SUSTAINABILITY-ORIENTED INNOVATION IN TOURISM: AN ANALYSIS BASED ON THE DECOMPOSED THEORY OF PLANNED BEHAVIOR

Abstract: Drawing on Taylor and Todd's 'decomposed theory of planned behavior', this study explores the sustainability beliefs, attitudes, social norms, perceived behavioral controls and behavioral intentions of accommodation managers, and considers how these relate to their uptake of water-related innovations. An online survey is used to capture data from over 300 accommodation establishments located in Catalonia (Spain). Using a structural equation model to interpret the data, 17 hypotheses are established, of which 15 are found to be significant. The findings show how the second order constructs informed by organizational innovation literature explain the attitudes, social norms and perceived behavioral controls of the managers; these factors inform 56% of the sustainability behavioral intentions. We explore the cognitive mechanisms that motivate managers to introduce sustainability practices in their businesses. We contribute to theory by demonstrating the benefits of studying the belief structures that inform taking sustainability actions from the perspective of innovation.

Keywords: Sustainability; Innovation; Beliefs; Behavioral Intention; Small and Medium-sized Tourism Enterprise

1. Introduction

Sustainability-oriented innovations deliberately integrate economic, social and environmental factors during the design of products, processes and organizational structures (Hansen, Grosse-Dunker, and Reichwald 2009). They do this to enhance the sustainability of production methods, market structures and patterns of consumption (Schaltegger and Wagner 2011). Sustainability is acknowledged as a key driver of innovation and value creation (Husted and Allen 2007; Nidumolu, Prahalad, and Rangaswami 2009). The evidence that innovation moderates the effect of sustainability on a firm's performance (Martinez-Conesa, Soto-Acosta, and Palacios-Manzano 2017) is partly explained by the fact that environmental responsiveness and proactivity tend to lead to the development of unique capabilities (such as higher order learning and continuous innovation) (Sharma and Vredenburg 1998; Aragón-Correa et al. 2008).

Much of the tourism literature reports that one's sustainability behavior proactivity results from one's habits, lifestyle and worldviews (Sampaio, Thomas, and Font 2012). This suggests that affecting a change in behavior is extremely difficult. However, behavior change is necessary if the industry is to scale up its sustainable production and consumption solutions. Further research is needed in this area, as sustainability innovation does not occur regularly; tourism firms: i) do not see sustainability as a priority field for innovation (Rodríguez 2015), and ii) dedicate limited efforts to sustainability learning (Garay, Font, and Pereira-Moliner 2017).

Of previous studies into understanding sustainability behavior change, those that have focused on one specific aspect of behavior at a time have produced better results, while those that have attempted more comprehensive models have drowned in the complexity of the many variables that influence each other (Stern 2000; Poortinga, Steg, and Vlek 2004). We argue that this is the result of misunderstanding the beliefs that inform the process of

decision-making. Moreover, that pro-sustainability beliefs, attitudes and behaviors can be analyzed from the perspective of innovation using similar frameworks to those that have been successfully used for other kinds of behavior (such as pro-technology). Consequently, we suggest that the beliefs of tourism businesses managers should be decomposed based on a better appraisal of the process of introducing sustainability oriented innovations. For these reasons, we adapt and extend the Decomposed Theory of Planned Behavior (DTPB) (Taylor and Todd 1995). The DTPB is a development of Azjen's well-known Theory of Planned Behavior (Ajzen 1991), which is used to study organizational innovations and which, we argue, shares many of the salient characteristics involved in introducing sustainability measures to the tourism industry.

Technological aspects are some of the main determinants and driving forces of innovation and growth creation (Hall and Williams 2008; Rodríguez, Williams, and Hall 2014), hence the need to further study technology acceptance in tourism (Fuchs et al. 2010). Pro-technology behavior has been recognized as relevant for business development, especially in combination with organizational innovations and dynamic capabilities (Teece 1986). Recent studies (Camisón and Villar-López 2014; Davenport 2013) confirm that organizational innovation favors the development of technological innovation capabilities and that both organizational innovation and technological capabilities (for products and processes) can lead to superior firm performance. These kind of pro-technology behavior analyses have also received attention in the innovation literature in tourism (Hjalager 2010). While previous tourism researchers have developed conceptual categories to explain innovation behavior (Martínez-Román et al. 2015; Hjalager 2010), our aim is to use a cognitive theory approach to achieve a more nuanced explanatory framework of the underlying motivations towards sustainability-oriented innovations.

Because of the challenges of testing behavioral intention towards intangible and complex concepts (Bamberg 2003; Ajzen and Fishbein 1977), such as sustainability, we choose to focus on the introduction of water-saving measures as being more specific and easily-definable. Water is globally important; in many water scarce tourist regions water abstraction has reached unsustainable levels and yet forecasts suggest lower precipitation due to climate change combined with additional water consumption due to changing lifestyles (Gössling et al. 2012). Water saving measures are some of the most commonly adopted sustainability innovations in accommodation organizations (Warren and Becken 2017; Becken and Dolnicar 2016).

Many of the water saving initiatives recorded can be considered as techno-economic innovations (Gössling et al. 2012). Warren and Becken (2017) comment on the potential of technology-based approaches for energy and water-saving measures, and lament that the impacts of smart technology have not been sufficiently studied in tourism. While initial water saving innovations primarily only require a predisposition to change and learn, the more profound innovations are more technologically driven and require not only greater investment but also greater mastery of the innovations and self-efficacy (Sampaio, Thomas, and Font 2012; Barberán et al. 2013). Potential annual savings from water management, for a 100 bedroom hotel, are calculated at nearly €60,000 (Styles, Schoenberger, and Galvez-Martos 2015), exemplified by the three star, beach Hotel Samba that reduced its water consumption from over 350 liters to under 75 liters per person per day through the adoption of water-saving innovations (Gabarda-Mallorquí, Garcia, and Ribas 2017). A literature review of the variables that influence water consumption shows that previous research has focused primarily on hotel characteristics, and not on behavioral or organizational variables (Gabarda-Mallorquí, Garcia, and Ribas 2017). The same can be said for much of the research on sustainability-oriented innovation in small firms (Klewitz and Hansen 2014); to our

knowledge, this is the first study to adapt the concept of the DTPB to sustainability-oriented innovation.

In summary, the research objective is to better understand the decomposed beliefs that inform the attitudinal, social-normative and control factors that configure behavioral intention. This will be achieved by testing diverse hypotheses related with these relationships through a Structural Equation Model (SEM). We first review the literature to justify the hypotheses that inform our structural model proposal. We then present our research methodology and analyze our findings, which we find validate 15 of the 17 hypotheses. We discuss the value of the findings to explain the behavioral intentions of tourism firms, and the value of our DTPB extension to explain sustainability as a form of organizational innovation. We then draw conclusions and limitations, suggesting potential areas for further research.

2. Literature review

Azjen's Theory of Planned Behavior (TPB) is probably one of the most referenced theories used to explain different kinds of behavior in different areas of social sciences (Armitage & Conner, 2001); hence, its introduction here will be deliberately brief. There is now a well-established data set of the explanatory value of TPB specifically for environmental issues in the hospitality industry (Gao, Mattila, and Lee 2016). TPB explains behavioral intention (BINT) as the result of three variables: i) a person's attitude toward the behavior (ATTI), ii) their subjective norm (NORM), and iii) their perceived behavioral control (CONT) (Ajzen 1991). In TPB, each of these three elements is preceded by the beliefs held by the person in question. First, ATTI refers to a person's favorable or unfavorable predisposition toward the behavior and is a combination of their beliefs regarding the behavior and their own assessment of that belief. ATTI can also be explained in terms of a person's underlying attitudes about the results that the behavior will produce. Second, NORM is the result of personal feelings about the opinion that other people (family, friends, colleagues at work and other agents) have on one's own behavior, and the importance attached to it personally. This is derived from two basic underlying factors: normative beliefs that a person attributes to relevant people, and the motivation to behave in accordance with the wishes of these people. Third, CONT is the variable that the TPB added to the earlier Theory of Reasoned Action (Ajzen and Fishbein 1980) to increase its predictive ability in the case of behaviors over which a person has limited control. Based on Bandura (1982), Ajzen incorporated the person's perceptions regarding their control over behavior as an explanatory variable of both behavioral intention and actual behavior.

The benefit of TPB as a cognitive model is that only very few variables manage to explain a significant proportion of behavior (Albarracin et al. 2001; Follows and Jobber 2000). Yet meta analyses have found that TPB prediction of behavioral intention is generally below 40%

(Armitage and Conner 2001; Rise, Sheeran, and Hukkelberg 2010). As a result, amending or expanding the components of TPB has had some traction (Armitage and Conner 2001; Ajzen and Fishbein 2005); many authors have suggested that further variables can be added to improve the explanatory power of TPB, with two approaches often being used. The first approach is to extend the number of variables beyond the original three i.e. to modify the model itself. For example, i) Wang (2016) found that including self-identity, moral responsibilities and commitment variables to the TPB substantially increased the model's explanatory ability; and ii) Sandve and Øgaard (2013) found that including attitudes toward trying, self-efficacy, subjective norm and past behavior were all partially able to explain the sustainability behaviors of small tourism managers; their work used a revised version of the Theory of Trying, itself modified from TPB.

Ajzen and Fishbein (2005) acknowledged that adding variables does add some explanatory value in different ways, and in different contexts, but that the strength of the TPB is its universal validity. Hence, a second approach that adapts TPB is to research the belief structures that underpin the attitude, social norms and perceived behavioral control aspects of TPB. An example of this approach is DTPB, which studies the behaviors towards innovation (Taylor and Todd 1995). In our study we take this second route.

The DTPB uses the Technology Acceptance Model from Davis Jr (1986) to propose antecedents of innovation. For ATTI, these are: i) *ease-of-use* (EASE), the degree to which an innovation is perceived as easy to understand and use; ii) *perceived usefulness* (USEF), the degree to which an innovation is perceived as better than what already exists; and iii) *compatibility* (COMP), the degree to which an innovation is perceived as being in line with existing values, past experiences, and needs of potential adopters. As individuals choose to perform an action, in response to important people in their lives or influential reference groups saying they should comply, NORM is decomposed into two reference groups: *peers*

(INTE) and *superiors* (EXTE). Finally, CONT is decomposed into *self-efficacy* (EFIC) and *facilitating conditions* (COND). Self-efficacy is based on Bandura's (1997) notion regarding an individual's ability to influence events that affect their lives, while facilitating conditions are informed by the work of Triandis (1979) and are defined in terms of resources (e.g. time, money) and technological possibilities (e.g. charging facilities, car maintenance), which have previously been reported as barriers to acting sustainably (Font, Garay, and Jones 2016b).

Figure 1, below, presents our resulting research model. It identifies 17 different hypotheses, of which 10 are structural (H1 to H10) and 7 are measurement (H11 to H17).

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Based on the DTPB, our model starts from the premise that pro-sustainability behavioral intention can be calculated primarily in accordance with an individual's personal utility and costs, similar to the way in which the model has been used to calculate pro-technological behavioral intention. Thus, from Ajzen's TPB (1991), we establish our first set of three hypotheses, namely, that the managers' attitudes towards introducing sustainability innovations (attitude towards behavior, H1), levels of engagement with sustainability innovations (subjective norm, H2) and perceptions of their own abilities to introduce sustainability innovations (perceived behavioral control, H3), each directly and positively influence their intentions to introduce sustainability innovations (behavioral intention).

Furthermore, following Taylor and Todd's (1995) DTPB, our model incorporates the following three hypotheses about these additional causal relationships: the managers' perceptions of introducing sustainability innovations as being useful (perceived usefulness, H4), easy to understand and use (ease-of-use, H5) and as being in line with their existing values, past experiences, and needs (compatibility, H6), each directly and positively

influence their attitudes towards introducing sustainability innovations (attitude towards behavior).

In addition, this study incorporates further hypotheses relating to how social groups can shape the attitudes of individuals towards innovation (Gatignon and Robertson 1985; Malhotra and Galletta 1999; Hsu, Chiu, and Ju 2004), namely, that the managers' levels of engagement towards introducing sustainability innovations (subjective norm, H7) directly and positively influence their attitudes towards introducing sustainability innovations (attitudes towards behavior).

We revert to the Technology Acceptance Model literature (Davis, Bagozzi, and Warshaw 1989), to expand H5 to further consider how the perceived usefulness of an innovation is conditioned by the ease-of-use associated with it, as evidenced by the extensive review by Gefen and Straub (2000). Agarwal and Karahanna (1998) incorporate the concept of compatibility in their model (based on literature on the attributes of innovations (Tornatzky and Klein 1982; Moore and Benbasat 1991; Taylor and Todd 1995)) and present a direct relationship between this variable and both utility and ease-of-use. This idea is consistent with the approaches of Taylor and Todd (1995) that analyze the existing interrelationships between the sets of beliefs incorporated in their theory. Therefore, the managers' perceptions of introducing sustainability innovations as easy to understand and use (ease-of-use, H8), and as being in line with their existing values, past experiences and needs (compatibility, H9), both directly and positively influence the degree to which those managers perceive introducing sustainability innovations as useful (perceived usefulness). In addition, H10 states that the managers' perceptions of introducing sustainability innovations that are in line with their existing values, past experiences, and needs (compatibility), directly and positively influence the degree to which they perceive introducing sustainability innovations as easy to

understand and use (ease-of-use). Having outlined our structural hypotheses, we now move on to outline the measurement hypotheses.

Although perceived usefulness has traditionally been considered a one-dimensional concept, some authors have suggested the need to analyze utility from different points of view (Hawlitschek, Teubner, and Gimpel 2016; Hamari, Sjöklint, and Ukkonen 2015; Bock et al. 2005). Therefore, in our model, perceived usefulness is also a second-order variable, decomposed into social, economic and environmental utility (e.g. contribution to society, reduction of costs, saving natural resources respectively). We posit that the managers' perceptions of introducing sustainability innovations as useful (perceived usefulness) are positively determined by the degree to which they perceive sustainability innovations as socially useful (H11), economically useful (H12) and environmentally useful (H13).

Additionally, although the concept of subjective norm is traditionally considered to be one-dimensional, several authors have suggested the need to analyze normative influence from different reference groups (Burnkrant and Page 1988; Oliver and Bearden 1985). Consequently, in our model, subjective norm is also a second-order variable, and we posit that the managers' levels of engagement towards introducing sustainability innovations (subjective norm) are positively determined by their opinions of external (superior/management) influences (H14), and internal (peer) influences (H15).

Finally, we follow the same approach by decomposing perceived behavioral control into its independent, but correlated, sub-dimensions (Armitage and Conner 1999; Ajzen 2002). We posit that the managers' perceptions of their ability to introduce sustainability innovations (perceived behavioral control) are positively determined by their beliefs in their ability to introduce sustainability innovations (self-efficacy, H16) and by the existence of facilitating conditions (facilitation, H17).

3. Methodology

3.1. Population and sample

The empirical research for this study was conducted in 2016 in Catalonia (Spain), where tourism employs around 200,000 people and accounts for 11% of the GDP (Idescat 2016). An online survey was sent to the population for this study, which consisted of 4,533 accommodation organizations with unique and valid email addresses (provided by the Catalan government (DIUE 2016)) that had previously been used for similar studies (Garay, Font, and Pereira-Moliner 2017). 85.8% of the organizations approached had 10 or fewer employees (Idescat 2016) and therefore had organizational cultures and decision-making dynamics that were heavily influenced by the owner-managers. Data was collected by e-mail in three rounds, including two reminders, over a six-week period. 284 out of the 304 questionnaires returned were saved after discarding questionnaires that presented acquiescence biases; this represented a sample error of 5.4% with a confidence level of 95.5% ($p = q = 0.5$). These numbers were obtained using a formula proposed by diverse authors, such as Spiegel and Stephens (2017) in the case of finite universes, where the sample error depends on the size of the sample (304 in this case), the total population size (4,533), the standard deviation of the population (if this is unknown, a constant value of 0.5 is used), the level of confidence (95%) and the acceptable limit of sample error (5%).

Self-selective responses could have introduced social desirability bias in the sample, but earlier TPB-related studies (Armitage and Conner 1999), that analyzed the role of social desirability in the validity and predictive capacity of the model, concluded that social desirability has a minimal impact on the TPB models, even going so far as to demonstrate that such desirability has very little effect on the relationships existing between the different variables of this model. Earlier, Beck and Ajzen (1991) had already specified that there is no real moderating effect of social desirability on the relationships of the different components

of the TPB. In the same vein, it was demonstrated by (Sheeran and Orbell 1996) that this moderating effect was minimal.

Non-response bias was checked by dividing the dataset into thirds according to the order of the surveys completed (Armstrong and Overton, 1977); the applications of Pearson's Chi Square test and the Student's t test between the first and last thirds indicated no statistically significant differences in the mean responses for any of the variables measured. A further check, to ensure that non-response bias was not present, compared sample characteristics of the accommodation in the population, the respondents' and the non-respondents' samples, finding that all three were distributed in a similar way. Based on these checks, non-response bias was presumed not to be a problem in this sample.

As per previous literature, our questionnaire included diverse socio-demographic questions (measured with descriptive variables) about the profiles and business characteristics of the owners (see Table 1).

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3.2. Measures

The survey then introduced the concept of sustainability-oriented innovation i.e. that "the product, process, marketing method or organizational method must be new (or significantly improved) to the firm" (OECD 2005, :46). Our questions focused on the attitudes, social norms and perceived behavioral controls towards either applying new knowledge or technologies, or extending the use of existing knowledge and technologies, for the introduction of sustainability measures in the six months following the study (justifiable to appraise near-future behavioral intention) (Ajzen and Fishbein 1980). The questionnaire asked questions designed for a situation-specific cognition (i.e. water) because general

environmental attitudes cannot be used to study specific environmental behaviors, and beliefs and attitudes need adapting to a specific intended behavior (Bamberg 2003; Ajzen and Fishbein 1977).

The survey used 7-point Likert scales to ask about values ("it is not like me at all" to "it is much like me"), as well as attitudes and perceptions ("totally disagree" to "totally agree"). Compound scales were used to obtain assessments for variables that are not directly observable (constructs and literature references can be found in Table 2). As recommended by Ajzen and Fishbein (1980), we detailed and specified the sustainability behavior being analyzed, in our case: "to introduce water-saving measures in my organization in the next six months". As the model of investigation is fundamentally based on DTPB, most items of the measurement scales were based on Taylor and Todd (1995), informed by the wording in other studies (see Table 2), and then adapted to the context of this study. The questions were deliberately focused on the underlying reasons behind water saving measures and did not ask them to specify the actual measures taken or to what extent these were product, organizational or process innovations (OECD 2005). This is because the pilot testing of the survey (which involved four managers representing different typologies, locations and sizes of accommodation businesses) identified consistencies in the narrative behind their reasons for behavioral choices irrespective of their particular innovations, while questioning interviewees on the actual choices was found to create blockages and a reticence to commit. The interviews served to confirm that the questions (see Table 2) were quite well adapted to the context we wanted to analyze and that only minor adjustments had to be made.

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4. Results

To interpret the results of the study, we commenced with a descriptive analysis of the data (see Table 3), and followed on with an analysis of central tendency and dispersion measures for each scale item.

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Table 3 indicates that both the mean and the median of these variables had values that, in general, were slightly above the middle of the range for each answer. However, there were no significant differences between the means and the medians, indicating relatively symmetric distributions. Standard deviation values were between 0.999 and 1.812. The dispersion of the data in relation to the average value was generally between 1 and 1.5. The kurtosis variable was between -0.927 (third indicator of facilitating conditions) and 8.552 (second indicator of environmental utility). This maximum positive value, along with nine other cases, exceeded the limit established to consider univariate normality (2 in an absolute value). However, this deviation was not significant, given that the remaining 23 indicators were within the established range. In relation to the analysis carried out to evaluate the multivariate normality, the standard estimate of the Mardia coefficient also showed a slight deviation above the recommended level. We therefore followed the recommendations of Martínez and del Barrio García (2000) according to which, in situations like the one presented in this investigation, it can be considered, for practical purposes, that the sample showed univariate and multivariate normality. Hence it was possible to apply the maximum likelihood method of estimation in the confirmatory factor analysis. We also followed the prudent advice of Bollen (1989) and corroborated the results obtained using the maximum likelihood method

with those that would be obtained by applying other estimation methods, such as the asymptotically free distribution function.

Skewness was between -2.428 (second indicator of the environmental utility) and 0.122 (second indicator of the facilitating conditions). 31 of the 33 analyzed indicators presented negative asymmetry, that is, a certain tendency for the values of means and medians to be slightly above the measurement range. Finally, as a consequence of the assessment made on the sample's behavior and trends, we did not identify the existence of variability patterns in the data. Hence the data could be considered as valid for further analysis without any purification, using the method of estimation of maximum likelihood in the confirmatory factor analysis.

After the descriptive analyses, we carried out a Confirmatory Factorial Analysis (CFA) to identify the measurement model to analyze its goodness of fit, reliability and convergent and discriminant validity. We then used structural equation modelling (SEM), including the analysis of the goodness of fit of the structural model and its nomological validity (Field 2009). These are outlined in turn in the following sections.

4.1. Measurement model

All the variables related to the absolute, incremental and parsimonious adjustments met the goodness of fit requirements in the measurement model (Table 4). Although the GFI and AGFI parameters did not surpass the threshold of 0.9, some authors suggest that both parameters can be considered as valid above 0.8 (Subhash 1996; Doll, Xia, and Torkzadeh 1994) or above 0.85 for AGFI (Schermelleh-Engel, Moosbrugger, and Müller 2003).

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The reliability and convergent validities were then analyzed using the standardized factorial loads, as well as the composite reliability and average variance extracted. Table 5 shows that all the factorial loads were greater than the recommended 0.5, the composite reliability values were greater than 0.7 (Hair et al. 2010) and the average variance extracted was greater than 0.5 (Fornell and Larcker 1981). Consequently, the measurement model had a suitable reliability and convergent validity.

**Table 5 approximately here

The analysis of the discriminant validity was carried out by testing the confidence interval and the extracted variance, which Table 6 shows was appropriate (Hair et al. 2010). For the extracted variance, the square roots of the factors' average variances extracted (AVE) were always greater than the correlations of those factors with other factors. Therefore, the measurement model presented a suitable discriminant validity.

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4.2. Structural model

The analysis of the goodness of fit in the structural model (Table 7) showed that all the variables related to the absolute, incremental and parsimonious adjustments met the requirements. Although the GFI and AGFI parameters did not surpass the threshold of 0.9, some authors suggest that both parameters can be considered as valid above 0.8 (Subhash 1996; Doll, Xia, and Torkzadeh 1994). Therefore, the structural model presented a suitable goodness of fit.

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For the structural model being analyzed, we compared the three indicators of goodness of fit (RMSEA=0.051, CFI=0.956 and TLI=0.950) with different less saturated models. Removing three of the proposed causal relationships generated marginally worse adjustment indices than the model analyzed: relation of compatibility with perceived usefulness (RMSEA=0.055, CFI=0.948 and TLI=0.941), relation of ease-of-use with perceived usefulness (RMSEA=0.051, CFI=0.955 and TLI=0.949) and relation of the subjective norm with attitude (RMSEA=0.051, CFI=0.956 and TLI=0.950). Only removing compatibility with ease-of-use resulted in slightly better adjustment indices (RMSEA=0.045, CFI=0.965 and TLI=0.960). Hence, we opted to keep all the causal relationships for their theoretical contribution. Our decisions were based on: i) Agarwal and Karahanna's (1998) proposal that there are direct relationships between compatibility and both utility and ease-of-use; and ii) Taylor and Todd's (1995) recommendation to test the whole DTPB.

Table 8 shows the nomological validity of the hypotheses initially posed, with 15 out of the 17 initial hypotheses being supported. We could not prove H5, whether the degree to which the managers perceived introducing sustainability innovations as easy to understand and use (ease-of-use) directly and positively influenced their attitudes towards introducing sustainability innovations (attitude towards behavior). Also not supported was H7, which presented factorial loads in the opposite direction of the hypothesis, as we found that the managers' attitudes towards introducing sustainability innovations (attitudes towards behavior) directly and positively influenced their engagement towards introducing sustainability innovations (subjective norm), although we had expected this to be the opposite (Gatignon and Robertson 1985; Malhotra and Galletta 1999; Hsu and Chiu 2004).

**Table 8 approximately here

To understand the structural model better, it is worth considering the diagram shown in Figure 2, in which we indicate the factorial loads of the different relations, their statistical significances and the acceptance or rejection of the corresponding hypotheses.

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Finally, Table 9 presents how much of the variance of each dependent variable of the structural model was explained. Behavioral intention presented a total of 56.0% of the explained variance (close to the 60% that, according to the literature (Taylor and Todd 1995), is normally explained by the DTPB and far superior to the variance typically explained by TPB (Armitage and Conner 2001; Rise, Sheeran, and Hukkelberg 2010)). Attitude, as a dependent variable that precedes behavioral intention, presented an explained variance of 89.3%. In relation to the antecedents of the attitude, the only two independent variables were perceived usefulness and ease-of-use, with explained variances of 40.9% and 24.4% respectively.

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5. Discussion and conclusions

The objective of this study was to model the behavioral intention towards sustainability-oriented innovations according to critical factors that have been proven to influence tourism managers' predispositions towards acting more sustainably. Because of the complexity of testing behavioral intention towards intangible and complex terms (Bamberg 2003; Ajzen and Fishbein 1977), such as sustainability, we tested this model on sustainability-oriented innovations in water management. To improve the reliability of the model, we adapted and extended the Decomposed Theory of Planned Behavior (DTPB), typically used to study technological innovations, to integrate beliefs that inform attitudes, social norms and perceived behavioral control into the model. We conducted a two-stage structural equation model, first developing a measurement model based on the literature, from which ten structural and seven measurement relations were identified. The results supported 15 hypotheses and rejected only two.

Our model demonstrated one way in which we can better understand pro-sustainability behavioral intentions, incentives and barriers to change. We found that the managers' subjective norms (H2) explained more of their behavioral intentions than their attitudes (H1) or perceived behavioral controls (H3) did, although all three hypotheses were supported. Also, the managers' perceptions of their own abilities to introduce sustainability innovations (H3) helped to explain the variance in their behaviors, as found in previous studies (Armitage and Conner 2001). This extended previous findings explaining how perceived behavioral control may depend on the extent of green core competences within the organization (Chen 2008), and how green core competencies in turn inform one's self efficacy (Bandura 1982).

Taylor and Todd's (1995) DTPB model helped us to explain the managers' attitudes towards introducing sustainability innovations because of their perception of introducing sustainability innovations as useful (perceived usefulness – H4) and in line with their existing

values, past experiences, and needs (compatibility – H6). However, the managers' attitudes were not related to finding the innovations easy to understand and use (ease-of-use – H5). The interviews conducted to validate the measurement constructs suggested that managers believed they knew how to save water daily (ease-of-use), which may partly explain this result. However, if we were to focus on more advanced, water-saving technological innovations, this result might be seen to vary.

We found that the DTPB, and the Technology Acceptance Model, are valid approaches for delving deeper into understanding the constructs behind attitudes, social norms and perceived behavioral control (Davis, Bagozzi, and Warshaw 1989; Davis Jr 1986). Ease–of-use explained the degree to which managers perceived introducing sustainability innovations as useful (perceived usefulness – H8) as suggested in the literature (Moore and Benbasat 1991; Taylor and Todd 1995; Tornatzky and Klein 1982). Agarwal and Karahanna's (1998) work on compatibility was also proven here, as sustainability innovations that were in line with the managers' existing values, past experiences, and needs (compatibility) were related with perceived usefulness (H9) and with being easy to understand and use (H10).

We found that there is merit in analyzing perceived usefulness as a multi-dimensional concept, and we accepted the hypotheses that perceived usefulness is explained by social utility (H11), economic utility (H12) and environmental utility (H13). This could be partly explained by the meaning of utility in relation to the motivations for engaging in sustainability, particularly with respect to whether the expected benefits are for oneself, others or the biosphere (Schultz 2001; Font, Garay, and Jones 2016a). We further found that subjective norm could also be decomposed into peer influences (H14) and superior influences (H15) (Burnkrant and Page, 1988; Oliver and Bearden, 1985).

Finally, we found that perceived behavioral control could also be explained by self-efficacy (H16) and facilitating conditions (H17) (Ajzen 2002; Armitage and Conner 1999).

We found that the variables exert an influence on one another; hotels that believe in the quality of expertise and support systems tend to be proactive to learn about sustainability (Garay, Font, and Pereira-Moliner 2017), which in turn leads to making more use of facilitating conditions such as environmental management systems and certifications that lead to having better water consumption figures (Gabarda-Mallorquí, Garcia, and Ribas 2017). This in turn reinforces their sense of self efficacy (Bandura 1982).

We attempted to address some of the explanatory limitations of TPB by decomposing them and yet we still find ourselves seeking further evidence on what contextual factors lie behind our hypotheses. For example, while this study has shown that TDPB is a useful model to explain sustainability as a form of organizational innovation, further research is needed to understand the socio-cognitive determinants of pro-sustainability behavior. An outstanding question from this study is to better understand the relation between attitudes towards introducing sustainability innovations (attitudes towards behavior) and engagement in introducing sustainability innovations (social norms – H7). Our hypothesis was based on literature suggesting that group behaviors towards innovation adoption shape the attitudes of individuals (Gatignon and Robertson 1985; Malhotra and Galletta 1999). However, the results suggested that the relationship was in fact in the opposite direction, that is, that attitudes towards sustainability influenced the managers' perceptions of social norms. Further research is needed to understand whether this can be interpreted as managers that have a positive attitude towards saving water therefore have additional expectations towards other stakeholders to act sustainably.

In summary, the theoretical contribution of this article comes from adapting the concept of the DTPB to sustainability-oriented innovation. Although diverse studies (Chou, Chen, and Wang 2012; Cordano and Frieze 2000) used TPB to investigate managers' attitudinal and behavioral decision factors on adopting environmental practices, we proved there is value in

researching the belief structures that underpin the attitudes, social norms and perceived behavioral controls aspects of TPB, by following the approach taken by DTPB to study behaviors towards innovation (Taylor and Todd 1995).

We demonstrated the value in refining and further decomposing the TPB to increase its ability to predict tourism managers' behavioral intentions towards sustainability-oriented innovations by linking them with their underlying beliefs in relation to their attitudes, social norms and perceived behavioral controls. In the sustainability-oriented innovation domain, Chou, Chen, and Wang (2012) considered Rogers (1995) perceived innovation characteristics (relative advantage, compatibility, complexity, observability and triability) as the cognitive indicators of ATTI. DTPB offers a more precise understanding of the relationships between the belief structures and antecedents of intention, by decomposing ATTI, NORM and CONT variables, for specific groups of beliefs. We showed how the model provides greater explanatory power when the concept of innovation is incorporated within it (Taylor and Todd 1995), as has already been shown for the adoption of technology (Hsu and Chiu 2004; Moore and Benbasat 1991; Rogers 1995).

Furthermore, we contribute to the literature by showing the benefits of drawing from different literatures to decompose concepts such as NORM (Burnkrant and Page 1988; Oliver and Bearden 1985) and CONT (Ajzen 2002; Armitage and Conner 1999), which are usually treated as uni-dimensional (Taylor and Todd 1995), into a series of variables that work together to improve the explanatory power of the model and thus, help us to better understand the logic behind behavioral intentions. Furthermore, one of the main contributions of this paper relates to the decomposition of perceived usefulness, another variable generally considered as uni-dimensional in DTPB analyses (see for example Sadaf, Newby, and Ertmer (2012)), into three second-order variables (SOCI, ECON, ENVI).

The practical contribution of this study is its ability to inform the design of interventions to promote managers' sustainability behavior change. One significant finding is related with the importance and magnitude of the influence of subjective norms in this behavior. Based on our findings, managers ought to socialize the introduction of new sustainability measures, using the importance of norms, both by creating peer-systems to learn from each other (H15) and by ensuring that the implementation aspects within the firm do not fall on one person alone (H14).

Moreover, the study proves the relevance of the perceived behavioral control in managers' pro-sustainability behavior and the influence of their self-efficacy beliefs (in line with the work of de Vries, Dijkstra, and Kuhlman (1988)) and the existing facilitating conditions (Ajzen 2002). Therefore, managers' interventions will need not only to create the facilitating conditions required for the particular innovation (H17) (for example access to knowhow or resources), but will also need to support this with a strong emphasis on the ability to succeed in making these innovations (H16).

Such interventions may find it hard to tap into the managers' attitudes to change their behavior, and our evidence shows that they will be most likely to succeed when they show how the proposed intervention is compatible with the managers' current values and attitudes (H6), in line with the theoretical proposition from Agarwal and Karahanna (1998). Furthermore, the perceived usefulness of the innovations also acquires a prominent role, as has been shown in relation to other pro-sustainability behaviors, especially those related with consumers and users (Kemp et al. 2015; Wan and Shen 2015) . Regarding this element, managers will need to demonstrate how the proposed actions are useful to achieve the organizational goals (H4); hence, the importance of adaptive interventions, rather than assuming that all firms respond to the same stimuli.

The findings of this study are currently being used to design a sustainability program in the province of Barcelona (in Catalonia, Spain). Over 500 businesses have been invited to develop their own sustainability pledges and to show evidence of implementation, using a peer and expert support system. The model outlined in this article will be used as the monitoring and evaluation framework to assess the sustainability innovations introduced on the back of these pledges.

This study's main limitation was not having independently verified data on either baseline sustainability behavior, or a measurement of how behavioral intention translates into actual adoption of behaviors. In addition, the study had limitations of self-deception bias due to its reliance on behavioral intention being self-reported via a survey, which is typical of studies of this type (Ajzen 2002; Armitage and Conner 1999). This limitation could be addressed by developing randomized field experiments, as well as longitudinal case studies, to verify the findings from this study. Such measures will be introduced as part of the design and evaluation of the Barcelona program and will be reported on in due course.

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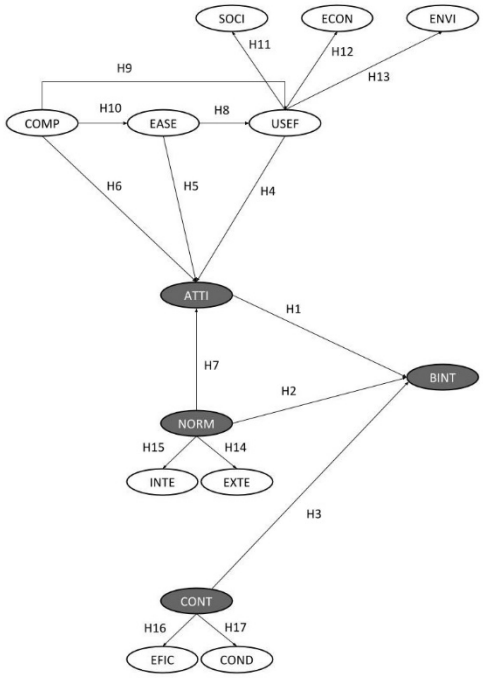
Figure 1. Model and hypotheses



Source: Self-produced.

Table 1. Sample's characteristics

Owner characteristics	***%***
Gender: Female/Male	55/45
Age: Less than 40/Between 41 and 60/More than 61	19/69/12
Owner/Manager/Director	70/19/11
Business characteristics	*%*
Affiliation to some brand or chain: Yes/No	7/93
Family businesses: Yes/No	93/7
Full time employees: Less than 5/From 6 to 10/More than 10	73/12/15
Annual occupancy: Less than 50%/51% to 75%/More than 76%	42/42/16
Months opened: Less than 6/7 to 9/More than 9	8/10/82
Financial health (good): Disagree/Neutral/Agree	12/25/63
Financial situation in the last 2 years(good): Disagree/Neutral/Agree	11/26/63

Source: Self-produced.

Table 2. Constructs and scale items

Introducing water-saving measures in my organization in the next six months is…		
ATTI_1	…A good idea	Pavlou And Fygenson (2006), Bhattacherjee (2002) and George (2004)
ATTI_2	…Of common sense	
ATTI_3	…An intelligent idea	
COMP_1	…Something that adjusts well to the way in that I do	Moore and Benbasat (1991), Hung et al. (2009), Lau (2011) and Wu and Wang (2005)
COMP_2	…Coherent with my way of acting	
COMP_3	…Something that fits with my lifestyle	
EASE_1	…Easy to learn	Davis, Bagozzi and Warshaw (1989), Reads (2006), Venkatesh and Davis (1996, 2000) and Moore and
EASE_2	…Simple to implement	
EASE_3	…Something that does not suppose a lot of effort	
Introducing water-saving measures in my organization in the next six months allows me to…		
SOCI_1	…Contribute something to society	Hawlitschek, Teubner and Gimpel (2016) and Collom (2007)
SOCI_2	…Help those that need water more than me	
SOCI_3	…Do something for others	
ECON_1	…Save money	Bock et al. (2005), Hamari, Sjöklint and Ukkonen (2015)
ECON_2	…Reduce costs	
ECON_3	…Obtain profits	
ENVI_1	…Consume in a sustainable way	Hamari, Sjöklint and Ukkonen (2015) and Collom (2007)
ENVI_2	…Save natural resources	
ENVI_3	…Have an ecological behavior	
These are my perceptions regarding the introduction of water-saving measures in my organization		
BINT_1	I expect to introduce them in the next six months	Gefen And Straub (2000), Pavlou and Fygenson (2006), Limayem, Khalifa and Frini (2000)
BINT_2	I want to introduce them in the next six months	
BINT_3	I have the intention to introduce them in the next six	
INTE_1	My friends and family encourage me to introduce them	Bhattacherjee (2000), Hung and Chang (2005), Hung et al. (2009), Lamberton and Rose (2012), Lau (2011) and Widlok (2004)
INTE_2	My workmates and/or employees encourage me to	
INTE_3	My customers appreciate that I introduce them	
EXTE_1	The news in journals on this type of measures,	
EXTE_2	The opinions in blogs related with these measures	
EXTE_3	The advice of experts has encouraged me to introduce	
EFIC_1	It could apply them easily	Limayem, Khalifa and Frini (2000), Koufaris, Kambil and LaBarbera (2001), Koufaris (2002), Lin (2007) and Vijayasarathy (2004)
EFIC_2	It would be able to introduce them without any help	
EFIC_3	It would feel comfortable introducing them on my own	
COND_1	I have time to introduce them	
COND_2	I have resources to introduce them	
COND_3	I have staff to introduce them	

Source: Self-produced.

Table 3. Scale items' central tendency and dispersion measures

	Mean	*Median*	*S.D.*	*Kurtosis*	*Skewness*
Behavioral Intention					
BINT_1	4.49	4	1.612	-0.282	-0.461
BINT_2	4.49	4	1.664	-0.373	-0.464
BINT_3	4.37	4	1.687	-0.443	-0.398
Attitude					
ATTI_1	6.25	7	1.036	5.42	-1.975
ATTI_2	6.21	7	1.043	2.993	-1.635
ATTI_3	6.20	7	1.067	3.079	-1.638
Compatibility					
COMP_1	5.98	6	1.15	3.93	-1.713
COMP_2	6.13	6	1.023	5.243	-1.855
COMP_3	6.14	6	0.999	2.732	-1.482
Ease-of-use					
EASE_1	5.49	6	1.322	0.505	-0.847
EASE_2	4.93	5	1.613	-0.46	-0.61
EASE_3	4.80	5	1.789	-0.697	-0.556
Social usefulness					
SOCI_1	5.93	6	1.223	2.411	-1.418
SOCI_2	5.36	6	1.566	0.364	-0.937
SOCI_3	5.68	6	1.413	0.92	-1.13
Economic usefulness					
ECON_1	5.64	6	1.485	1.523	-1.335
ECON_2	5.63	6	1.541	1.202	-1.282
ECON_3	5.16	5	1.64	0.115	-0.836
Environmental usefulness					
ENVI_1	6.26	7	1.049	4.331	-1.87
ENVI_2	6.34	7	1.003	8.552	-2.428
ENVI_3	6.29	7	1.022	6.168	-2.098
Internal influences					
INTE_1	3.94	4	1.552	-0.263	-0.112
INTE_2	3.89	4	1.495	-0.083	-0.164
INTE_3	4.61	5	1.694	-0.441	-0.497
External influences					
EXTE_1	4.42	4	1.588	-0.157	-0.407
EXTE_2	3.92	4	1.599	-0.442	-0.265
EXTE_3	4.2	4	1.704	-0.622	-0.312
Self-efficacy					
EFIC_1	4.02	4	1.668	-0.637	-0.088
EFIC_2	4.27	4	1.8	-0.77	-0.345
EFIC_3	4.81	5	1.663	-0.077	-0.703
Facilitating conditions					
COND_1	4.04	4	1.713	-0.687	-0.164
COND_2	3.45	4	1.699	-0.788	0.122
COND_3	3.67	4	1.812	-0.927	0.071

Source: Self-produced.

Table 4. Measurement Model. Analysis of goodness of fit

Tests	*Measurement*	*Threshold*
Absolute adjustment (X^2/df)	1.482	<5.0 (Marsh and Hocevar 1985)
Goodness-of-fit index (GFI)	0.881	>0.9 (Jöreskog and Sörbom 1986) >0.8 (Subhash 1996; Doll, Xia and Torkzakeh, 1994)
Standardized root mean square residual (SRMR)	0.052	<0.08 (Byrne 2013)
Root mean square error of approx. (RMSEA)	0.041	<0.08 (Steiger 1990)
Adjusted goodness-of-fit index (AGFI)	0.854	>0.9 (Jöreskog and Sörbom 1986) >0.85 (Schermelleh-Engell, Moosbrugger and Müller, 2003)
Tucker-Lewis index (TLI)	0.967	>0.9 (Tucker and Lewis 1973)
Normed fit index (NFI)	0.917	>0.9 (Bentler and Bonett 1980)
Comparative fit index (CFI)	0.971	>0.9 (Bentler 1990)
Incremental fit index (IFI)	0.971	>0.9 (Bollen 1989)
Parsimonious goodness of fit index (PGFI)	0.718	>0.5 (Mulaik et al. 1989)
Parsimonious normed fit index (PNFI)	0.797	>0.5 (Mulaik et al. 1989)
Parsimonious comparative fit index (PCFI)	0.844	>0.5 (Mulaik et al. 1989)

Note: In order to guarantee goodness of fit, two items were eliminated (EASE_1 and INTE_3). Source: Self-produced.

Table 5. Reliability and convergent validity

	Standardized loads	*CR*	*AVE*
Behavioral Intention			
BINT_1	0.925	0.957	0.881
BINT_2	0.962		
BINT_3	0.929		
Attitude			
ATTI_1	0.836	0.874	0.699
ATTI_2	0.897		
ATTI_3	0.770		
Compatibility			
COMP_1	0.814	0.902	0.755
COMP_2	0.909		
COMP_3	0.881		
Ease-of-use			
EASE_2	0.850	0.839	0.723
EASE_3	0.850		
Usefulness			
SOCI	0.941	0.886	0.723
ECON	0.737		
ENVI	0.860		
Subjective Norm			
INTE	0.970	0.980	0.961
EXTE	0.991		
Perceived Behavioral Control			
EFIC	0.972	0.957	0.918
COND	0.944		

Source: Self-produced.

Table 6. Discriminant validity

	BINT	*EASE*	*USEF*	*NORM*	*CONT*	*COMP*	*ATTI*
BINT	**0.939**	0.139 0.743	0.334 0.778	0.364 0.992	0.266 0.922	0.230 0.626	0.279 0.655
EASE	0.441	**0.850**	0.236 0.648	0.122 0.654	0.280 0.936	0.269 0.669	0.328 0.712
USEF	0.556	0.442	**0.850**	0.381 0.789	0.290 0.718	0.442 0.738	0.599 0.903
NORM	0.678	0.388	0.585	**0.981**	0.226 0.794	0.163 0.503	0.222 0.550
CONT	0.594	0.608	0.504	0.510	**0.958**	0.205 0.593	0.256 0.628
COMP	0.428	0.469	0.590	0.333	0.399	**0.869**	0.669 0.985
ATTI	0.467	0.520	0.751	0.386	0.442	0.827	**0.836**

Note: The diagonal displays the square root of the average variance extracted of each factor. Below of the diagonal we show the correlations between factors, and above we show the corresponding confidence intervals. Source: Self-produced.

Table 7. Structural Model. Analysis of goodness of fit

Tests	*Measurement*	*Threshold*
Absolute adjustment (X^2/df)	1.722	<5.0 (Marsh and Hocevar 1985)
Goodness-of-fit index (GFI)	0.861	>0.9 (Jöreskog and Sörbom 1986) >0.8 (Subhash 1996; Doll, Xia and Torkzakeh, 1994)
Standardized root mean square residual (SRMR)	0.060	<0.08 (Byrne 2013)
Root mean square error of approx. (RMSEA)	0.051	<0.08 (Steiger 1990)
Adjusted goodness-of-fit index (AGFI)	0.832	>0.9 (Jöreskog and Sörbom 1986) >0.8 (Subhash 1996; Doll, Xia and Torkzakeh, 1994)
Tucker-Lewis index (TLI)	0.950	>0.9 (Tucker and Lewis 1973)
Normed fit index (NFI)	0.902	>0.9 (Bentler and Bonett 1980)
Comparative fit index (CFI)	0.956	>0.9 (Bentler 1990)
Incremental fit index (IFI)	0.956	>0.9 (Bollen 1989)
Parsimonious goodness of fit index (PGFI)	0.715	>0.5 (Mulaik et al. 1989)
Parsimonious normed fit index (PNFI)	0.799	>0.5 (Mulaik et al. 1989)
Parsimonious comparative fit index (PCFI)	0.847	>0.5 (Mulaik et al. 1989)

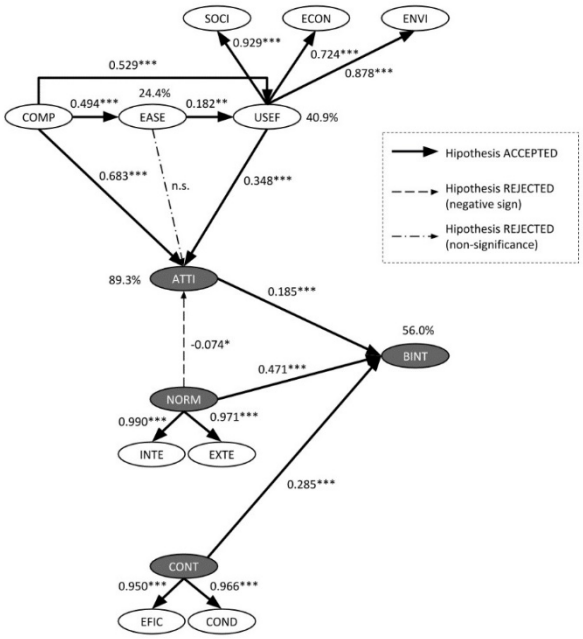
Source: Self-produced.

Table 8. Supported or rejected hypotheses

Hypothesis	***Causal relation***	***Standardized load and significance level***
H1	ATTI -> BINT	Supported (0.185***)
H2	NORM -> BINT	Supported (0.471***)
H3	CONT -> BINT	Supported (0.285***)
H4	USEF -> ATTI	Supported (0.348***)
H5	EASE -> ATTI	Rejected (n.s.)
H6	COMP -> ATTI	Supported (0.683***)
H7	NORM -> ATTI	Rejected (-0.074*)
H8	EASE -> USEF	Supported (0.182**)
H9	COMP -> USEF	Supported (0.529***)
H10	COMP -> EASE	Supported (0.494***)
Hypothesis	***Measure relation***	***Standardized load and significance level***
H11	USEF -> SOCI	Supported (0.929***)
H12	USEF -> ECON	Supported (0.724***)
H13	USEF -> ENVI	Supported (0.878***)
H15	NORM -> INTE	Supported (0.990***)
H14	NORM -> EXTE	Supported (0.971***)
H16	CONT -> EFIC	Supported (0.950***)
H17	CONT -> COND	Supported (0.966***)

Note: *** ($p<0.001$) _ ** ($p<0.05$) _ * ($p<0.10$). Source: Self-produced.

Figure 2. Support or rejection of the model's hypotheses



Source: Self-produced.

Table 9. Extracted variance

Variable	*Variance explained*
BINT (behavioral intention)	56.0%
ATTI (Attitude)	89.3%
USEF (perceived usefulness)	40.9%
EASE (ease-of-use)	24.4%

Source: Self-produced.