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Environmental knowledge management: a long term enabler of tourism development

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Abstract

A review of the literature confirms that there is a need for knowledge management frameworks which support knowledge creation, particularly in those organisations having to operate in a changing environment. Socialisation, externalisation, combination and internalisation continue to be key processes for the creation of knowledge which enables organisations to successfully address environmental challenges. This paper examines the relevance and importance of a SECI model as an enabler of the processes of reusing and updating the environmental knowledge of an organisation. The research reported has confirmed that time is a key component of the implementation of a SECI model in organisations operating in a changing environment. It has been confirmed that such a strategy should focus on the reuse of prior environmental knowledge as a mechanism to establish within the organisation a context where new knowledge management processes are understood and adopted by employees. The paper also examines the relationship between environmental knowledge and organisational performance indicators. These relationships are examined through an empirical study of 87 companies in the Spanish hospitality sector. The results of the study indicate that environmental knowledge at any given time (T) is significant in predicting the knowledge management processes that may be successfully implemented at a later point in time (T+6 years).

Keywords: SECI model, environmental knowledge, hospitality industry, performances and time**.**

1. Introduction

Environmental knowledge has become one of the most important intangible assets for organisations in the current competitive environment (Po-Shin & Li-Hsing, 2009). Environmental knowledge can be defined as the degree to which an individual or organisation becomes aware of and concerned with ecological issues (Amyx et al., 1994). Environmental knowledge may be thought of as comprising stocks of data, information and knowledge resources (environmental memories) that have been gathered and accumulated by an organisation by virtue of its knowledge structures (Chou et al., 2005). While the relationship between environmental knowledge and organisational performance has been addressed by several authors (e.g. Boiral, 2002; Boiral, 2009; Cegarra-Navarro & Martinez-Martinez, 2010), there has been surprisingly little empirical investigation of the effects that environmental knowledge can have on knowledge management process (and vice versa) over a period of time.

Time has traditionally been considered in the management literature as a constant rather than a variable, a belief that Bluedorn (2000) ascribes to people in general. Furthermore, as Bluedorn notes, the understanding of time as a constant is deeply institutionalised, which suggests that most people, most of the time, do not even consider the possibility that time may vary and the effects that this may have on the subject of their study. This suggests that one should speak of 'times' rather than 'time' (Purser et al., 2005). In this study it is assumed that 'times' are sequential and enable first creating an environmental knowledge base and then putting the upcoming environmental processes into a familiar context for members of the organisation. The question that arises is whether a knowledge management framework is needed to reuse and update prior knowledge of the environment and if so what can be done to face environmental challenges in the coming years (Cegarra-Navarro et al., 2013).

In this regard, the SECI model (socialisation, externalisation, combination and internalisation) provides a good basis to explain the adoption of new environmental knowledge (Nonaka & Takeuchi, 1995; Nonaka et al., 2000). This paper offers an empirically tested SECI model which helps identify how prior environmental knowledge in the Spanish hospitality sector could be reviewed and updated through the development of knowledge processes at a later point in time. In the conduct of this research, we have addressed the following questions: Does availability of environmental knowledge at a given time necessarily mean its use at a later point in time? How can hospitality companies update their environmental knowledge resources? By addressing these questions this paper demonstrates that the availability of environmental knowledge at a given time does not necessarily guarantee the effectiveness of environmental knowledge for the purpose of increasing innovation and organisational competitiveness at a later point in time.

The longitudinal study described in this paper involved two observations of the same variables over a period of six years (2008 and 2014). The proposed theoretical framework is presented in the following section. Details of the survey which was used to collect appropriate data to test the model is presented in section 3 and the results of testing the models are detailed in section 4. The results and managerial implications are discussed in section 5 which is followed by the conclusions of the research in section 6.

2. The Proposed Research Model

2.1 Connecting the Spanish hospitality industry to environmental knowledge

In order to answer the questions above, a model was developed using quantitative data from the Spanish hospitality industry, in particular the section dealing with hotel operation and management. The Spanish hospitality industry is a very relevant sector within the Spanish economy (Cadarso, 2005). The Spanish hospitality industry includes approximately 52.7 million tourists, representing potential revenue of close to 41.61 billion Euros (Domínguez-Vila et al., 2015), and Spain is currently ranked fourth in terms of international tourist arrivals and second in international tourist receipts (United Nations World Tourism Organization [UNWTO], 2011).

As shown in Figure 1, the 2008–2014 Spanish financial crisis impact on the tourism industry has become apparent with a decrease of 2 % in international tourist arrivals for 2009 and it is currently putting existing business models under pressure (Alegre & Sard, 2015). In this regard, 2008 was the year when the tourist industry did not contribute to the growth of the Spanish economy for the first time since records began. Just the opposite, the income generated by the tourist industry in Spain decreased in 1.1% with respect to 2007 (National Statistics Institute Information Bulletin, 2008). However, while the Spanish economy as a whole has languished since the start of the European sovereign debt crisis in 2008, the Spanish tourism industry has continued to grow strongly (Gómez-Loscos & González, 2014). Revenue from inbound tourism has increased by almost 14% since 2008 – meaning that the tourism industry is now the Spanish's first largest export earner (Canova & Dallari, 2013), reporting 5.1% of the Spanish gross domestic product (GDP) in 2012 (Gómez-Loscos & González, 2014).

Insert Figure 1 about here

It should be noted, however, that the European Parliament and the Spanish public sector is making continuous efforts to innovate Spanish tourism and increase attractiveness by shifting from standards/basic products in traditional markets to specialised products which address new markets and are tuned on different consumers' preferences (WTO, 2014). In this regard, sustainable development is one of the world's most important priorities in the efforts to attain the well-being of mankind (Nouri et al., 2008). As Carmona-Moreno et al. (2004) state, the environmental policy in hotels is fundamental for their results, as these depend, essentially, on the environment in which hotels are located. Thus, the preservation of the environment becomes a crucial factor influencing hotel operations. Examples of these efforts are new environmental regulations, as 2008/98/EC updated on 14/07/2011, whose aims are to promote high quality recycling (Directive 2008/98/EC).

In the Spanish hospitality industry the growing interest of tourists in the environment has led to the promotion of ecotourism and with it the efforts to develop strategies that focus on the environment (Brockhoff et al., 1999). The concept of environmental knowledge has been invoked to characterise the way in which organisations align their strategic goals to sustainable development (Wernick, 2003). This means that organisations with environmental knowledge will know what can be done about environmental problems and they understand the benefits of environmentally responsible goals (Frick et al., 2004). As Po-Shin & Li-Hsing (2009) suggest

environmental knowledge involves what people know and are concerned about regarding the natural environment, their responsibilities towards environmental protection and the relationship between the economy and sustainable development.

It should also be noted that the Spanish tourism sector is very complex and requires intensive use of knowledge resources to competitively operate in the market and satisfy its customer needs (Gómez-Loscos & González, 2014). In that respect, The National and Integral Tourism Plan 2012-2015 includes transversal measures to promote tourism by developing innovative products. Development of these innovations shall be addressed by systematically integrating sustainability and environmental issues, attention to technological innovation (e.g. the role of social media) as well as investment in human resource development (PNIT, 2012). These considerations lead us to argue that new environmental regulations may put new demands on model management (Erdogana & Baris, 2007). Thus, as Alegre and Sard (2015) note, the people responsible of tourist destinations are redirecting their market strategies towards the protection of their social and natural resources.

The above discussion provides an illustration that for Spanish hospitality companies to grow and prosper in a turbulent context, such as the Spanish tourism sector during the period we have examined (2008-2014), it is necessary for them to create environmental knowledge. Furthermore, like other service providers, hospitality companies need ways of remembering what others do and their perceptions of why others act (e.g. prevention behaviours such as buying second-hand or separation and collection systems). Thus, by gathering data from the Spanish tourism sector during the period we have examined (2008-2014), we can learn how its companies are getting over this difficult situation. It is with this in mind that we propose that the Spanish tourism sector during the period we have examined (2008-2014) is an appropriate setting for an investigation into environmental knowledge and its impact on organizational performance because during this period Spanish hospitality companies have required an intensive understanding of environmental knowledge. Below, we provide an overview of current research, which addresses these relationships.

2.2 Connecting the SECI model to environmental knowledge

In the same way that there are different environmental codes of conduct for tourism (Mihalic, 2000), environmental knowledge varies greatly in coverage, scope and content. Nieves and Haller (2014) gain insight into the processes within the development of knowledge by explaining two types of knowledge in their relation to environmental dynamism. Declarative knowledge shows a more significant relation to the ability to make use of the opportunities the environment offers (sensing) and to create new knowledge in response (learning), while procedural knowledge is linked to specific areas of the firm and shows a greater influence on changes affecting internal organizational resources and activities (Nieves & Haller, 2014). Put another way, while procedural environmental knowledge may be thought of as comprising environmental memories (e.g. stocks of data, information and knowledge resources) that have been gathered and accumulated by an organisation by virtue of its knowledge structures (Chou, 2005; Leonidou et al., 2013), declarative environmental knowledge is a process that entails being good at transferring knowledge from one context to another (Gold et al., 2001; Nieves & Haller, 2014)

What the above considerations could mean for environmental knowledge is that declarative environmental knowledge is more related to apply knowledge (e.g. comparing the most polluting techniques with the less polluting ones). The focus of this paper is on the procedural environmental knowledge, we will therefore focus on our consideration that "environmental knowledge" is closer to a wide range of resources for effective action (i.e. procedural knowledge). For example, the environmental processes, green programs, environmental emergency plans and measures that the company has actually acquired, which may also provide it with the incentive to improve efficiency (Chou et al., 2005).

One way to gain environmental knowledge consists of developing a continuous process of dynamic interactions between strategic goals and environmental challenges (Shawa & Williams, 2009). As Martelo & Cegarra-Navarro (2014) noted, knowledge in a firm emerges both from inside and outside the firm. By doing so, the SECI model may play an important role in the creation of environmental knowledge since it is a way of transferring knowledge to refine the knowledge existing within the organisation while also improving the effectiveness of its search and retrieval strategies. A key argument supporting the SECI model is that knowledge held by individuals is shared with other individuals so it interconnects to a new knowledge (Nonaka et al., 2000).

Nonaka & Takeuchi (1995) suggest four dimensions of the SECI model, each playing different but complementary roles in explaining how knowledge can be created in organisations. While sharing tacit knowledge between actors is considered a socialisation process, tacit knowledge becomes explicit through an externalisation process. This conversion is due to a social process between groups and individuals (Nonaka & Takeuchi, 1995). While the ability to maintain the explicit knowledge within the organisation is defined as combination, internalisation happens when explicit knowledge transforms into tacit and thus becomes part of an individual's expertise. Therefore, internalisation means the understanding of explicit knowledge resources.

The creation of environmental knowledge supposes, in this case, the reactivation and development of new information about events, trends, and relationships in the external environment of the organisation (Shawa & Williams, 2009). For example, if there is no prior knowledge or history associated with environmental issues, then a failure to act towards achieving the strategic goals of the organisation may result in a search for environmental knowledge at a given time (T). This, in turn, fosters learning and therefore the absorption of new knowledge by employees (Choo & Auster, 1993). As Boiral (2002) points out, this knowledge includes employee compliance with new practices. Some of these new practices include the exchange of information and sharing of environmental concerns (Fryxel & Lo, 2003), the acceptance of constraints related to the prevention of pollution (Cordano & Frieze, 2000), and collaboration with technical services to develop cleaner processes (Aggeri, 1999).

The above considerations have led us to frame the first hypothesis of our study as follows:

H1: The SECI model at a point in time (t0) has a positive effect on environmental knowledge at the same point in time (t0).

2.2 Connecting environmental knowledge to the SECI model over time

As competition intensifies and the pace of change accelerates, it is likely that aspects of environmental knowledge (e.g. environmental routines and procedures) will change over time (Imran et al., 2014), requiring the modification of some knowledge structures (Aggeri, 1999; Brockhoff et al., 1999). Prior research has also shown that the effect of environmental initiatives on business performance can vary substantially in a turbulent context (Cegarra-Navarro et al., 2013), such as the Spanish hospitality sector during the period we have examined. In these circumstances it becomes necessary for hospitality companies to update their existing knowledge of environmental issues (Fraj et al., 2015). It should also be noted that a number of authors are focused on time as a variable to be taken into consideration. For Gist & Mitchell, (1992) an individual's level of self-efficacy can be expected to change over time as new information and experience are acquired though direct experience with the task the individual performs, the performance feedback received, among other factors. Along the same lines, Adam's (1990) work shows, that "causal time" is seen as one-dimensional, structured in terms of past (t_0), present (t_1), and future (t_n).

The above considerations have led the authors to argue that once prior knowledge and skill are assessed at a given time (T), there is a range of potential responses by employees, which are determined by the type and characteristics of the challenges. In addition, impact and importance of environmental knowledge varies over time and prior environmental knowledge can soon become outdated or obsolete at a different point in *time.* There may be a number of different ways of understanding the concept of 'time'. In this regard, Crossan et al. (2005) focus on three characteristics of time, namely:
a) Time as a trigger for change. As Gersick's (1991) work shows, groups with very different characteristics change their behaviour when approaching the middle of the span of time they have to perform a task;
b) Time acts as a coordination mechanism for change. Time creates a shared calendar for change and, thus, serves to schedule activities and to maximise their synchronisation (Hedberg et al., 1976); and
c) Time as a resource for change. These considerations lead us to argue that 'time' provides organisational members with the temporal space they need to reflect on and conceive prior environmental knowledge (Tyre et al., 1996; Eisenhardt & Brown, 1998).

Our focus is on the relationship between casual time and environmental knowledge. For the purposes of this paper, the authors assume that environmental knowledge is a process which takes place over time, and that it takes time to update environmental knowledge resources (Lei et al., 1999; Purser et al., 2005). In this 'from-to' causal structure, whatever arises in the future has its origin in the past (Tulku, 1994). This means that hospitality companies which are responding to a series of new environmental challenges are forced to 'think and act over time' (McKenna, 1997), and demands for instant responses frequently means relying on prior environmental knowledge. Therefore, when the rate of change itself is steadily accelerating, this means that it becomes highly problematic whether the environmental knowledge needed to increase company benefits can be accessed in a timely manner (e.g., Rondinelli & Vastag 2000; Zhang et al., 2000).

Environmental issues and management challenges are likely to change over time (Bohdanowicz, 2005). An example of this is the emergence of new environmental

regulations which may go far beyond the current company's plans to issue new standards for greenhouse gas emissions. As these environmental regulations change, it may become necessary for the organisation not only to exploit their prior environmental knowledge about these regulations but also to update (i.e. replace) such knowledge. Hence the ability of a firm to combine prior environmental knowledge with new one over time is therefore essential if a business is to align its processes, products and services with new challenges to face new or changing environmental issues. This is where a good knowledge management program such as a SECI program should distribute the new acquired information amongst all the employees involved in environment-related activities, codifying and storing such information for future uses, retrieving past successful environmental experiences, but also being able to continuously renovate past environmental experience with new acquired knowledge (Carmona-Moreno et al., 2004). As a consequence, the SECI program at a later point in time acts as a facilitator in the relationship between environmental knowledge at a given moment and environmental knowledge at a later point, since it means that new environmental knowledge can be socialised, externalised, combined and internationalised using past knowledge and also used in the innovation process.

Therefore, we propose the following hypothesis:

H2: The impact of environmental knowledge (EK) at a given time (EK_{to}) on environmental knowledge at a later point in time (EK_{t+n}) is positively mediated through a knowledge management program ($SECI_{t+n}$).

2.3 Connecting environmental knowledge to organisational performance

The Spanish hospitality industry is a very complex one and requires intensive use of knowledge resources to successfully operate in a competitive market, meeting the increasingly complex needs of it customers (Claver-Cortés et al., 2006). In hospitality institutions, staff need appropriate and up-to-date knowledge to face a number of environmental challenges, including the need to implement new customer engagement strategies such as those based on social networks, increasing customer demands and global competition to reach and attract new customers (Chandana, 2001). These considerations led us to understanding that up-to-date environmental knowledge plays an important role in the improvement of organisational performance since it facilitates a situation where, if something is being done wrong, the organisation can change to quickly resolve it (King & Lenox, 2001). This in turn may help hotels and other organisations from the hospitality industry to achieve their operational full potential (Cegarra-Navarro & Martínez-Martinez, 2010).

As the customer profile changes (e.g. physical location, behaviour, environmental preferences etc.), it becomes an imperative for hospitality companies not only to revise and update the environmental knowledge but also to effectively use such knowledge. Using up to date environmental knowledge may have a positive effect in the public's perception, which is likely to result in an increase in the number of visitors to the hotels and more benefits being receive from the use of their installations and services (Carmona-Moreno et al., 2004). As Boiral (2002) noted, the existence of environmental knowledge helps both companies and customers alike to obtain beneficial results. For example, hotel operators encourage their guests to participate in new programmes to reuse their towels, which benefits the environment but also help reducing laundry

expenses. Therefore, hotels equipped with up to date environmental knowledge can provide a more competitive way to deliver services, which could enhance the public perception as the company is seen to be more socially responsible (Erdogan & Tosun, 2009).

Hence, we state that:

H3: The existence of up-to-date environmental knowledge will determine the extent to which the company achieves better organisational performance

Taking into account all of the above, this study proposes the structural model shown in Figure 2. In summary, a firm with a SECI program possesses a key capability for the updating of environmental knowledge. To manage prior environmental knowledge effectively, firms could put in place a SECI program which enables employees to update their assumptions and then replace new or modified environmental knowledge. Finally, firms with a SECI program will be able to use up-to-date environmental knowledge in order to improve organisational performance.

Insert Figure 2 about here

3. Research Method

3.1 Data collection

As noted previously, the focus of the data collection process was the Spanish hospitality industry. The unit of analysis for this study was the company, on the assumption that aspects relating to the creation of environmental knowledge affect the entire organisation. Relevant data sets were collected through telephone interviews with the CEO or owner of every business using a simple structured questionnaire. A list of 560 Hotel Operators was provided by the SABI[1] database (from the SABI Database based on the statistics for the year 2006), which was used as an initial sampling frame. All companies were included in the CNAE-552 (The Spanish National Classification of Economic Activities 552) and had ten or more employees. Before conducting the survey, the businesses were contacted by telephone and invited to participate in the study. Potential participants were informed of the objectives of the research and reassured of its strictly scientific and confidential nature, as well as the global and anonymous treatment to be given to any data collected. In total, 560 companies were contacted by telephone and invited to participate in the study. A total of 245 companies agreed to participate in the first instance. These 245 companies were then contacted again for the purpose of data collection. Participants were asked questions about environmental activities carried out by their hotels and the learning processes implemented to create and update environmental knowledge in a context of intensive innovation.

Data sets were gathered in two phases, the first of which lasted two months, from early September to the end of October 2008. From a sample of 245 companies, 127

[1] Sistema de Análisis de Balances Ibéricos (SABI database) contains financial information for 520.000 companies (480.000 from Spain and 40.000 from Portugal). This includes public and private, Spanish and Portuguese companies, with up to 10 years of data, updated daily.

companies responded to the survey. The size of these organisations (in terms of number of employees) can be described as follows:

- 41 of these companies have 10-49 employees,
- 59 companies have 50-249 employees,
- 18 companies have 250-499 employees, and
- 9 companies have more than 500 employees

This produces a response rate of 22.67% of the total number of companies invited to participate in the study and 51.83% response rate when we consider the companies which agreed to participate.

A comparison between companies which had provided a response and those that had not done so yielded no significant differences in relation to turnover, total assets or the number of employees, which suggests that non-response bias did not constitute a significant issue in this research (Armstrong & Overton, 1977).

The second stage in the data collection process within this research was conducted six years after the completion of the first phase. For approximately two months, between January and February 2014, the same companies that had completed the survey six years earlier were contacted. A survey was conducted and a total of 87 responses were collected, for a response rate of 15.53% of the total.

3.2 Measures

Churchill's (1979) approach to questionnaire development was used. Scales were combined from several other relevant empirical studies with new items to make an initial list of 19 items distributed as follows: 4x3=12 of these measuring knowledge management processes, 3 focused on measurement of environmental knowledge and 4 items measuring organisational performance. The survey was initially validated by academics with expertise in organisational learning from Universities of Murcia and Cartagena (Spain) during the period of June – July 2008.

A series of telephone interviews were then conducted involving managers from a pilot sample of 2 leading Spanish hotels. These respondents were asked to indicate the reasons why they implement environmental initiatives. All responses were related to economic reasons, e.g. conservation of materials or energy, adherence to industry codes or legislative requirements, decreased costs, process and product innovation. In fact, it was found that such initiatives were also being used by businesses as communication tools to demonstrate their commitment to preventing issues which could have a negative impact on the environment. As a result of this pre-testing, we made some minor modifications based on the suggestions received. Specific issues relating to the development of the questionnaire and its related constructs are elaborated on below (see Appendix for a list of items).

- The final measures relating to the existence of knowledge management processes consisted of 4 items adapted from a scale designed by Lee & Choi (2003) to measure the constructs of knowledge socialisation, externalisation, combination and internalisation. Consistent with the findings of Lee & Choi (2003), items that addressed knowledge socialisation were interwoven with issues related to encouraging individuals in the organisation to track changing markets and share market intelligence with external agents. Also consistent with Lee & Choi's (2003) findings, items that addressed knowledge externalisation

were interwoven with issues related to the encouragement of selected individuals in the organisation to transform their tacit knowledge of customers or experts into other forms which were easy to understand by others. Knowledge combination items described the process of formalising and storing concepts into a knowledge system, such as databases and knowledge bases so that reconfiguration of existing information through sorting, adding, combining, and categorising explicit knowledge could be used to create new knowledge. Knowledge internalisation items were focused on the use of knowledge about environmental issues for the development and implementation of business plans.

- Previous studies by Boiral (2002) provide guidance in developing items to measure environmental knowledge. The importance of 'environmental knowledge' to cognitively diverse teams relates to enhancement of technical, administrative and social strategies through the accurate understanding of the information available to groups and where such information is located in relation to environmental initiatives. This highlights the importance of supporting policies, rules, reporting structures and decision-making protocols that encourage the introduction of clean technologies and approaches to reduce pollution that often leads to substantial savings of materials and energy.

- As the use of objective measures may pose some challenges to researchers while making causal inference from the historical data (March & Sutton, 1997), this study adopts subjective measures to achieve a more comprehensive evaluation of performance of the firm. In this regard, several measures of business performance have appeared in literature and we adopt the growth-based measures proposed by Kaplan & Norton (1992), and Klassen & McLaughlin (1996) for sales, profits and profitability on total assets.

3.3 Data analysis

This study used PLS-Graph software version 03.00 Build 1058 (Chin, 2003) to analyse the data collected. PLS was selected due to the characteristics of our model and sample. Our model is complex, uses reflective indicators and our data is non-normal. Other techniques of structural equation modeling (e.g., the covariance-based model performed by LISREL or AMOS) cannot be applied in these circumstances (e.g., Reinartz et al., 2009; Chin & Newsted, 1999; Chin, 2010; Hair et al., 2011; Hair et al., 2012; Polites et al., 2012; Hair et al., 2013).

Using PLS involves a two-stage approach (Barclay et al., 1995). The first step requires the assessment of the measurement model. This allows the relationships between the observable variables and theoretical concepts to be specified. This analysis is performed in relation to the attributes of individual item reliability, construct reliability, average variance extracted (AVE), and discriminant validity of the indicators of latent variables. In the second step, the structural model is evaluated. The objective of this is to test the extent to which the causal relationships specified by the proposed model are consistent with the available data. For hypothesis testing, we used the bootstrapping procedure recommended by Chin (1998).

In order to analyse the relationships between the different constructs and their indicators, the latent model perspective was adopted, in which the latent variable is

understood to be the cause of the indicators. We therefore refer to reflective indicators for first-order constructs or dimensions. Three constructs in the model are operationalised as first-order reflective constructs (i.e. environmental knowledge 2008, environmental knowledge 2014 and business performance 2014), while knowledge management practices on 2008 (SECI 08) and knowledge management practices on 2014 (SECI 14) are modelled as second-order reflective constructs. With regard to the measurement model, we began by assessing the individual item reliability (Table 1). The indicators exceed the accepted threshold of 0.7 for each factor loading (Carmines & Zeller, 1979).

Insert Table 1 about here

From an examination of the results in Table 2 it can be argued that all of the constructs are reliable. The values for both the Cronbach's alpha coefficient and composite reliability are greater than the 0.7 required in the early stages of research and than the stricter value of 0.8 for basic research (Nunnally, 1978). The AVE should be greater than 0.5, meaning that at least 50% variance of the indicators should be accounted for (Fornell & Larcker, 1981). All the constructs of our model exceeded this condition (Table 2). To assess the discriminant validity, we compared the square root of the AVE (the diagonal in Table 2) with the correlations between constructs (the off-diagonal elements in Table 2). On average, each construct relates more strongly to its own measures than to others.

Place Table 2 about here

As noted above, a second-order confirmatory factor analysis was conducted of a model depicting the constructs of knowledge socialisation, externalisation, combination and internalisation. From an examination of the results shown in Table 3 and Table 4, all first-order and second-order factor loadings were significant. In addition to this, all the knowledge creation constructs involving two organisations (i.e. SECI 08 and SECI 14) explain a high amount of variance in their respective knowledge processes (i.e. socialisation, externalisation, combination and internalisation), thereby providing evidence that SECI 2008 and SECI 2014 are multifaceted constructs, construed from four dimensions (i.e. socialisation, externalisation, combination and internalisation).

Place Table 3 about here
Place Table 4 about here

4. Results

The structural model resulting from the PLS analysis is summarised in Table 5, where the variance of endogenous variables (R2) and the standardised path coefficients (β) are shown. As it can be noticed, all the hypothesised relationships have shown to be significant, and therefore, the hypotheses leading this research have been confirmed to be valid. Since PLS makes no distributional assumptions in its parameter estimation, traditional parameter-based techniques for significance testing and modelling were used for this study (Chin, 1998). One significant consequence of the comparison between

covariance structure analysis modelling approaches and PLS is that no proper overall goodness-of-fit measures exist for models using the latter (Hulland, 1999).

The structural model is evaluated by examining the R2 values and the size of the structural path coefficients. Adopting the approach used by Tippins & Sohi (2003), we looked for the presence of the mediating effect by comparing the direct effect between variables and the competing links where the mediated variable is inserted, whereby two significant links are estimated and evaluated in a search for significant differences. Table 5 shows the results of the two competing links. The proportion variance explained in 'BP 14' was 42 per cent. With regard to hypothesis H1, the influence of 'SECI 08' on 'EK 08' was evident ($\beta = 0.71$, $p < 0.001$).

With regard to hypothesis H2, we explored the presence of a mediating effect by comparing the relationship between 'EK 08' and 'EK 14', as well as the competing link where 'SECI 14' is included. Table 5 shows the results of these two competing links. The first link (direct effect) examined the direct relationship between 'EK 08' and 'EK 14', whilst the second link (partial mediation) examined the same relationship with 'SECI 2014' by acting as a mediator. The results of the partial mediation link support our hypothesis. Firstly, the partial mediation model explains more variance in 'EK 14' than the direct effect model (0.79 vs. 0.75). Secondly, positive relationships exist between 'EK 08' and 'SECI 2014' ($\beta = 0.63$, $p < 0.001$) and between 'SECI 2014' and 'EK 14' ($\beta = 0.18$, $p < 0.05$). Finally, the significant relationship between 'EK 08' and 'EK 14'in the direct effect model ($\beta = 0.86$, $p < 0.001$) diminishes in the partial mediation model ($\beta = 0.69$, $p < 0.001$). We also estimated the ratio F2 suggested by Chin (1998), to understand the significance of the improvement of the partial mediation model over the direct effect model, whereby such an improvement is considered significant in those cases where F2 is greater than 0.02. In our study, F2 was found to be 0.19, and therefore we conclude that there has been a significant improvement. Together, these three areas provide significant evidence that there is a discernible mediating effect of 'SECI 2014' and that the partial mediation model represents a significant improvement over the direct effect model. With regard to hypothesis H3, the effects of 'EK 14' on 'BP 14' were fully verified ($\beta = 0.64$, $p < 0.001$). Consequently, the findings provided full support for H1, H2 and H3.

5. Discussion

The first contribution made by this research is the questioning of the existing models of the relationship between knowledge management processes and environmental knowledge over time. In doing so, the authors have included time as a variable in the analysis and, have focused on the need to create environmental knowledge at a given time (T) in order for a more efficient learning to take place at a later point in time (T+6 years in this case). The concept of knowledge management processes was explored by studying the processes behind the organisational knowledge creation construct (i.e. socialisation, externalisation, combination, and internalisation) and then studying its impact on environmental knowledge. In summary, a null hypothesis [that environmental knowledge at a given time T is a prerequisite in the SECI program at a later point in time (T+6)] was tested against the alternative hypothesis [that environmental knowledge at time (T) is not a required prior step in the implementation of knowledge management processes] through an empirical study of 87 companies in the Spanish hospitality sector through PLS.

The second contribution of this research is derived from the results of testing the hypotheses in a real context. Environmental knowledge at a time (T) is found to be significant in predicting the success of knowledge management processes later on. The managerial implications of the relationships observed between the factors that constitute the conceptual framework shown in Figure 1 are discussed in more detail below.

The analysis of the data collected provided full support for H1: (*SECI 08 → EK 08*). This finding corroborates the notion that specific knowledge management processes have to be used to create environmental knowledge and thereby contribute to its dissemination and retention within a company (Boiral, 2009). A possible explanation for the significance of such an effect may be related to the fact that before environmental knowledge can be created specific assumptions should be established and shared. Failing to do so will result in only a few individuals within the organisation having access to such relevant knowledge resources, which in turn may lead to the under-utilisation of relevant knowledge or the utilisation of knowledge which is not relevant, both of which cases are likely to lead to a degradation of environmental knowledge (Cegarra-Navarro et al., 2013). One interpretation of this relationship is that through the knowledge management processes, a company can allow individuals to adjust their mental models and the nature of their assumptions to highlight some of the environmental issues and concerns that may have a direct effect on the entire company, its operation and results.

Regarding H2, the results support the position that if the organisation considers establishing a strategy for the creation of environmental knowledge resources at a given point in time, then this knowledge is likely to have a positive influence on the conditions that stimulate knowledge management processes for the creation and use of new environmental knowledge resources in the future, which may have a significant impact on the organisation and its performance. A plausible explanation for this result is that reusing prior environmental knowledge puts the upcoming knowledge management processes into a familiar context for members of the organisation. In other words, knowledge management processes provide a path which activates and gives value to environmental knowledge which was previously created. We believe that this is an important finding which provides the basis for a hotel to become more competitive, as its competitiveness relies on the hotel's ability to reuse and update the relevant knowledge of its workforce.

However, many hotel managers are cutting back on knowledge management programs by simply using prior environmental knowledge instead of implementing more innovative programs which are supported by knowledge of new environmental challenges (Aggeri, 1999). If this is the case it is possible that hotel managers are over-investing in the exploitation of prior environmental knowledge, and under-investing in (or underestimating the value of) mechanisms and aspects to develop and update existing environmental knowledge. This confirms the position adopted by Cegarra-Navarro & Martinez-Martinez (2010) when they argued that the use of environmental knowledge also needs to involve changes in the organisational knowledge structures. One way of doing this would be for senior management to set up a knowledge management program to embrace change and encourage new ideas and insights, which often lead to the creation of new environmental knowledge resources. Our results show that a knowledge management program is required for the enhancement of

environmental knowledge. In this respect, socialisation, externalisation, combination, and internalisation processes can be viewed as a mechanism for improving environmental knowledge as this may involve a process of replacing existing outdated environmental knowledge with new knowledge structures. SECI 14 enhances the effectiveness and efficiency of EK 08 which potentially leads to improved EK 14.

Regarding H3 (*EK 14→ BP 14*), the results support the argument that, in order to improve the performance of business operations, companies need to provide their workforce and other stakeholders with up-to-date environmental knowledge resources. These findings are important in the ongoing debate surrounding the relationship between environmental knowledge and business performance, and reinforce the views that environmental knowledge may lead to increased company benefits (e.g. Rondinelli & Vastag, 2000; Zhang et al., 2000). A possible explanation for these findings relies on the fact that when information or knowledge is up-to-date and is not fragmented within a company, customer feedback is easy to obtain and, as a result, performance improves. As Erdogana & Baris (2007) noted, holding up-to-date environmental knowledge will lead to a reduced consumption of energy, water, and materials, thus improving organisational performance. Thus, the easy retrieval of environmental knowledge is a critical aspect in responding to the growing customer demand for environmentally friendly programs and hence improving organisational performance (Bohdanowicz, 2005).

Managerial implications

There are different methods for managing environmental issues. However, companies still show some resistance to changing their current environmental programs. The general notion among many businesses is that once they have an environmental program in place, they should not change it. The results from this study contradict such a view. As competition intensifies and the pace of change accelerates, aspects of environmental knowledge (e.g. routines and procedures) are likely to change over time, requiring the modification of some of the contents of this knowledge. Our findings reflect the need for managers to become more aware of the importance of time when they drive the conditions and/or context where environmental knowledge can be exploited to increase company benefits such as cost savings resulting from eco-efficiency. Time appears to be an interesting variable to understand how environmental knowledge emerges and how it can be updated to improve an organisation and its performance. With this notion in mind, we argue that traditional concepts of managing and leading change based on knowledge management processes need to consider methods which aim at deepening participation or immersion in the immediacy of the temporal flow.

6. Conclusions

The above findings suggest that the creation of environmental knowledge is an important factor for organisations to become competitive, but it is not sufficient for them to maintain such a competitive advantage over time. It has been further observed that the creation of environmental knowledge strongly depends on environmental knowledge which was previously created and on the previous implementation of a knowledge management program facilitating socialisation, externalisation, combination, and internalisation. Through this program, individuals will be able to

update their mental models by focusing their efforts on problems that are more important for the organisation and its customers, which in turn facilitates the retrieval of prior environmental knowledge.

This study has some limitations. First, national cultural issues might influence the way organisations create and update environmental knowledge. Therefore, it would be interesting to extend the study to other countries, since national cultural issues might influence the results. Secondly, this study relies on the assumption that the CEO or general director of each of the organisation possesses key knowledge of the company and therefore our emphasis here is on finding commonalities among firms in terms of the critical knowledge areas they consider important and had access to. Although this subjective information is commonly used in studies (Glaister et al., 2008), future research using more than one individual who hold key knowledge within a firm (including managers, employees and even customers) will be a useful mechanism for the study to improve the internal validity of the SECI model and environmental knowledge. Thirdly, we would consider a further research into how other organisational factors (e.g. organisations' size and agility) which have not been included in this study are likely to affect the performance of the firm. Therefore, future research should investigate the potential links between different initiatives such as reducing waste production and resource and energy consumption by controlling and improving lighting, heating, ventilation, air conditioning, and water use, by making proper purchasing decisions on containers, use of returnable containers and recycling materials and the company goals. Fourthly, it is worth noting that this study doesn't differentiate between ownership criteria. Taking into account this limitation, it would be interesting to differentiate between ownership criteria (e.g. owning 100%; owning a share; only having a management) because owner-stakeholders might influence strategy and environmental knowledge indirectly. Finally, it may also be interesting to observe the change in the performance of companies after adopting environmental activities, through future case studies.

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Appendix
Questionnaire items

Socialization of knowledge (1= high disagreement and 10= high agreement):
SOC_1: Our company stresses gathering information from suppliers and customers.
SOC_2: Our company stresses building databases on products and service.
SOC_3: Our company stresses planning strategies by using published literature.
Externalisation of knowledge (1= high disagreement and 10= high agreement):
EXT_1: Our company stresses the use of deductive and inductive thinking.
EXT_2: Our company stresses the use of metaphors in dialogue for concept.
EXT_3: Our company stresses exchanging various ideas and dialogues.
Combination of knowledge (1= high disagreement and 10= high agreement):
COM_1: Our company stresses building up environmental materials by gathering management figures.
COM_2: Our company stresses building databases on products and service
COM_3: Our company stresses planning strategies by using published literature, computer simulation and forecasting.
Internalization of knowledge (1= high disagreement and 10= high agreement):
INT_1: Our company stresses forming teams as a model and conducting acquisition from databases, and sharing results with entire departments.
INT_2: Our company stresses enactive activities with functional departments by cross-functional development teams
INT_3: Our company stresses sharing and trying to understand management visions through communications with fellows.
Environmental knowledge (1= high disagreement and 10= high agreement):
EK_1: The company (hotel) uses less polluting industrial processes and products
EK_2: The company (hotel) has developed a green program (waste management, control of effluents, inventory of pollution sources)
EK_3: The company (hotel) has developed a drafting of environmental emergency plans and measures
Business Performance (1=much worse than competitors and 10=much better than competitors):
BP_1: Growth rate of sales
BP_2: Growth rate of profits
BP_3: Profitability rate on total assets
BP_4: Greater productivity

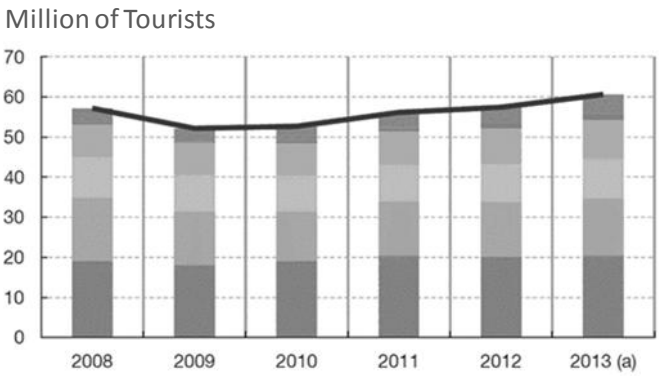

Fig. 1. *Visitor numbers (*modified from Gómez-Loscos and González, 2014: pp. 70*)*

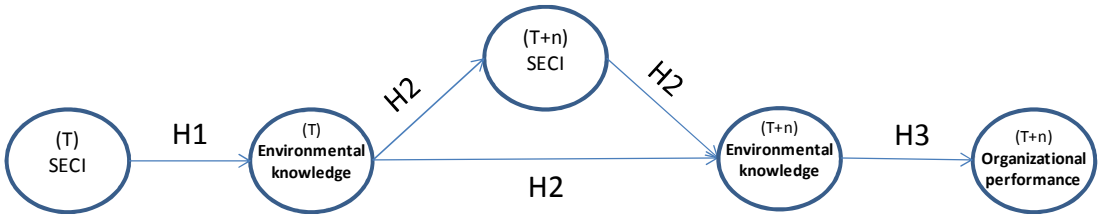

Fig. 2. *Theoretical model*

Table 1
Factor Loadings of reflective constructs

	SOC08	EXT08	COM08	INT08	EK08	SOC14	EXT14	COM14	INT14	EK14	BP14
SOC_1	***0.86***	0.42	0.48	0.42	0.51	0.54	0.37	0.47	0.43	0.53	0.27
SOC_2	***0.84***	0.43	0.42	0.48	0.60	0.71	0.36	0.42	0.50	0.64	0.36
SOC_3	***0.73***	0.44	0.34	0.61	0.28	0.41	0.43	0.34	0.66	0.22	0.15
EXT_1	0.48	***0.87***	0.49	0.65	0.53	0.46	0.60	0.47	0.54	0.48	0.42
EXT_2	0.51	***0.88***	0.40	0.50	0.51	0.51	0.76	0.39	0.46	0.44	0.29
EXT_3	0.29	***0.75***	0.36	0.32	0.34	0.29	0.71	0.33	0.24	0.26	0.23
COM_1	0.34	0.47	***0.91***	0.47	0.47	0.39	0.40	0.79	0.34	0.40	0.29
COM_2	0.54	0.48	***0.94***	0.46	0.60	0.58	0.45	0.88	0.44	0.62	0.37
COM_3	0.48	0.43	***0.91***	0.48	0.54	0.55	0.43	0.89	0.41	0.53	0.49
INT_1	0.42	0.50	0.45	***0.84***	0.47	0.39	0.28	0.38	0.58	0.29	0.23
INT_1	0.58	0.52	0.38	***0.88***	0.46	0.50	0.40	0.34	0.72	0.34	0.28
INT_1	0.62	0.59	0.54	***0.93***	0.56	0.43	0.40	0.47	0.72	0.40	0.29
EK_1	0.47	0.60	0.49	0.45	***0.84***	0.55	0.56	0.47	0.42	0.77	0.49
EK_2	0.53	0.45	0.60	0.49	***0.91***	0.49	0.40	0.54	0.36	0.80	0.59
EK_3	0.50	0.41	0.45	0.54	***0.85***	0.51	0.28	0.37	0.34	0.68	0.42
SOC*_1	0.53	0.58	0.57	0.47	0.53	***0.90***	0.61	0.60	0.55	0.58	0.39
SOC*_2	0.61	0.39	0.48	0.43	0.42	***0.90***	0.47	0.50	0.59	0.47	0.27
SOC*_9	0.67	0.36	0.41	0.40	0.63	***0.81***	0.39	0.41	0.45	0.65	0.41
EXT*_1	0.46	0.73	0.36	0.34	0.38	0.55	***0.88***	0.40	0.51	0.49	0.35
EXT*_2	0.32	0.72	0.36	0.34	0.34	0.30	***0.80***	0.34	0.31	0.31	0.26
EXT*_3	0.41	0.67	0.48	0.36	0.49	0.56	***0.90***	0.52	0.45	0.59	0.57
COM*_1	0.32	0.42	0.79	0.37	0.38	0.41	0.42	***0.91***	0.34	0.45	0.32
COM*_2	0.54	0.47	0.86	0.45	0.59	0.59	0.48	***0.94***	0.48	0.64	0.40
COM*_3	0.49	0.42	0.88	0.41	0.47	0.56	0.46	***0.93***	0.44	0.58	0.50
INT*_1	0.49	0.45	0.35	0.62	0.33	0.47	0.44	0.39	***0.87***	0.37	0.24
INT*_2	0.62	0.48	0.34	0.74	0.36	0.59	0.47	0.38	***0.90***	0.40	0.29
INT*_3	0.61	0.46	0.48	0.69	0.45	0.58	0.44	0.48	***0.91***	0.45	0.30
EK*_1	0.34	0.48	0.46	0.26	0.74	0.56	0.60	0.51	0.29	***0.85***	0.58
EK*_2	0.56	0.37	0.61	0.33	0.77	0.56	0.46	0.66	0.44	***0.90***	0.61
EK*_3	0.59	0.43	0.41	0.43	0.76	0.56	0.41	0.45	0.47	***0.85***	0.49
BP*_1	0.38	0.37	0.51	0.25	0.52	0.45	0.43	0.55	0.28	0.65	***0.83***
BP*_2	0.22	0.32	0.24	0.24	0.35	0.23	0.37	0.28	0.26	0.41	***0.80***
BP*_3	0.18	0.29	0.30	0.19	0.55	0.31	0.38	0.29	0.17	0.56	***0.83***
BP*_4	0.23	0.29	0.29	0.33	0.42	0.29	0.36	0.30	0.32	0.41	***0.79***

Note: * Year 2014

Table 2
Descriptive Statistics and Correlation Matrix

	Mean[a]	SD	CA	CR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13
1. SECI08	6.85	1.53	n.a.	n.a.	n.a.	**n.a.**												
2. SOC08	6.26	2.00	0.74	0.85	0.66	n.a.	**0.81**											
3. EXT08	6.46	1.91	0.77	0.87	0.69	n.a.	0.50	**0.83**										
4. COM08	6.87	1.99	0.89	0.93	0.82	n.a.	0.50	0.49	**0.90**									
5. INT08	7.80	1.70	0.86	0.91	0.78	n.a.	0.63	0.56	0.50	**0.88**								
6. EK08	6.20	2.11	0.83	0.90	0.75	0.70	0.56	0.54	0.59	0.55	**0.86**							
7. SECI14	6.99	1.50	n.a.	n.a.	n.a.	0.88	0.71	0.73	0.74	0.66	0.63	**n.a.**						
8. SOC14	6.93	1.77	0.84	0.90	0.76	0.69	0.67	0.48	0.55	0.50	0.59	n.a.	**0.87**					
9. EXT14	6.16	2.06	0.80	0.88	0.72	0.69	0.47	0.77	0.47	0.41	0.47	n.a.	0.53	**0.84**				
10. COM14	7.07	1.84	0.89	0.93	0.81	0.74	0.50	0.46	0.80	0.44	0.53	n.a.	0.57	0.49	**0.90**			
11. INT14	7.79	1.83	0.87	0.92	0.79	0.71	0.65	0.47	0.42	0.77	0.42	n.a.	0.61	0.49	0.45	**0.88**		
12. EK14	6.30	2.07	0.84	0.90	0.75	0.61	0.53	0.46	0.56	0.38	0.87	0.70	0.64	0.54	0.62	0.44	**0.86**	
13. BP14	6.38	1.93	0.83	0.89	0.66	0.43	0.30	0.36	0.41	0.31	0.56	0.50	0.39	0.45	0.42	0.31	0.63	**0.81**

Notes:
[a] Mean = the average score for all of the items included in this measure; S.D. = Standard Deviation; CA = Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted; n.a. = not applicable. [b] They represent the dimensions of each second-order construct. The bold numbers on the diagonal are the square root of the Average Variance Extracted. Off-diagonal elements are correlations among construct

Table 3
Second-order confirmatory factor analysis of SECI 08

First-order construct		First-order		Second-order	
	Indicator	Loading	*t*-value	Loading	*t*-value
Socialization 08 R^2=0.65	SOC_1	0.73	12.81	0.80	17.72
	SOC_2	0.86	26.97		
	SOC_3	0.84	26.18		
Externalization 08 R^2=0.66	EXT_1	0.86	33.91	0.80	19.59
	EXT_2	0.88	22.17		
	EXT_3	0.72	7.89		
Combination 08 R^2=0.62	COM_1	0.85	33.91	0.79	14.81
	COM_2	0.93	67.29		
	COM_3	0.91	4032		
Internalization 08 R^2=0.74	INT_1	0.83	19.62	0.85	31.15
	INT_1	0.88	35.25		
	INT_1	0.93	61.70		

Note: * Year 2014

Table 4
Second-order confirmatory factor analysis of SECI 14

First-order construct		First-order		Second-order	
	Indicator	Loading	*t*-value	Loading	*t*-value
Socialization 14 R^2=0.74	SOC*_1	0.90	61.56	0.86	38.90
	SOC*_2	0.90	37.16		
	SOC*_3	0.80	16.46		
Externalization 14 R^2=0.61	EXT*_1	0.87	27.02	0.78	16.63
	EXT*_2	0.76	10.25		
	EXT*_3	0.89	50.44		
Combination 14 R^2=0.64	COM*_1	0.84	19.88	0.79	17.01
	COM*_2	0.93	78.68		
	COM*_3	0.92	52.53		
Internalization 14 R^2=0.63	INT*_1	0.86	27.51	0.79	21.63
	INT*_1	0.89	37.84		
	INT*_1	0.90	35.60		

Table 5
Model statistics

Hypotheses	Path coefficients	T values	R^2	ΔR^2	F^2
H1: SECI 08 → EK 08	0.71***	14.19	0.50		
H2 EK 08→ SECI 14	0.63***	8.94	0.40		
H2: SECI 14 → EK 14	0.18**	1.98	0.79		
H2: EK 08 → EK 14 (only direct effect)	0.86***	11.67	0.75		
H2: EK 08 → EK 14 (mediated by SECI 14)	0.69***	5.07	0.79	0.04	0.19
H3: EK 14 → Business Performance 14	0.64***	10.82	0.42		

***p <.01, **p <.05, ns=not significant (based on a Student t (499) distribution with two tails).
t(.01,499)=2.585711627, t(.05,499)=1.964726835.