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Identifying hotel revenue management implementation drivers

Identificación de los impulsores de la implementación de la gestión de ingresos del hotel

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ABSTRACT. This research means to globally analyse which variables drive the implementation of Revenue Management and the specific variables related with its application that have been boosted. We selected the size of the establishment, belonging to a hotel chain, the implementation of Revenue Management and the use of specific Revenue Management software as driving forces for its application, as well as possible relations between them. The model verified the repercussion of these aspects on 13 variables related with demand and pricing and 13 with capacity management linked to its implementation. Variance-based Structural Equation Modelling (PLS-SEM) has been used to both build and test the model. We carried out measurements at two moments with a 10-year difference. Revenue Management has recently been more advanced and sophisticated. Belonging to a chain and the implementation of a Revenue Management system have been identified as driving forces which positively and significantly influence Revenue Management application.

RESUMEN. Con esta investigación se pretende analizar de forma global qué variables impulsan la implementación de Revenue Management y las variables concretas que han sido impulsadas por estas. Se seleccionan la dimensión del establecimiento, la pertenencia a cadena, la implantación de Revenue Management y la utilización de un software de Revenue Management como fuerzas impulsoras de su aplicación, así como la relación entre estas. El modelo confirma la influencia de estos aspectos para 13 de las variables relacionadas con la gestión de demanda y precios, y 13 relacionadas con la gestión de la capacidad, todas ellas vinculadas con su implantación. Se utiliza un modelo de ecuaciones estructurales (PLS-SEM) tanto para la construcción como para la prueba del modelo. La medición de variables se realiza en dos momentos diferentes con una diferencia de 10 años entre la primera y la segunda medición. Los resultados confirman que Revenue Management ha avanzado y es más sofisticado en la actualidad. La pertenencia a cadena y la implantación de un sistema de Revenue Management (software) se identifican como fuerzas impulsoras que ejercen una influencia positiva y significativa sobre la aplicación de Revenue Management.

KEYWORDS: Revenue management, Hotel implementation, Model, Drivers, Partial least squares.

PALABRAS CLAVE: Revenue management, Implantación en hoteles, Modelo, Impulsores, Mínimos cuadrados parciales.

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1. Introduction

Revenue Management has its origin in the airline industry more than sixty years ago (Anderson & Xie, 2010, p. 53). It is the basis of the booking systems which currently operate and that enable the increase of revenues via the optimisation of joint management of the perishable resources (inventory) of the firm (for example, hotel rooms per night, places of a training centre per day or event), the demand and the prices. Given the benefits and advantages which its implementation yields, it has been extended to numerous sectors. Plenty of success cases have been noted, such as American Airlines (driver of its development), British Airways, Marriott International, Hilton, Holiday Inns, Sheraton, Disney, UPS, FedEx and Ford Motor Company, among others (Cross, Higbie, & Cross, 2010).

The innovative character of this management philosophy has been highlighted since its beginnings and currently by numerous authors. Belobaba & Wilson (1997) underscore the novelty of Revenue Management to determine the inventory of seats (referring to airlines), by allowing an increase of future revenues via establishing limits about advance booking. Other authors coincide in asserting that the revising of classical pricing management concepts has been required and that their optimisation means innovation at both the strategic and the tactical level (Cross, Higbie, & Cross, 2010; Lieberman, 2010; Post and Spann, 2012; Pekgün, Menich, Achatya, Finch, Dschamps, Mallery, Sistine, Christianson, & Fuller, 2013).

Despite pricing or other elements of Revenue Management standing out, it also provides major upgrades in the use of perishable resources through its capacity management. Its implementation can minimise the sum of oversales and spoilage (Kasilingam, 1996), enables obtaining productivity improvements (Elimam & Dodin, 2001; Kimes & Thompson, 2004), a higher utilisation of perishable inventories (Elimam & Dodin, 2001) and improved capacity/scheduling linkage (Pinder, 2005).

For this reason, we can therefore state that Revenue Management has signified important advances, mainly in the administering of the processes geared to capacity management, on the one hand, and demand and pricing management, on the other hand. These have driven the economic progress of the firms in which it has been implemented. However, in previous research it was not proposed to go deeply into the factors that can boost and influence this process or to identify the specific variables that drive the most relevant changes stemming from its implementation.

This research's main aim is to identify the variables which stand out when Revenue Management is adopted by hotels. To do so, we set out from the identification of the variables that can affect the implementation of Revenue Management, and those which enable us to measure and analyse demand-pricing and capacity management. In order to identify the variables in which this philosophy is reflected, we practise a measurement of them at two moments in time with a difference of 10 years between the first and second series of data. To study the global relation between variables, we specify and test a model for each study case. The comparison of the two models allows us to both analyse the evolution in the Revenue Management implementation and to know the variables which have driven a greater change and, therefore, to identify the driving forces.

2. Literature review

The Revenue Management implementation is influenced by different factors. The study of previous works has allowed us to identify the dimension of the hotel (number of rooms), belonging to a hotel chain, confirmation of its implementation and application of a Revenue Management system as the main ones. These are the ones which we will consider as drivers of its application. On the other hand, so that the improvement in process management provided by the Revenue Management implementation can be noted, we turn to works centred on its management in the hotel sector and which carry out a discussion about the data and policies which its application means. To complete this latter analysis, the variables are grouped into two dimensions to distinguish the aspects related with the demand and pricing management and those with capacity management. The selection of the variables included in the model are now justified.

Different behaviours have traditionally been detected depending on the dimension of the hotel and its belonging to hotel chains. Jarvis et al. (1998) identify the number of rooms and the ownership regime as variables which influence the Revenue Management application in hotel establishments. Also, aware of this reality, diverse publications, in the light of an empirical study, analyse what happens in the business reality, differentiating between small and medium-sized hotels (European Commission, 1997; Luciani, 1999), due to their belonging to hotel chains (Bradley & Ingold, 1993; Weatherford & Kimes, 2003; Rohlfs & Kimes, 2007; Noone & Hultberg, 2011; Wang, 2012; Chen & Xie, 2013), and even analyzing the influence of various of these factors at the same time (Chávez-Miranda, 2005; Talón, 2010).

The first works which tackle implementation of Revenue Management in hotels date from the end of the 1980s (Orkin, 1988; Relihan, 1989; Kimes, 1989a, 1989b). In later articles the knowledge of this aspect is broadened. Examples of this are the formulation of the seven steps to attain success with Revenue Management by Jones and Hamilton (1992), the study of the key variables which justify it (Jarvis et al., 1998), the proposal of a model which describes the implementation process (Jones, 1999) and the four steps for its implementation (Huyton & Thomas, 2000). These works have allowed us to select some of the variables in which Revenue Management application is reflected, although in those investigations, unlike in this research, the possible influence on its application is not verified. In later studies in Spain (Chávez-Miranda, 2005; Talón, González, & Figueroa, 2014), the partial influence of some of these dimensions is considered but the individual or joint interaction among them is not proposed, nor is the identification of factors which contribute to process innovation related with Revenue Management application.

On the other hand, the complexity and variety of decisions to be adopted has determined the need to count on Revenue Management Systems, as various authors have recognised since its origins (Kimes, 1989a and 1989b; Jones & Hamilton, 1992). In this sense, numerous authors have acknowledged that the availability of a Revenue Management System enables obtaining additional improvements to those achieved with the Revenue Management implementation, such as increases in the revenues or profits of 2-5% along with the possibility of obtaining competitive advantages (Belobaba & Wilson, 1997; Kimes & Wagner, 2001; Emeksiz, Gursoy, & Icoz, 2006). In more recent research, the advantages of using software for the application of Revenue Management continue being highlighted (Aziz, Saleh, Rasmy, & ElShishiny, 2011; Bayoumi, Saleh, Atiya, & Aziz, 2013; Talón et al., 2014; Domingo-Carrillo, Chávez-Miranda, & Escobar-Pérez., 2016).

With respect to the identification of grouped variables, such as management of demand-pricing and capacity, given that the first field work was developed in 2005, we set out from the classic works dedicated to the implementation of Revenue Management (Jomes & Hamilton, 1992; Jarvis, Lindh, & Jones, 1998; Jones, 1999; European Commission, 1997; Luciani, 1999 and Upchurch, Ellis, & Seo. 2002 y 2003). Nevertheless, numerous references have been consulted which corroborate the relevance and the suitability of the variables used. Table 1 and Table 2 gather the works of the different authors who have tackled the topic, classified based on the variables used in this study.

Segmentation	Kimes (1989a and b); Dunn & Brooks (1990); Jones & Hamilton (1992); Weatherford & Bodily (1992); Lieberman (1993); HIRO (1994); Bitran & Mondschein (1995); Donaghy, McMahon, & McDowell (1995); Donaghand & McMahon (1995); Griffin (1995); Jauncey *et al.* (1995); Ladany, (1996); Donaghand *et al.* (1997a and b); Huyton & Peters (1997); Jarvis *et al.* (1998); Lambert & Lambert (1988); Schwartz (1998); Hilton (1999); Luciani (1999); Badinelli (2000); Ghalia & Wang (2000); Kimes (2000); McMahon-Beattie & Donaghy (2000); Kimes & McGuire (2001); Upchurch *et al.*, (2002); Capiez (2003); Talluri & van Ryzing (2004); Upchurch *et al.*, (2004); Emeksiz, Gursoy & Icoz (2006); Harewood (2006); Harrison (2006); Helsel & Cullen (2006); Lambert (2006); Queenan *et al.* (2007); Zrelli (2007); Metters *et al.* (2008); Milla & Shoemaker (2008); Srivastava (2008); Aziz *et al.* (2011); Queenan *et al.* (2011); Iyengar & Suri (2012) and Wang (2012)
Rates according to each segment	Jarvis *et al.* (1998); Ingold *et al.* (2000); Upchurch *et al.* (2002); Talluri & van Ryzin (2005); Queenan *et al.* (2007); Hormby *et al.* (2010); Abdel *et al.* (2011); Aziz *et al.* (2011); Taylor & Kimes (2011); Talón *et al.* (2012); Wang (2012) and Bayoumi *et al.* (2013)
Last minute rate[1]	Upchurch, Ellis, & Seo (2004); Harrison (2006); Lambert (2006); Su (2007); Su & Zhang (2008); Cachon & Swinney (2009); Yin *et al.* (2009); Jerath *et al.* (2010); Lai *et al.* (2010) and Aslani *et al.* (2013)
Rack Rate[2]	Upchurch *et al.* (2002); Noone and Mattila (2009) and Talón *et al.* (2012)
BAR Rate[3]	Carvel & Quan (2005); Gilden (2004, 2005); Marcus & Anderson (2006); Rohlfs & Kimes (2007); Anderson & Xie (2010) and Talón *et al.* (2012)
Structure of discounts	Hanks *et al.* (1992); HIRO (1994); Bitran & Mondschein (1995); Baker & Collier (1999); Hilton (1999); Upchurch *et al.* (2002); Upchurch *et al.* (2004); Emeksiz, Gursoy *and* Icoz (2006) and Bayoumi *et al.* (2013)
Promotions	Upchurch *et al.* (2002)
Events	Jauncey *et al.* (1995); Baker & Collier (1999) and Upchurch *et al.* (2002)
Forecast of the demand	Butler *et al.* (1974); Gilchrist (1976); Jones & Hamilton (1992); Lieberman (1993); HIRO (1994); Griffin (1995); Jauncey *et al.* (1995); Schwartz (1998); Kimes (1999, 2000 and 2011); Hilton (1999); McMahon-Beattie & Donaghy (2000); O'Connor, Remus & Griggs (2000); Rajopadhye *et al.* (2001); Weatherford *et al.* (2001); Upchurch *et al.* (2002); Baker & Collier (2003); Weatherford & Kimes (2003); Schwartz & Cohen (2004); Upchurch *et al.* (2004); Emeksiz, Gursoy, & Icoz (2006); Helsel & Cullen (2006); Aghazadeh (2007); Chen & Kachani (2007); Chiang *et al.* (2007); Queenan *et al.* (2007); Weinberg *et al.* (2007); Guadix *et al.* (2008); Metters *et al.* (2008); Shen & Huang (2008); Srivastava (2008); Zakhary *et al.* (2008); Cross *et al.* (2009); Zakhary *et al.* (2009); Zrelli (2010); Morales & Wang (2010); Aziz (2011); El Gaandar *et al.* (2011); Haensel & Koole (2011); Jones, Lee, & Chon (2011); Noone & Hultberg (2011); Padhi & Aggarwal (2011); Queenan *et al.* (2011); Tse & Poon (2012); Bayoumi *et al.* (2013) and Pekgün *et al.* (2013)
Length of stay in the hotel (LOS)	HIRO (1994); Kimes (1994 and 1999); Weatherford (1995), Hilton (1999); Weatherford *et al.* (2001); Upchurch *et al.* (2002); Baker & Collier (2003), Weatherford & Kimes (2003); Upchurch *et al.* (2004); Talluri & van Ryzin (2005); El Gaandar *et al.* (2011); Bnandoumi *et al.* (2013) and Pekün, *et al.* (2013)

[1] Rate to apply when the arrival date and the booking date almost coincide. It tends to be quite economical, as the hotel establishment takes advantage to increase the occupancy rate.

[2] This is the official rate. It tends to be the highest rate.

[3] This is the best rate available.

Table 1. References in which the variables of demand and pricing used in the study are identified. Source: Self-made.

Inventory of rooms available by segment	Kimes (1997); Zrelli (2010)
No shows[4]	HIRO (1994); Bitran & Mondschein (1995); Jauncey *et al.* (1995); Weatherford (1995); Baker & Collier (1999); Hilton (1999); Luciani (1999); Upchurch *et al.* (2002); Upchurch *et al.* (2004); Emeksiz Gursoy, &Icoz (2006); Romero & Wang (2010) and Bayoumi *et al.* (2013)
Declines	Jones & Hamilton (1992); Jarvis *et al.* (1998); Luciani (1999); Upchurch *et al.* (2004).
Restrictions are applied in the acceptation of the bookings	HIRO (1994); Bitran & Mondschein (1995); Kimes (1997); Hilton (1999); Upchurch *et al.* (2004) and Vinod (2004)
Policy of *upselling*[5]	Aydin & Ziya (2008) and Butscher *et al.* (2009)
Denials	Orkin (1988); Jones & Hamilton (1992); Jarvis *et al.* (1998); Luciani (1999); Kimes & McGuire, (2001); Weatherford *et al.* (2001); Weatherford & Kimes (2003) and Queenan *et al.* (2007)
Cancellations	HIRO (1994); Bitran & Mondschein (1995); Jauncey *et al.* (1995); Weatherford (1995); Baker & Collier (1999); Hilton (1999); Luciani (1999); Badinelli (2000); Upchurch *et al.* (2002); Baker & Collier (2003); Upchurch *et al.* (2004); Emeksiz, Gursoy, & Icoz (2006); Harewood (2006); Pan (2007); Romero & Wang (2010); Chen *et al.* (2011); El Gayar *et al.* (2011); Bayoumi *et al.* (2013) and Chen & Xie (2013) Mandelbaum (2010) analyses the penalisations of groups
Overbooking[6]	Rothstein (1974); Ladany (1976 and 1977); Williams (1977); Liberman & Dechiali (1978); Gilly and Hansen (1985); Rothstein (1985); Lambert, Lambert, & Cullen (1989); HIRO (1994); Bitran & Mondschein (1995); Bitran & Gilbert (1996); Hadjinicola & Panayi (1997); Chatwin (1998); Hilton (1999); McGill & van Ryzing (1999); Badinelli (2000); McCollough (2000); Toh & DeKay (2002); Upchurch *et al.* (2002); Baker & Collier (2003); DeKay *et al.* (2004); Talluri & van Ryzing (2004); Upchurch *et al.* (2004); Knide & Ishii (2005); Harewood (2006); Pan (2007); Sparks & Fredline (2007); Metters *et al.* (2008); Erdelyi & Topaloglu (2009) and Noone & Lee (2011)
Walk in[7]	Bitran & Gilbert (1996) and Upchurch *et al.* (2002)
Understays	HIRO (1994); Bitran & Mondschein (1995); Weatherford (1995); Baker & Collier (1999); Hilton (1999); Upchurch *et al.* (2004)
Overstays	HIRO (1994); Bitran & Mondschein (1995); Weatherford (1995); Baker & Collier (1999); Hilton (1999); Upchurch *et al.* (2004)

[4] Customers who, having made a booking, do not turn up at the hotel.

[5] Selling at a higher rate when there is no availability at a lower rate.

[6] Selling more rooms than exist.

[7] Customers who stay in the hotel without a prior booking.

Table 2. References in which the variables of capacity used in the study are identified. Source: Self-made.

3. Methods

For the data gathering interviews were carried out in 40 hotels in 2005 (Year 1) and 37 hotels in 2015 (Year 2) in the city of Seville and its province, all 4 and 5-stars, both belonging to chains and independent. The destination is among the first 5 tourist points in Spain according to diverse sources (Instituto Nacional de Estadística, 2013). Information was compiled of 4 variables considered to be influential, 13 of demand and pricing management, and 13 of capacity management. The selection of the variables included in the model are justified by their use in previous works, as has been described in the previous section. As well as those

incorporated in previous studies, in Year 1 the questionnaire was validated by experts which meant incorporating additional variables, in which the chain Sol Meliá took part.

We have used the version 24 of the IBM SPSS Statistics packet for the data of descriptive statistics and tests of normality and SmartPLS 3.2. for the model proposal, the evaluation of the measurement model and the evaluation of the structural model. To measure the variables of demand-pricing and capacity management a 5-point Likert scale has been used (1 = totally disagree; 5 = totally agree), including the option (does not know/does not answer).

Table 3 shows the main descriptive values that in the model are considered as influential in the application of Revenue Management by the establishment for years 1 and 2.

	Year 1		Year 2	
	Minimum-maximum	Mean or percentage	Minimum-maximum	Mean or percentage
Number of rooms (Size)	7-623	147.13	24-623	164.89
Belonging to a chain		70.0%		78.4%
Implemented Revenue Management		63.9%		100.0%
Implemented Revenue Management System		43.5%		54.1%

N(2005)=40; N(2015)=37

Table 3. Descriptors of the unidimensional variables of the models. Source: Self-made.

The results show a slight increase in the number of rooms and the number of hotels belonging to a chain from year 1 to 2. The most recent values indicate that, as stated by the respondents, all the establishments have implemented Revenue Management. This means a significant advance with respect to the previous values and enables us to answer the proposal of our research. A growth is also noted in relation with the use of software specifically assigned to the administering of Revenue Management in the hotel.

Table 4 brings together the minimum, maximum and mean values of different items which allow measuring the Revenue Management application in its facet of demand and pricing and at the two moments in time analysed (variables D1 to D13 in the table). In general, a positive evolution of the values obtained is noted from the first year (global average of 4.6) to the second (average of 4.8), being over 4 in this latter measure. On the other hand, after having carried out the tests of normality of these variables, it is confirmed that in all the cases the variables do not behave normally.

	Year 1		Year 2	
	Minimum-maximum	Mean	Minimum-maximum	Mean
D1. Application of demand **segmentation**	1-5	4.9	1-5	4.8
D2. Application of **different prices** to the different segments	1-5	4.5	1-5	4.7
D3. **RevPAR** information is available	1-5	4.8	4-5	4.9
D4. **Last minute rate** has been established	1-5	3.6	1-5	4.2
D5. **RACK** rate has been established (highest rate)	5-5	5.0	5-5	5.0
D6. **BAR** (Best Available Rate) has been established (lowest rate)	5-5	5.0	5-5	5.0
D7. **Discounts by segments** has been established	0-5	4.2	1-5	4.4
D8. Application of constraints to apply **promotions**	1-5	3.8	1-5	4.7
D9. Pricing policies depend on **seasons**	1-5	4.7	1-5	4.8
D10. Pricing policies depend on **events**	5-5	5.0	1-5	4.9
D11. **Historical data** is available	3-5	5.0	4-5	5.0
D12. **Length of Stay** (LOS) information is available	1-5	4.4	1-5	4.6
D13. **Repeated guest's** data is available	1-5	4.5	1-5	4.8

Table 4. Descriptors of the variables of demand and pricing management. Source: Self-made.

Table 5 shows the summary of some descriptors in relation with the items of capacity management (variables C1 to C13 in the table). In this case, a greater variability in the results is noted, so it is to be expected that there will have been a greater advance in the aspects related with demand-pricing than in those of capacity. Therefore, although in general terms the variables show an increase of the mean values over time (3.7 in Year 1 and 3.9 in Year 2), and unlike the aspects of demand, not all the mean scores are over 4. It is also noted that four variables show lower current values. As with the previous case, the tests of normality show lower current values. The same as in the previous case, the tests of normality indicate that the variables are not normal.

		Year 1		Year 2	
		Minimum-maximum	Mean	Minimum-maximum	Mean
C1.	**Inventory data**, in general, is available	5-5	5.0	5-5	5.0
C2.	**No shows** data is available	1-5	4.9	2-5	4.9
C3.	**Declines** data is available. Customers who decide not to book after consulting availability data.	1-5	2.3	1-5	2.9
C4.	Application of **constraints**. Not all requests are considered	1-5	4.0	1-5	3.8
C5.	Application of **upselling** policies	1-5	4.4	1-5	4.5
C6.	**Denials** data is available. Number of requests not accepted for the hotels due to constraints applied	1-5	2.1	1-5	2.7
C7.	**Fully booked** data is available	1-5	2.2	1-5	3.4
C8.	**Cancellations** data is available	5-5	5.0	1-5	4.8
C9.	Application of **overbooking** policies	1-5	3.3	1-5	3.7
C10.	**Walk-ins** data is available	1-5	4.6	1-5	4.8
C11.	**Understays** data is available	1-5	3.7	1-5	2.6
C12.	**Overstays** data is available	1-5	3.9	1-5	2.5
C13.	**Booking evolution** data is available	1-5	3.3	1-5	4.6

Table 5. Descriptors of the variables of capacity management. Source: Self-made.

To verify the hypotheses, we have used Structured Equation Modelling (SEM) for each year of the study. These models are part of the second-generation statistical techniques which enable researchers, especially in social sciences, to incorporate variables which are not directly observable, although they are indirectly measured through indicators (Hair, Hult Ringle and Sarstedt, 2014).

In our research we have decided to use a variance-based structural equation modelling technique, Partial Least Squares SEM (PLS-SEM), mainly because there is little knowledge a priori of the model's causal relations. On the other hand, it has been observed that the variables do not have a normal distribution. Moreover, the sample size is small for the two years of the study – Year 1 (n=40) and Year 2 (n=37). For the first model, the size required for a verification power of 0.8, alpha=0.5 and four predictor variables (Green, 1991) would be n=599, n=84 and n=39 to capture small, medium and large effects, respectively, of the predictor variables concerning the endogenous constructs. For Year 2 and given that the structure equations model has 3 predictor variables, the size needed would be n=547, n=76 and n=35 to capture small, medium and large effects, respectively, of the predictor variables concerning the endogenous constructs. The sample size for years 1 (n=40) and 2 (n=37) are adapted to the minimum size required to detect only those relations which are sufficiently important. Therefore, these characteristics of the research justify the use of variance-based structure equation modelling.

4. Results and discussion

Having estimated the structural equations models, we evaluate the quality of the results obtained via: (1) the evaluation of the measurement model for Year 1 and Year 2 and (2) the evaluation of the structural model for each of these years.

4.1. Evaluation of the measurement models

For the evaluation of the measurement model, Year 1 and Year 2 have been specified as reflective measurement models, given that the indicators are manifestations of the construct considered (demand-pricing and capacity). That is to say, the application of Revenue Management is reflected in the different values which the variables present grouped into the dimensions of demand-pricing and capacity.

For the evaluation of the reflective measurement models (demand-pricing and capacity), we analyse the individual reliability of the items, the composite reliability (internal consistency), and the Average Variance Extracted (AVE) to evaluate the convergent validity. Furthermore, we use the Fornell-Larcker criterion and the HTMT coefficient (Heterotrait-Monotrait Ratio of Correlations) to measure the discriminant validity of the factorial cross-loadings (Henser, Ringle and Sarstedt, 2015). The results obtained for each test and in both models are shown in Table 6 and Table 7.

The variables which do not appear in Table 6 have been removed because, according to the values obtained, they do not enable an explanation of the behaviour of the demand-pricing and capacity, due to very similar answers being obtained from the respondents. In Table 6 it is observed that the reflective constructs for the models of Year 1 and Year 2 have an internal consistency with a composite reliability over 0.7. The demand construct in both models has a convergent validity with an AVE over 0.5. The capacity construct in both models has an AVE close to 0.5, hence fulfilling the requirements.

To evaluate the discriminant validity, we have used the HTMT criterion (Henser, Ringle and Sarstedt, 2015). The results obtained are shown in Table 7. Given that the HTMT criterion is less than 0.90 for the constructs demand and capacity in the two years considered, it can be said that there is discriminant validity. When applying the sample procedure (bootstrapping n=5000 subsamples) to verify the hypotheses (H0: HTMT≥1), the confidence interval obtained for each of the years does not contain the value 1. This indicates that there is discriminant validity between the two constructs.

	Model Year 1				Model Year 2			
	Items	Reliability (λ). item	Composite Reliability (ρ_c)	AVE	Items	Reliability (λ) item	Composite Reliability (ρ_c)	AVE
Demand			0.828	0.617			0.905	0.581
	D2	0.867			D2	0.816		
	D12	0.706			D7	0.614		
	D13	0.867			D8	0.730		
					D9	0.695		
					D10	0.894		
					D12	0.694		
					D13	0.854		
Capacity			0.782	0.482	C2	0.775	0.866	0.457
	C6	0.641			C4	0.584		
	C7	0.540			C5	0.661		
	C9	0.807			C7	0.556		
	C10	0.607			C8	0.834		
	C12	0.623			C9	0.534		
					C13	0.798		

Table 6. Measurement Model. Internal consistency and convergent validity. Source: Self-made.

Model Year 1						Model Year 2				
	1	2	3	4	5		1	2	3	4
1.Demand						1.Capacity				
2.Capacity	0.708					2.Demand	0.789			
3.Implementation RM	0.268	0.266				3.Implem software	0.295	0.287		
4.Implem software RM	0.35	0.347	0.457			4.Belongs chain	0.716	0.522	0	
5.Belongs chain	0.433	0.33	0.46	0.365		5.Size	0.304	0.237	0.048	0.285
6.Size	0.413	0.606	0.458	0.474	0.353					

Table 7. Discriminant validity according to the HTMT criterion. Source: Self-made.

It stands out from the evaluation of the measurement model in both years that the reflective items which allow the measuring of the constructs demand-pricing and capacity vary in the two years considered (Figure 1 and Figure 2). This leads us to think that in a period of 10 years there has been an evolution in the applicability of Revenue Management which has affected the definition of the constructs demand-pricing and capacity.

Regarding demand and pricing variables, it is observed that in Year 2 two indicators of Year 1 are maintained, application of different prices to the different segments (D2) and repeated guest's data is available (D13). Additional indicators are also included in Year 2 indicating that there is a greater knowledge of the demand and pricing: discounts by segments has been established (D7), application of constraints to apply promotions (D8), pricing policies depend on seasons (D9), pricing policies depend on events (D10) and historical data is available (D11). These results highlight that the hotels work with a greater number of segments and apply more rates, therefore a greater complexity and breadth in the application of Revenue Management in the hotel is appreciated.

On the other hand, a greater change in the measurement of the variable capacity is observed. In Year 2 the variables denials data is available. Number of requests not accepted for the hotels due to constraints applied (C6), walk-in's data is available (C10) and overstays data is available (C12), which were reflected in the Year 1 model, disappear. This fact means that in the more recent periods they are not reflected in the aspects of capacity management. In Year 2 only the indicators fully booked data is available (C7) and application of overbooking policies (C9) were kept. And new indicators were included with respect to Year 1, no shows data is available (C2), application of constraints (C4), application of upselling policies (C5), cancellations data is available (C8) and booking evolution data is available (C13). There has therefore been a greater change in the knowledge of the capacity in the ten-year period. As happened with regards to the values of the demand-pricing, the results indicate that the Revenue Management is more advanced in Year 2, without doubt stemming from an evolution of the information systems used, as to carry out these operations the prior registering of the data is required, which usually depends on the performance of the software, be it a Property Management System and/or tools or specific Revenue Management software.

4.2. Evaluation of the structural models

Having evaluated the measurement model, the evaluation of the structural model is assessed. This step entails analysing the significance of the relations existing in the model. For this investigation we deal with: (i) Analysis of collinearity (Table 8). To detect problems of multicollinearity the tolerance index and the variance inflation factor (VIF) are used. It is considered that levels of tolerance under 0.20 (VIF >5) in the predictive variables indicate collinearity; (ii) The significance of the parameters using the bootstrapping technique (Table 9); (iii) The coefficient of determination (R2) which, associated with each dependent variable, represents the proportion of variance explained by the set of predictive variables; (iv) The f2 statistic, which enables us to analyse the effect that omitting a relevant exogenous construct has on the variance explained of an endogenous construct. In general, f2 values of 0.002, 0.15 and 0.35 represent small, medium and large effects, respectively, of the exogenous variable on the endogenous variable (Cohen, 1998) (Table 10); (v) And the measurement of the model's goodness of fit, SRMR (Root Mean Square Residual). This has recently been proposed as an indicator of goodness of fit in PLS-SEM in the work of Henseler et al. (2014). A value equal to or less than 0.08 is recommended, although there is not yet a consensus in about this threshold in the literature.

	Year 1				Year 2	
	Demand (VIF)	Capacity (VIF)	Implem Software. (VIF)		Demand (VIF)	Capacity (VIF)
Implem. Sof.	1.368	1.368		Implem. Sof.	1.004	1.004
Chain	1.212	1.212	0.09	Chain	1.234	1.234
Size	1.355	1.355		Size	1.122	1.122
Implem. RM			0.384			

Table 8. Evaluation of collinearity. Source: Self-made.

As is noted in Table 8, the variance inflation factors (VIF) for each endogenous construct are less than 5, so the models for Year 1 and Year 2 do not present problems of multicollinearity between the exogenous variables of each endogenous variable. There not being collinearity in the models thus enables the estimating of the coefficient paths and the analysing of their significance.

Let us recall that in the structural model of Year 2 the causal relations which involved the Implementation of Revenue Management variable were removed, as in this year all of the hotels surveyed had implemented Revenue Management. The causal relations between Year 1 and Year 2 indicate that the knowledge of demand-pricing and capacity in a period of ten years has varied.

Table 9 enables the observing of which causal relations were significant for each of the years considered in the study. For Year 1 it is noted that the implementation of Revenue Management has a direct and very significant influence on the implementation of specific Revenue Management software. On the other hand, it is seen that the size of the hotel has a positive and significant influence on capacity. For Year 2, a positive and significant influence of the implementation of software and capacity, and a positive influence of belonging to a chain is observed, which is very significant for capacity and significant for demand-pricing.

As the sample size in the years considered is very small and only allows the capturing of those path relations that are quite important, it is interesting to observe the relative contributions of the predictive variables to the endogenous variables, as is gathered in the following figures (Figure 1 and Figure 2). Relations with a thick line represent the greater relative contributions of the predictive valuables to the endogenous construct.

	Model Year 1			
	Capacity R^2=0.282	Demand R^2=0.243	Implem Software R^2=0.212	Implem RM R^2=0.239
Implem. RM			**0.366*** (t=3.294)**	
Implem. Sof.	0.037 (t=0.209)	0.085 (t=0.170)		
Chain	0.122 (t=0.568)	**0.360* (t=1.168))**	**0.196** (t=2.318)**	**0.460** (t=3.03)**
Size	**0.455** (t=2.74)**	0.166 (t=0.978)		
	Model Year 2			
	Capacity R^2=0.501	Demand R^2=0.283	Implem Software R^2=0.002	
Implem. Sof.	**0.240** (t=2.144)**	0.151 (t=0.630)		
Chain	**0.628*** (t=6.6499**	**0.477** (t=2.427)**	0.043 (t=0.268)	
Size	0.076 (0.369)	0.071 (t=0.518)		

*** p <0.01 ; ** p < 0.05 ; * p <0.10

Table 9. Structural Estimation model. Source: Self-made.

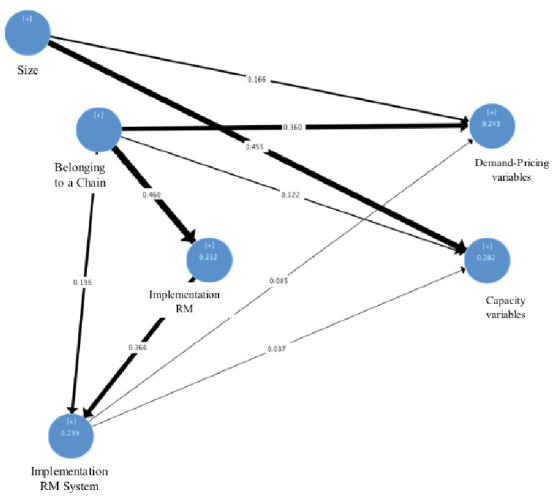

Figure 1. Model estimated for Year 1. Source: Self-made.

In Year 1 the variable which best represents the behaviour of capacity is the Size of the hotel, while the behaviour of demand-pricing is best explained by belonging to a chain.

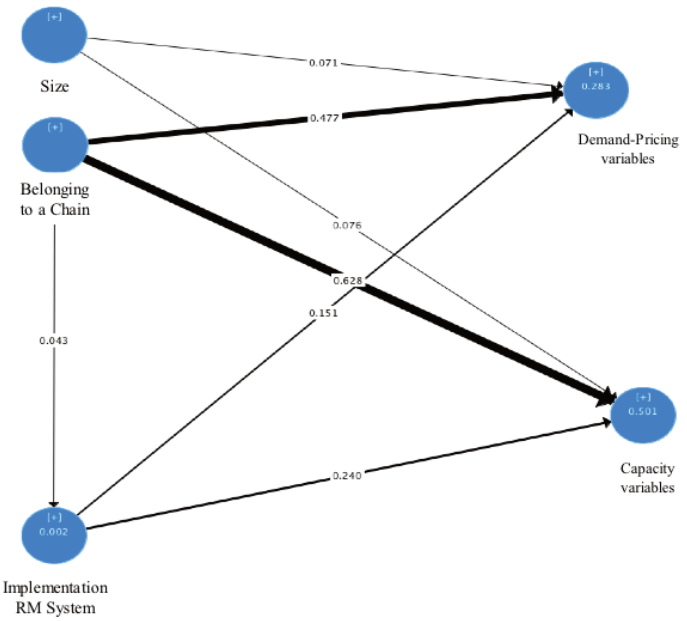

Figure 2. Model estimated for Year 2. Source: Self-made.

A great change takes place in Year 2 with respect to Year 1. The variable belonging to a chain is the most significant in explaining the behaviour of both demand-pricing and capacity. The R^2 values and the f2 statistic are gathered in Table 10.

	Year 1		Year 2	
	R^2	f^2	R^2	f^2
Demand	0.243		0.283	
Implem software		0.007		0.032
Chain		**0.142**		**0.283**
Size		0.027		0.006
Capacity	0.282		0.501	
Implem software		0.001		**0.115**
Chain		0.017		**0.705**
Size		**0.213**		0.010
Implem. Soft.	0.239		0.02	
Implem. RM		**0.139**		
Chain		0.040		0.002

Table 10. Determination coefficient and f^2 statistic. Source: Self-made.

It is observed that omitting belonging to a chain as a predictor would have a medium effect on explaining demand-pricing in Year 1 (f^2=0.142) and 2015 (f^2=0.283) and a large effect on capacity in Year 2 (f^2=0.705). Size, however, would have a medium effect on capacity (f^2=0.213) and the implementation of Revenue Management a medium effect on the implementation of software.

5. Conclusions

Revenue Management is the basis of all the booking systems which currently operate. Numerous authors assert that its implementation has provided significant improvements in management which have contributed to the progress of the firms and the optimisation in the use of perishable resources. This work is therefore

centred on the study of this process implementation considering pricing and demand and also capacity management variables. Specifically, this research proposes the identification of the drivers which boost the adoption of Revenue Management in the hotel sector, as well as the variables in which this activity is reflected. To do so, we compare two scenarios with data compiled at moments 10 years apart in one of the main tourist destinations in Spain.

In Year 1, when the hotels began to apply Revenue Management, two important driver variables of innovation were identified, (1) the size of the hotel and (2) belonging to a chain (Figure 3A). In general terms, (1) the size of the hotel is the main determinant of the variables related with the management of capacity. Therefore, the need to compile relevant information about variables directly related with the application of Revenue Management is beginning to be valued by all the hotels. Examples are recording the data of denials, overstays, walk-ins, situations of fully booked, as well as the application of overbooking policies.

On the other hand, (2) belonging to a chain drives its implementation. The effect of this push is reinforced by Revenue Management implementation, but in a more determinant way by the availability of software of Revenue Management. It is shown that these hotels prioritise decisions of pricing and those related with the demand management. In this case, the number of indicators considered is not very high. Centring on the application of different tariffs and the compiling of data of Length of Stay (LOS) and repeat guests. It is therefore confirmed that the Revenue Management implementation requires the adopting of changes in the processes that, in demand and pricing management, are driven by belonging to a chain, while capacity management is positively and significantly determined by the size of the hotel.

In the second-year model, two important changes take place. On the one hand, all the hotels state having implemented Revenue Management and, on the other hand, the size of the hotel ceases to be a factor of influence in its management. As indicators driving innovation we find (3) belonging to a chain and (4) the implementation of Revenue Management software (Figure 3B). The (3) chain hotels, for their part, increase the number of variables related with the demand and pricing management, which denotes an advance with respect to Year 1 and demonstrates the increase of complexity associated with the very evolution of its application. We note, for example, the incorporation of a greater number of considerations for pricing management, such as applying a multitude of rates, the application of discounts for segments, and also the consideration of variables that involve a greater complexity both in their recording and in their processing (seasons and events). The availability of historical data is also highlighted, which is in accordance with the application of forecasting techniques.

But it is especially seen that the hotels belonging to chains are giving a greater importance to the recording and processing of data related with capacity. In this sense, they coincide with the hotels which have at their disposal a (4) Revenue Management System. As is to be expected, the availability of technology enables pushing innovation (Hjalager, 2010). The number of indicators is also high, demonstrating that Revenue Management implementation requires the availability and processing of information about no shows, fully booked, cancellations, booking evolution, the application of constraints and policies of upselling and overbooking.

The results obtained have allowed us to identify the factors that are mostly affected by adopting Revenue Management. In global terms, they show us the variables that we must pay greater attention to when implementing Revenue Management. It is also noted that the hotels which do not belong to a chain need a greater effort for its application, although after this study they will be able to take note of the most relevant variables and establish action priorities.

As additional benefits of the research, the hotel companies will be able to use the capacity and demand-pricing indicators identified both to review their processes with a view to improving their management and to evaluate if the software used for Revenue Management incorporates the data which have turned out to be more relevant.

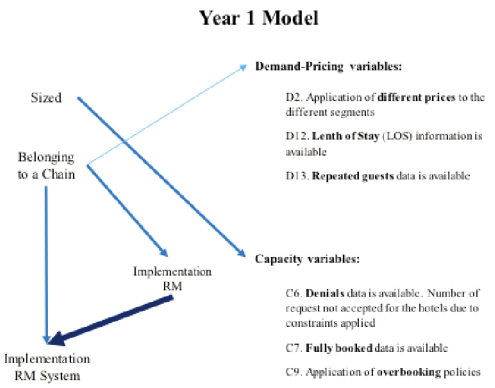

Figure 3A. Year 1 model. Driving forces for Revenue Management implementation

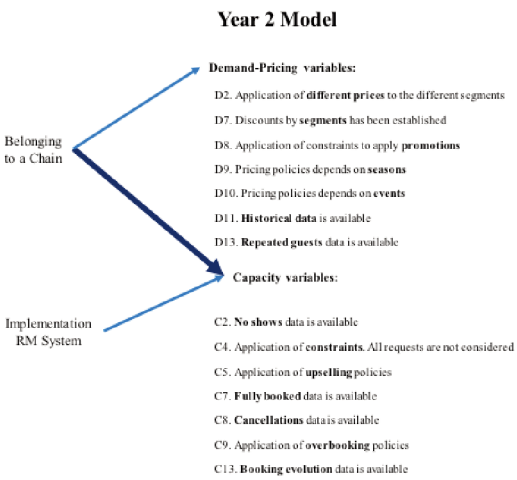

Figure 3B. Year 2 model. Driving forces for Revenue Management implementation

Figure 3. Driving forces for Revenue Management implementation. Comparison between Year 1-Year 2 models. Source: Self-made.

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