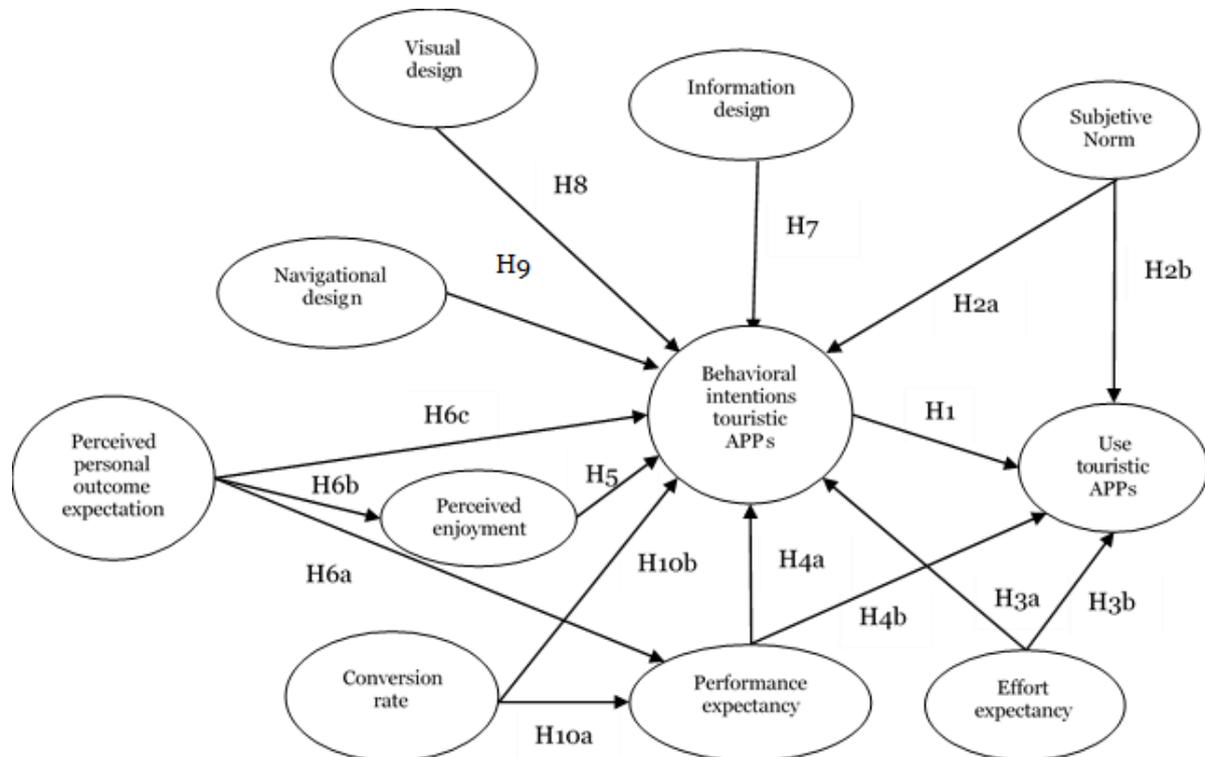


Figure 1. Model proposed

Sample Selection/Methodology

Sample selection and model analysis

A non-probabilistic sample based on the convenience method ([Hernández Sampieri, Fernandez Collado & Baptista Lucio, 2010](#)) was developed through personal surveys with students at the University of Barcelona, given that millennials are considered potential users of APPs in general. In fact, 40% of all online bookings for leisure-related travel are made by millennials ([Allende, 2018](#)).

The study requirements for model analysis were met through the Partial Least Squares (PLS) method ([Hair et al., 2017](#)). Partial Least Squares Structural Equation Modelling (PLS-SEM) has become a standard tool for establishing complex interrelationships between observed and latent variables in social science research, hotel management, marketing, and tourism ([Sarstedt et al., 2020](#)). This method is one of the most recommended for exploratory and even verifiable analyses ([Hair, Howard & Nitzl, 2020](#)). As Manley *et al.* (2020) propose, while

prediction is the primary statistical objective of the research, conducting exploratory research to develop or extend theory or research must include multi-item latent variables, because PLS-SEM is a powerful tool through which it can simultaneously assess the relationships between multiple variables that are measured with more than one item, an approach not possible with multiple regression.

Measurement tool and data collection

The questionnaire was designed in two sections. The first section collected basic demographic information of the participants, mainly gender and age range. The second section included variables taken from the previous literature (Table 1).

Table 1. Measurement tool

| Construct | Items |
|--|---|
| APPs use (Kapoor & Vij, 2018) | BI1 I consider using travel APPs when travelling BI2 I use travel APPs when travelling BI3 I will increase the frequency of using travel APPs when travelling |
| Information design (Kapoor & Vij, 2018) | ID1 The APP provides me with relevant information to my needs ID2 The APP provides accurate information ID3 The APP provides a dedicated account for all my transactions |
| Visual design (Kapoor & Vij, 2018) | VD1 I like the way information is structured on the APP VD2 The APP is visually attractive VD3 The graphics displayed on the mobile APP are engaging |
| Navigational design (Kapoor & Vij, 2018) | ND1 The APP provides a dynamic filter option for making choices ND2 The APP enables me to track my order status ND3 The APP has a menu which tracks different options |
| Effort expectancy (Lu et al., 2015) | EE1 I find is easy to use the APP EE2 It doesn't take brains to learn how to use an APP EE3 It is easy to use information from this APP |
| Performance expectancy (Lu et al., 2015) | PE1 The APP improves the efficiency of travel information searches PE2 The APP makes it easier to make travel decisions PE3 The APP improves my satisfaction with my tourism experience |
| Perceived enjoyment (Hedonic) (Hew et al., 2015 ; Verkasalo et al., 2010 ; Wang et al., 2016). | EJ1 I believe that using the APP is fun EJ2 I believe that using the APP is enjoyable EJ3 I believe that using the APP is very entertaining |

| Construct | Items |
|---|---|
| Conversion rate (Kapoor & Viji, 2018) | FB1 I pay for tourism services/products through the travel APPs FB2 I purchase special services/products online through the travel APPs FB3 I reserve tourism services/products through the travel APPs |
| Perceived personal outcome expectations (Lu et al., 2015) | OE1 Using the travel APP increases my sense of achievement OE2 Using the travel APP provides fun and recreation OE3 Using the travel APP keeps me up to date |
| Subjective norm (Tak & Panwar, 2017) | SN1 My family thinks I should use the travel APPs SN2 My friends think I should use the travel APPs SN3 Many people around me use the travel APPs |
| Behavioural intention APP (Tak & Panwar, 2017) | AT1 I intend to use a tourism APP AT2 In the future I would use a tourism APP AT3 I would like to use a tourism APP on my next trip |

The questionnaire was collected from students enrolled in any college course. The data was collected using the snowball technique, since a link with the online questionnaire was shared and disseminated among the students to facilitate its completion. The final sample included 156 valid questionnaires, which was a valid number to perform the analysis given that the PLS technique allows the use of small samples with a high degree of reliability and robustness in the results of the statistical analysis. Students were asked to indicate to what extent they agree or disagree with the statements of the questionnaire on a 5-point Likert scale (1 = Strongly disagree; 2 = Disagree; 3 = No opinion; 4 = Agree; 5 = Strongly agree). The sample received a greater response from females (66%); however, this did not affect the results of the study since statistical tests were made by gender and of moderating effect without finding any significant difference. Similarly, no significant differences were found between the three participating age groups (Table 2).

Table 2. Sample

| Gender | Age | Reasons for using tourist apps |
|------------|-----------|--------------------------------|
| Male 34% | 16–20 20% | Tourism bookings 90% |
| Female 66% | 21–30 46% | Information search 80% |
| | 31–40 34% | Transport services 70% |
| | | Travel management 40% |
| | | Touristic guides 35% |

Results

The data were analysed using the Smart-PLS 3.0 statistical program, given the exploratory nature of the model. The discriminant validity test was applied, which examined whether the

items measured only their corresponding variable. The results indicated that the loads were greater than 0.505 for all items; likewise, the correlation test between the items and the variable they measured were valid (Hair *et al.*, 2017). The other reliability tests, including the Cronbach Alpha test (>0.70), Average Variance Extracted (>0.5), compound reliability (>0.6), and Rho A (>0.70), exceeded the required levels (Table 3) (Gefen, Straub & Boudreau, 2000; Henseler, Ringle & Sarstedt, 2014).

Table 3. Reliability test.

| Variable | Cronbach Alpha | Rho A | Compound reliability | Average Variance Extracted (AVE) |
|----------------------------------|----------------|-------|----------------------|----------------------------------|
| Behavioural intention to use APP | 0.957 | 0.957 | 0.972 | 0.920 |
| APP use | 0.852 | 0.868 | 0.912 | 0.777 |
| Effort expectancy | 0.841 | 1.036 | 0.897 | 0.746 |
| Perceived enjoyment | 0.871 | 0.879 | 0.921 | 0.795 |
| Conversion rate | 0.849 | 0.926 | 0.904 | 0.759 |
| Information design | 0.796 | 0.797 | 0.907 | 0.830 |
| Navigational design | 0.768 | 0.872 | 0.892 | 0.805 |
| Perceived personal outcome | 0.901 | 0.902 | 0.938 | 0.834 |
| Performance expectancy | 0.787 | 0.818 | 0.874 | 0.699 |
| Subjective norm | 0.906 | 0.917 | 0.941 | 0.843 |
| Visual design | 0.722 | 0.747 | 0.877 | 0.781 |

Regarding the validity and predictability of the empirical model, a re-sampling was carried out with the bootstrapping technique using 5,000 sub-samples (Hair *et al.*, 2017). This test examined the size and statistical significance of the path coefficients and assessed in-sample prediction of the dependent constructs based on the R² of the endogenous variable (Manley *et al.*, 2020).

As obtained from the study, the dependent variable attitude adopted APP received a R²= 0.516, and the dependent variable APP use was a R²= 0.613. Because these values are acceptable, we can thus conclude that the model may enable a high level of prediction with a great degree of statistical validation of the variables (Table 4).

Table 4. Validity of the empirical model.

| Hypothesis | Validation | Original sample (B) | T (O/STDEV) | P Values |
|------------|------------|---------------------|----------------|----------|
| H1 | Supported | 0.730* | 14.455 | 0.000 |
| H2a | Supported | 0.148* | 2.051 | 0.009 |
| H2b | Supported | 0.101* | 1.918 | 0.015 |
| H3a | Supported | 0.166* | 1.951 | 0.012 |

| Hypothesis | Validation | Original sample (B) | T (O/STDEV) | P Values |
|------------|------------|---------------------|----------------|----------|
| H3b | Supported | 0.131* | 1.985 | 0.009 |
| H4a | Supported | 0.219* | 2.347 | 0.019 |
| H4b | Supported | 0.270* | 2.759 | 0.006 |
| H5 | Supported | 0.285* | 1.969 | 0.009 |
| H6a | Supported | 0.151* | 1.087 | 0.017 |
| H6b | Supported | 0.707* | 1.932 | 0.011 |
| H6c | Supported | 0.302* | 1.934 | 0.010 |
| H7 | Supported | 0.279* | 10.950 | 0.000 |
| H8 | Supported | 0.146* | 3.814 | 0.000 |
| H9 | Supported | 0.166* | 1.950 | 0.011 |
| H10a | Supported | 0.169* | 1.992 | 0.015 |
| H10b | Supported | 0.130* | 1.830 | 0.009 |

Notes: Significant * $P < 0.05$

Behavioural intention was supported as a condition for tourist APP use (H1: 0.730). This result, although it has already been validated within other APP studies ([Tak & Panwar, 2017](#)), allows us to verify the explanatory capacity of this behaviour in particular.

Regarding hypotheses H2, the data supported that the subjective norm of social influence affects both the behavioural intention (H2a: 0.148) and the subsequent use of tourist APPs (H2b: 0.101). This result is important because, in the context of tourist APPs, people consider the comments, recommendations, and suggestions of close friends and family or other tourists who generate trust; it is also important to consider that word of mouth (wom) and e-wom will affect its use.

H3 hypotheses were supported because the perception of effort expectancy, or ease of use, of tourist APPs is a fundamental condition for a positive behavioural intention of the tourist APP (H3a: 0.166) and the tourist's subsequent use of a tourist APP (H3b: 0.131). It should also be noted that the tourist APP must be easy to download and install on a smartphone, and that it complies with all the qualities related to ease of operation ([Tak & Panwar, 2017](#)).

The hypotheses H4 were verified; the performance expectations regarding the benefits that these applications will bring are determining factors for a positive behavioural intention of the tourist APP (H4a: 0.219) and the subsequent use of a tourist APP (H4b: 0.270). Therefore, tourism APPs that reduce costs, are convenient, save time, and allow for real-time transaction will be used most frequently ([Iskandar & Sia, 2020](#); [Tak & Panwar, 2017](#)).

Hypothesis H5, which was related to how the influence of the perception of enjoyment influences the behaviour intention of the tourist APP (H5: 0.285), validates the need to offer enjoyment with this type of application ([Castañeda, Martínez-Heredia & Rodríguez-Molina,](#)

[2019](#)), such as map viewing, augmented reality, pleasant information, games, and challenges. It has been shown that having fun can increase positive attitudes towards and use of APPs ([Okumus & Bilgihan, 2014](#)), as well as loyalty ([Castañeda, Martínez-Heredia & Rodríguez-Molina, 2019](#)).

Hypotheses H6 were also validated, which stated that perceived personal outcome is a determining factor for perceived performance expectancy in the use of a tourist APP (H6a: 0.151). This hypothesis was proposed in an exploratory manner and its validity shows that tourists associate elements of benefits in the use of the app to their perceptions of personal fulfilment offered by the app, and that the perceived personal outcome determines perceived enjoyment (H6b: 0.707). This result may indicate that people associate humorous aspects of the tourist APP with their personal fulfilment, which suggests that the perceived personal outcome helps determine the behavioural intention of tourist APP use (H6c: 0.302); this relationship was previously suggested in a study of tourist APPs in China ([Lu et al., 2015](#)). These results show that tourists like to use the apps to socialise, so it is necessary that tourist applications are compatible with different lifestyles, so that they are perceived as inspirational ([Ding & Chai, 2015](#)).

Hypothesis H7 was supported, demonstrating the importance of the design of the information architecture of the tourist application to behaviour intention usage (H7:0.279). This is a factor of increasing relevance, as information, its management, and storage are becoming more important for the tourist; for example, users increasingly want to know that the APP is real, safe, and will be regularly updated. This relationship had already been proven for tourist apps in other studies.

Hypothesis H8 regarding whether visual design is a determining factor in the behavioural intention of tourist APP use (H8:0.146) was also valid in this and other studies. This factor is also related to visual aesthetic aspects.

Hypothesis H9 regarding navigation design as a determining factor for behavioural intention of tourist APP use (H9: 0.166) was also verified as another fundamental characteristic for a user of this type of application, and it is one of the most important usability factors; for example, from a practical standpoint, the user wants to use only one finger to navigate the smart phone. This factor is also linked to the fact that the user will want to have fun when browsing the APP ([Ding & Chai, 2015](#)).

Finally, hypotheses H10 were also supported, which regarded conversion rate as a determining factor for perceived performance expectancy (H10a: 0.169) and for behavioural intention towards tourist APP use (H10b: 0.130). Thus, the greater the services and benefits that can be made in the tourist applications, the more likely tourists are to continue to use them. In other

words, the more operations the tourist can manage in the APP, the greater the APP demand will be among tourists ([Marino & Lo Presti, 2019](#)).

Conclusions/Recommendations

The objective of this study was to analyse the adoption of tourist mobile applications among millennials. More specifically, this study aimed to explore a causal-relational model that grouped together most of the variables that have been generally validated in previous studies as contributing factors towards peoples' use of tourist-related APPs. This study has managed to integrate in the same explanatory model most of the elements that a tourist considers important when adopting a tourist APP.

The theoretical implications of this study relied on the integration of a model that explained, with a better understanding, the key elements for the use of tourist APPs. The explanation of the variables demonstrated that this model, which validated those with values R square above 0.6, could widely predict behaviour in the use of tourist APPs. (See Table 3.)

All hypotheses proposed in the model were supported, confirming that all variables that were proposed significantly contribute to the adoption of tourist APPs in general. The variables that most greatly influenced the intention to use tourist APPs were the expectations of APP performance, perceived personal outcome expectations, and APP information design.

The results also validated the ideas that tourists consider visual design, navigation design, and other operational aspects when adopting a tourist APP. Therefore, it is important that the APPs have accessible menus and are easy to navigate, regarding the presence of the section menu, navigation within the same section, clarity in the navigation structure, and graphic quality, among other benefits.

As suggestions for the development and management of tourist APPs, we propose the following technical aspects: screen size, zoom or enlargement, visual contrast, keyboard control for touchscreen devices, touch target size and spacing, screen touch, device manipulation gestures, button placement (easily accessible), changing screen orientation (vertical/horizontal), consistent layout, positioning important page elements before the scroll page, operable elements that perform the same action, a clear indication that the elements are actionable, and, finally, providing custom touch screen instructions and device manipulation gestures.

Also, the results of this study suggest that co-creation in the development and improvement of tourist APPs is fundamental for their success. Thus, it is necessary to integrate end users in the innovation teams, since it is necessary to know the end users' needs, desires, and suggestions related to the following: perceived personal outcome expectations (i.e., that the

application makes the user feel fulfilled when using it for their tourist activities); motivations for personal or communal achievement; perceived enjoyment (i.e., that the applications' focus on tourism must also generate exciting sensations, even if their services are associated with the wellbeing of tourism); subjective norm (i.e., giving priority to the recommendations that other people give, according to positive or negative experiences); and effort expectations (because easy-to-use touristic apps should be efficient, intuitive, and pleasant to use, and should take into account the degree of propensity for error and how much users like them). Whether a feature can be or is used is linked to the design variables, but also to their correct operation. Performance expectations of tourism APPs must offer solutions that tourists cannot find in other media and are possible on a smartphone. The conversion rate seeks to satisfy a specific need effectively by providing powerful search tools, tourist guides, and comments related to experience made by other travellers, and personal, authentic, and essential testimonies. Also of value is content supplied by experts on singular subjects and many additional services, such as photo and video capturing and editing for trips, the provision of electronic books to read during the trip, and augmented and online realities applied to visits of tourist sites.

This study is of great importance for companies in the tourism sector in general, since it offers a possible checklist of elements that must be analysed in the design, development, and implementation of a tourism APP. A practical contribution of this study is the recommendation to companies developing this type of application that they contemplate and consider fully all the design, navigability, and usability factors that the tourist requires; in an environment that is quickly and constantly evolving, the most successful companies will be those that are aptly positioned and competitive ([Kim et al., 2016](#)). It should also be kept in mind that users tend to change applications when they find others that offer better or more services, such as real-time and location-based information. These factors should also allow for APP personalisation ([Morosan & DeFranco, 2016](#); [Okumus & Bilgihan, 2014](#)). Although it was not analysed in this study, the results suggest that many aspects of use and assessment by the user reinforce the need to offer applications that satisfy very specific requirements, which allow for user personalisation ([Marino & Lo Presti, 2019](#); [Stocchi, Michaelidou & Micevski, 2019](#)).

Finally, the limitations of this study were methodological; the sample consisted only of university students, which may bias the results with respect to other population groups. Likewise, this study did not analyse a specific tourist APP, but rather generalised the attitudes of tourists in regard to the idea.

Future studies should apply this type of model to tourist applications to examine this phenomenon with greater precision and to affirm whether, theoretically, another model would

be more appropriate in studying variables analysed in other studies, such as facilitating conditions and innovativeness, or in examining moderating variables such as age or gender. Likewise, research on the use and applications of ICTs in tourism should certainly continue, given that the level of innovation in this sector is very high (Carter & Yeo, 2016). The use of other technologies related to APPs, such as the Internet of things, smart cities, virtual reality, and the future of mobile telephony, will be the new trends in the tourism sector.

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