Website adoption and sales performance in Valais' hospitality industry

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Abstract

An analysis of 147 Valaisan hotels' monthly revenue between 1992 and 2003 indicated that website adoption related positively to a performance indicator – Revenue per Available Room or RevPAR. That is, the RevPAR of hotels was higher after adoption than before and hotels with no web presence showed a negative trend in revenues. Furthermore, revenue growth rates were stronger for hotels with their own website than for hotels with a web presence via regional portals. These patterns suggest that Internet technologies have a positive impact on hotel performance, perhaps via improved marketing and distribution.

Keywords: hospitality industry, website adoption, RevPAR, performance indicator, time series analysis

1. Introduction

Beginning last century, academics have waxed on about the fit between tourism and information technologies (IT). Information-intensive industries are ideal candidates for Internet transformation (Bloch and Segev, 1996). Tourism's dependence upon the supply and exchange of information throughout the service chain is particularly suitable for IT adoption (Sheldon, 1993). Discussing tourism, Poon (1993) notes IT benefits such as reducing transaction, print and distribution costs, and enabling last minute changes, one-to-one customer interaction and broad market reach. One such IT application, the Internet promises opportunities for small to medium sized hospitality firms (SMEs) to develop their business and gain competitive advantages (Buhalis and Main, 1998; Morrison and Thomas 1999).

Continuous improvement and high performance in Internet applications such as email correspondence, website effectiveness, online marketing and bookings grow as a critical competitive factor, but industry and academics suggest the lodging industry lags other industries in IT implementation (Siguaw et al., 2000, Arthur Andersen, 1999). The low IT use by small hospitality enterprises may stem from lack of training, traditional ownership, deficiency of rational management and marketing functions and management's short-term operational focus (Buhalis and Main, 1998). Consistent and efficient management has been a formula for past hotel success, but global competition demands innovation and flexibility in today's dynamic marketplace (Kunz & Johnson, 2000). Successful Internet use exemplifies responding to this dynamic marketplace. Most hospitality Internet studies address problems such as quality and benchmarking (Morrison et al., 2004), diffusion of that innovation (Hashim et al., 2007; Matzler et al., 2005; Wang & Fesenmaier, 2005; Murphy et al., 2003), hotel manager's perception of

the effect of adopting the Internet (Perruchoud-Massy et al., 2005) and e-mail response quality (Schegg et al., 2003). Yet while many papers laud the Internet's potential, few papers examine the relationships among Internet adoption and success in the hospitality industry (Scharl et al., 2004).

Yet while many papers laud the Internet's potential, few papers examine the relationships among Internet adoption and success in the hospitality industry (Scharl et al., 2004). Similarly, authors last century noted little empirical evidence linking improved revenue or profitability to the use of technology (Bakos & Kemerer, 1992). An innovation such as the Internet should, following Schumpeter's theory (1947), effecting indicators such as revenue and productivity. The Internet should lower labour, distribution and marketing costs while increasing sales and service quality as well as marketing reach.

Thus, how do performance indicators relate to the adoption of Internet technology? To investigate the economic impact of website adoption, this study analysed Revenue per Available Room (RevPAR) before and after hotels adopted websites. After controlling for factors such as inflation, does the adoption of a website have a significant positive relationship with RevPAR?

Internet use and performance

The growth of e-business should lead to "higher firm productivity and efficiency as a result of lower search and transaction costs" (Konings & Roodhooft, 2002, p.569). However, there is little empirical confirmation for these productivity improvements in the literature. Results from Konings & Roodhooft (2002) based on empirical evidence of a large representative data set of Belgian firms suggest that e-business has no effect on productivity in small enterprises, but has positive effects on performance in large

firms. Two literature reviews this century note that many studies lack a clear correlation between IT expenditure and organisational performance, in part because of the difficulty in isolating technology's contribution from organisational and external factors (O'Connor, 2001; O'Connor and Murphy, 2004).

In hospitality, the Internet is an important interface between customers and hotels for information exchange, business transactions and relationship management, and may improve hotel performance through:

- cost reductions in the distribution process;
- incremental revenues;
- improved guest loyalty; and
- improved marketing and market access (Sigala et al., 2001).

Driven by the rapidly evolving online travel market, many Swiss hotels created a website during the last ten years. Schegg et al. (2002) found a 38% website penetration rate by the Swiss hotel industry in 2001. By late 2005, over 90% of the Swiss Hotel Association (hotelleriesuisse.ch) members, Switzerland's the top professional hotel association with 50% of all hotels and 80% of all Swiss room nights, had a web presence. This new medium has widespread adoption by Swiss hotels, but widespread adoption may not equal being an effective business tool.

A 2002 study by Schegg et al. showed that most Swiss hotel websites simply broadcast static information and provided limited transactional functions. This static format corresponds to the first of three stages – publishing sites; databases/forms; and personalization – of website evolution (Hanson, 2000). A recent study (Schegg et al., 2007) on a representative sample of 182 hospitality enterprises across six Austrian, German and Swiss alpine destinations showed evolving Internet adoption (Murphy et

al., 2006 and references therein); website ages tended to reflect advanced website features and IT use. According to these authors, early adopters invested more in these technologies, made better and wider use of them such as quality websites and e-service, and seemed more successful in website traffic and online bookings. In line with prior diffusion research, there were significant positive relationships between hotel size, category and affiliation with IT performance (Schegg et al., 2007).

Irrespective of their IT use this century or last century, hotels distribute their products through direct and indirect channels. Hotels and other suppliers in tourism use various distribution channels including "other properties within their chain, joining marketing consortia or other types of affiliation organizations, or outsourcing to representation or third-party reservation companies (O'Connor & Frew 2002, p.33)." Horwath's Worldwide Industry Study listed direct contact – telephone, fax and email – as the predominant hotel distribution channel but direct contact dropped from 38% in 1995 to 34% in 2002 (Marvel, 2004).

The global results, however, differ in countries with few chain hotels and mostly independent operators, such as Switzerland or Austria. A survey of over 200 Swiss hotels showed three of four bookings (74%) came through direct channels: 44% through telephone/fax contacts, 13% through the hotel website and 17% through e-mail (Schegg & Steiner, 2003). The proportion of direct booking was higher in 1-3 stars hotels (75-80%) than in 4-5 stars hotels (67%). Online intermediaries such as Expedia or Travelocity had a small market share (4%) in Swiss hotels.

Regardless of country differences, the Internet is a critical distribution channel, particularly to reach foreign markets. According to an annual European survey by Marcussen (www.crt.dk/UK/staff/chm/trends.htm), online travel sales increased by 34%

from 2004 to 2005 and reached EUR 25 billion in Europe in 2005, or 10% of the total market. Yet as noted earlier, despite the possible benefits there is little empirical research of the economic impact of adopting websites in hospitality. A US study supports this view, noting a major concern of 209 US hotel managers was profitability of distribution channels as "there were no evaluation methods in place to measure the actual amount and type of business generated by each channel (Brewer & Kang, 2004 p.24)."

1. Diffusion of innovation

A theoretic approach for examining hotels' Internet use is the Diffusion of Innovations (Rogers, 1995). This theory, which has explained technology adoption at both the individual and organisational level for decades, helps examine hotels' website adoption (Murphy et al., 2006). The theory classifies organisations into five adopter categories: pioneers (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%) (Rogers, 1995).

Rather than Rogers model, this study relies upon a coupled Bass and Rogers' diffusion model (Mahajan et al., 1990a; Mahajan et al., 2000, p. 4-7), hereafter called the BR model. The BR model has the dual advantages of allocating adopter categories based on actual data and reflecting two coefficients – innovation and imitation – that influence adoption. The authors revised Rogers' adopter types based on the BR model and properties of a bell-shape function of adopter frequencies.

Three points – the peak T and inflection points T1 and T2 in Figure 1 determine the timing of the BR categories. Up to T1 the monthly adoption rate increases rapidly and delineates between the Early Adopter and Early Majority categories. From T1 to the peak T, which indicates the time of maximum monthly adopters and separates the Early

Majority and Late Majority, the growth rate slows. Finally, from T the adoption rate decreases slowly until T2, which separates the Late Majority and Laggards (Mahajan, Muller, & Bass, 1990; Mahajan et al., 2000).

With regard to hospitality and the Internet, Scaglione et al. (2004a, b) used the BR model to study the adoption of domain names by Swiss hotels. An early step with websites is registering a domain name, such as accor.com or hyatt.com. These electronic addresses help businesses build their brand and drive visits to their website (Carpenter, 2000). In line with previous diffusion research, Scaglione et al. (2004a, b) found significant relationships between adopting domain names and hotel size, category, affiliation and geographic location. For the Swiss hospitality industry, Murphy et al. (2006) demonstrated that domain name age reflects the presence of advanced website feature.

To investigate the temporal dimension of Internet adoption in the Swiss hospitality industry, this paper relied upon data from the Wayback Machine (WM) in the Internet Archive (archive.org), a non-profit organisation that began archiving websites in 1996 (FAQs, 2007). While domain name registration dates suggest when an organisation started to go online (Scaglione et al., 2004a,b), ages available through the WM serve as a proxy for when a website went online (Hashim et al., 2007). Researchers have used the WM to investigate archived web pages (Ryan et al., 2003; Thelwall et al., 2003; Veronin, 2002) and to infer website age (Vaughan & Thelwall, 2003). From hereafter, the date from the WM is the “website age”.

Using the WM on the database of Scaglione et al. (2004a, 2004b), 2049 Swiss hotels with a domain name registered in Switzerland’s *.ch* domain, 1388 hotels had an active website. This suggests many hotels secured their online brand, but had no website.

Using the hotel's website age and the BR model classified the hotels into Roger's five categories of innovators, early adopters, early majority, late majority and laggards (see Figure 1).

place figure 1 here

2. Methodology

To investigate the economic impact of website adoption, this study analysed a performance indicator before and after hotels in Valais, a Canton in Western Switzerland, adopted websites. The authors merged three data sets (Scaglione et al. 2004a, *Office Fédéral de la Statistique, and Valais Tourisme*) into a master database of Valais hotels. For confidentiality, the data set was anonymised after merging the three databases. The database contained three organisational variables for each hotel: star category, number of rooms and website age. The dependent variable was the 147 hotel's monthly revenue and overnights from January 1992 to December 2003. Dividing monthly room revenue by the monthly rooms available yielded the monthly RevPAR for each hotel. The final dataset contained 147 monthly time series of RevPAR, one series for each hotel.

Of the 147 hotels, 93 hotels had a website with their own domain name before December 2003, 40 owned no own domain name according to the Swiss Hotel Association's (www.swisshotels.ch) official guide but had a web presence in a destination portal such as www.region1.ch/hotelABC. The final 14 hotels showed no evidence of registering a domain name before December 2003, nor having a website in the hotel guide, nor after extensive search engine checks. As some hotels changed their star category from Jan '92 to Dec '03, an additional set of categories represented this

change: *High* from 4 to 5 stars, *Medium* from 3 to 4 stars and *Low* from 'without category to 1 star', from '1 to 2 stars' and from '2 to 3 stars'. Table 1 shows the hotel distribution by category.

** insert Table 1 about here**

The following generalised linear equation (SAS Proc GENMOD, option autoregressive AR(1) correlation) tested the relationship between monthly RevPAR and website age, using non-adopters as the control group. To model the effect of website adoption, the dichotomous categorical variable "*adoption-time*" represented whether or not the hotel had a website. As the dependent variable (RevPAR) is a normally distributed times series, the model followed a traditional approach, with RevPAR as a continuous and normally distributed dependent variable.

$$\text{RevPAR}_{\text{ti}} = \beta_0 + \beta_1 * adoption - time_{ti}(0) + \varepsilon_{ti} \quad (1)$$

where *t* represents time and *i* is an index for each hotel, ε_{ti} is the error. The first coefficient β_0, the intercept of the equation, is the average RevPAR of all hotels across all periods after website adoption and is positive in this model. The second coefficient β_1 represents the difference in RevPAR before and after website adoption. If RevPAR is greater after adoption, the coefficient β_1 is negative. Formula (1) is twofold depending on the time:

$$\text{RevPAR}_{\text{ti}} = \beta_0 + \beta_1 + \varepsilon_{ti} \qquad \text{if } t < \text{website age}$$
$$\text{RevPAR}_{\text{ti}} = \beta_0 + \varepsilon_{ti} \qquad \text{if } t \geq \text{website age}$$

Two tests evaluated the relationship of website adoption and performance. Analysis of the parameter estimates based on the Wald statistic assessed if the coefficient estimate was zero for a given variable and a global type III test based on $\chi 2$ statistics involved more parameters (SAS 2004, p.1697- 98).

3. Results

If website age has a significant positive relationship with performance, RevPAR should be higher after website adoption than before. To evaluate this relationship, the authors applied the analytical procedure in the previous section to three hotel groups: the adopter group (93 hotels, Group 1), the group in a tourism portal (40, Group 2) and hotels with no web presence (14, Control Group). For hotels in Group 1 and 2, "*adoption-time"* was 0 before the hotel had a website presence and 1 afterwards. Even if the Control Group hotels had no web presence, a methodology similar to Groups 1 and 2 had to apply. Thus, the authors coded "*adoption-time"* for the Control Group corresponding to the three adoption dates related to the BR categories defined in Figure 1, namely January 2000 (T1), November 2000 (peak T) and September 2001 (T2) resulting in three models.

include Table 2 here

Table 2 shows the linear model coefficients and the type III statistics for each group. The Type III results for Groups 1 and 2 were significant, suggesting a relationship between website adoption and RevPAR, particularly for hotels with their own website.

The average RevPAR for hotels after website adoption was 72.6 SFR for hotels with their own website and 83.77 SFR for hotels in portals. For Groups 1 and 2, the coefficient β_1 was negative; showing that the average RevPAR was higher after website adoption than before adoption. The coefficient β_1 was -3.95 SFR for hotels having their own website representing an average RevPAR increase of 5.4 % after website adoption. For Group 2 hotels, the difference was -8.91 SFR indicating a general increase of 10.6% after website adoption.

The models for the Control Group hotels with no website presence and a website age corresponding to the first inflection point T1 and the peak yielded no significant Type III statistics or β_1 coefficient. In spite of the fact that the average RevPAR (β_0) of 57.28 SFR was significant for the T1 model, the lack of significance for the Type III statistics shows there is insufficient evidence of the relationship of those dates on the RevPAR for both models.

The model on the second inflection point T2 (September 2001), yielded a significant test statistics for the type III showing evidence of the relationship of this date and the RevPAR. However, the second coefficient was positive and significant, showing that the RevPAR was higher before September 2001 than after this date. The average RevPAR after that date was 45.50 SFR where as before it was 59.27 SFR (45.50+13.77), around one third higher before. The date of September 2001 is the second inflection point showing, from diffusion theory the maturity of the process. Following that theory, around 85% of the hotels have website presence by September 2001 and for that moment, the model for the control became significant and shows enough evidence of a loss in RevPAR after that date.

Hotels in the control group behaved differently than Group 1 and 2 hotels that showed evidence of an increase of RevPAR after website adoption. This pattern helps support the positive relationship of website date and RevPAR was not due to other factors such as normal inflation of hotel RevPAR in the Valais.

3.1 Investigating mixed effects

A second set of analyses focused on hotels with their own website (Group 1), investigating mixed relationships of website age and three independent variables. Hotels size was an ordinal category, due to slight changes in the number of rooms, with "Small" for less than 11 rooms, "Medium" from 11 to 60 rooms and otherwise "Large". The second variable was a binary variable, whether the hotel was in one of Valais' five top destinations – Verbier, Leukerbad, Crans-Montana, Saas Fee and Zermatt (39% of the hotels in Group 1) – or not. The third variable was the category of the hotels that kept the same category during the study, and the five hotels giving no information (see Table 1).

include Table 3 here

The Type III statistics indicated the mixed effect of size with *adoption-time* was significant with hotel RevPAR, but not that all the mixed effect were significant. Only for large hotels was there enough evidence of a change. The average RevPAR for large hotels was 136.66 Swiss Franks (SFR) before adoption and 151.71 SFR after adoption, a 9 % increase.

The mixed effect of location and *adoption-time* was also significant, with all coefficients significant at least at p=.002. The average RevPAR for the hotels outside the “Big Five” was 40.37 SFR before adoption whereas after adoption average RevPAR was 43.35 SFR, a 6.4% increase. For hotels in the “Big Five” areas, average RevPar was 81.29 SFR before adoption; after adoption, the average RevPar raised to 88.62 Sfr, a 9% increase.

The mixed effect of hotel category with *adoption-time* showed an overall significant relationship with hotel RevPAR according to type III statistics. The only category that gave enough evidence was the four stars category. The average RevPAR for this category hotel was 137.95 SFR before website adoption and 140.40 SFR after, a 1.78% increase.

3.2 Investigating dynamics of RevPAR trends

The sum of monthly RevPAR for the hotels within each group yielded three times series (Jan’92 to Dec ’03) for analysis of the evolution of RevPAR through the slope of overall revenue over the time, using a tri-variate structural time series model (Harvey, 1989) (the diagnostic analysis is in the annex). Figure 2 shows the overall RevPAR evolution corrected for seasonal effects for each group. The control group RevPar are on the right y-axis, and the Group 1 and 2 RevPAR are on the left y-axis. The dotted lines are linear estimates of the RevPAR trends. Finally, the grey bands show the Bass-Rogers categories limits from Figure 1.

The slopes for Groups 1 and 2 were positive, 3.79 and 1.64 respectively. The Control Group, however, had a negative, almost null slope (-0.087). Moreover, STS analysis shows that for the end of the sample (Dec ’03), the growth rate per year was +8.1% for Group 1, +5.35% for Group 2, but –0.04% for the Control Group. Thus, Group 1 and 2 hotels showed a stronger revenue evolution after website adoption than the control group hotels, perhaps fuelled by website adoption.

By here figure 2

4. Conclusions

This study investigated how performance indicators in Valais’ hospitality industry related to the adoption of website. The results suggest that website adoption, specifically for hotels with their own domain or in a portal, related positively to RevPAR. In other words, the revenue was higher after adoption than before adoption. The inclusion of a control group in the analysis helps rule out other possible factors explaining the RevPAR increase in two first groups, such as inflationary growth. Furthermore, revenue growth rates were stronger for hotels with their own domain than for hotels with a web presence via regional portals. Hotels with no web presence showed a negative trend in revenues. The results of this study align with an analysis of 288 Spanish SMEs showing a positive relationship between website content and increased sales (Meroño-Cerdan & Soto-Acosta, 2007).

Moreover, positive effects for larger hotels and hotels in large destinations, support conclusions by Konings & Roodhooft (2002). That is, e-business has little effect on productivity in small enterprises, but positive effects on performance in large firms. The

observed patterns suggest that Internet technologies might have a positive impact on hotel performance, perhaps via improved marketing and distribution.

Given these results are not based on an experimental design, this research does not claim any causal relationship between website adoption and RevPAR. Moreover, these results might simply reflect that better and more competitive hotels were faster in adopting Internet technologies than their less performing colleagues. Another limitation is that authors could not exclude other causes for the decreasing RevPAR trend by the control group hotels.

Future studies should use a larger sample size and hotels from other regions and locations (e.g. urban environment). As importantly, future studies should test other performance indicators such cash flow and organisational factors and external factors such as exchange rates and consumer confidence indicators associated with firm performance.

5. Acknowledgment

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Annex

The diagnosis test statistics for a single series in an STS model follow (Koopman, Harvey et al, 2000, p. 180-883; (Harvey, 1989), p. 268-270):

- S: The equation standard error
- N: the Doornik-Hansen statistic, which is the Bowman-Shenton statistic with the correction of Doornik and Hansen. Under the null hypothesis that the residuals are normally distributed, the 5% critical value is approximately 6.0.
- H(df): A two-sided F-test that compares the residual sums of squares for the first and last thirds of the residuals series.
- DW: or Durbin Watson statistics, distributed approximately as N(0,1/T), T being the number of observations.
- Q(df): Box-Ljung Q-statistic, test of residual serial correlation, based on the first P residual autocorrelations and distributed as chi-square, with P-n+1 df when estimating n parameters.
- R^2: Coefficient of determination.

Here table 4

Vitae

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Figure 1: Actual and estimated monthly website adoption by 1388 Valais hotels. The estimated curve was based on the BR model and excluded important outliers such as December 1998.

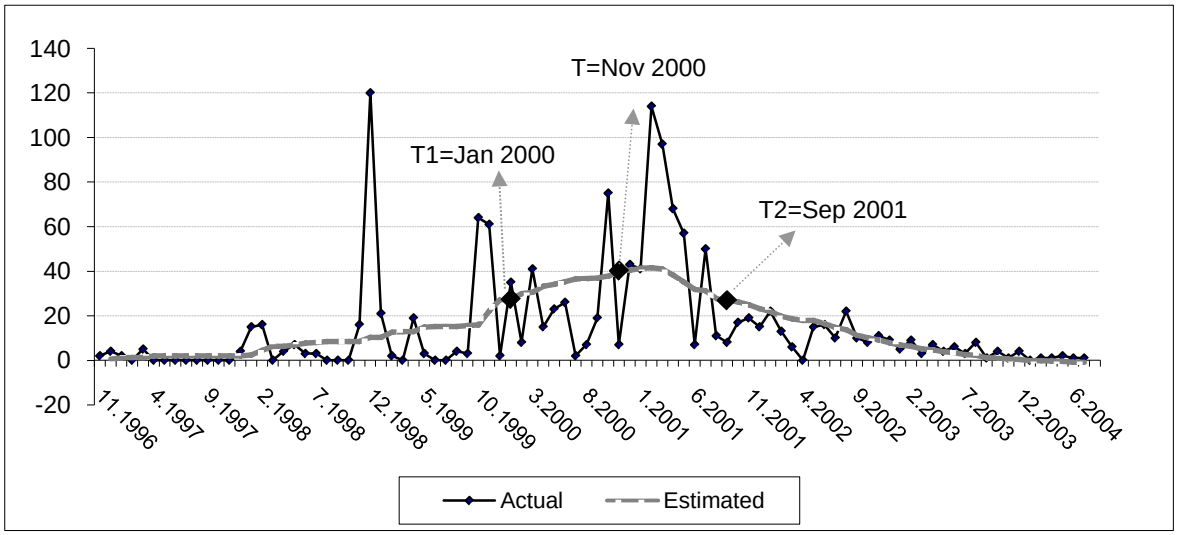

Figure 2. Evolution of aggregate monthly RevPAR in Swiss Francs. Time series are corrected for seasonal effect. Control group y-axis on the right.

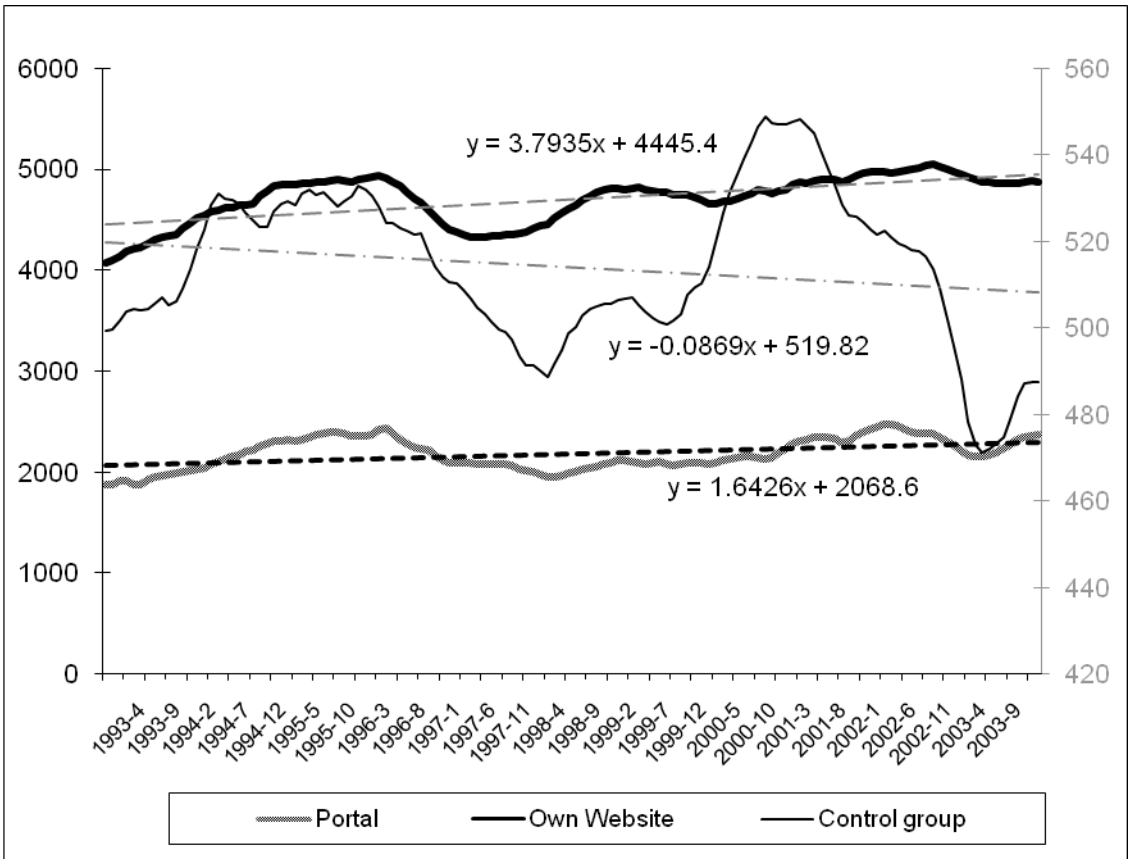

Table 1. Valais hotel sample: distribution by category

Category	**hotels with a website**	**hotels with web presence in portal**	**hotels without a domain name**
1 star	3		
2 stars	17	8	6
3 stars	40	15	5
4 stars	10	4	
5 stars		2	
High	2		
Low	14	7	3
Medium	2	3	
No information	5	1	
total	***93***	***40***	***14***

Table 2. Model estimates with coefficients, confidence intervals and Type III statistics.

		coefficients Numbers in ( ) represent 95% confidence intervals	Type III $\chi 2(1)$ statistics
with Website Group 1	β_0 (intercept)	72.60 *** (62.24, 80.13)	**5.79****
	β_1	-3.95** (-8.98, -1.05)	
Portal Group 2	β_0 (intercept)	83.77*** (61.76, 94.06)	**3.07***
	β_1	-8.91** (-13.11 , -4.72)	
Control Group January 2000	β_0 (intercept)	57.28*** (37.22, 77.35)	**0.01**
	β_1	-1.19 (-28.03,25.65)	
Control Group Nov 2000	β_0 (intercept)	53.12 (35.07, 71.17)	**0.08**
	β_1	3.79 (-22.00 , 29.58)	
Control Group Sept 2001	β_0 (intercept)	45.50*** (29.75, 61.25)	**8.23*****
	β_1	13.77*** (7.95,19.61)	

*Legend: * p-value<0.1, ** p-value<0.01, *** p-value<0.001*

Table 3. Average RevPAR with confidence intervals for mixed-models.

		before adoption	after adoption	
		RevPAR 95% Confidence Intervals	RevPAR 95% Confidence Intervals	Type III $\chi 2$ statistics
size and adoption-time	large hotels	136.66 *** (76.81, 94.38)	151.71 *** (97.26, 206.17)	**19.95** (df=5)**
	small and medium hotels	*not enough evidence for significant change*		
location and adoption-time	located within "Big Five"	81.29*** (77.50, 85.08)	88.62*** (77.45, 99.79)	**33.45*** (df=3)**
	outside "Big Five"	40.37** (27.64, 58.82)	43.35** (30.13, 56.57)	
category and adoption-time	4 stars	137.95** (100.50, 185.18)	140.40** (95.22, 185.58)	**23.54** (df=7)**
	other categories	*not enough evidence for significant change*		

*Legend: * p-value<0.1, ** p-value<0.01, *** p-value<0.001*

Table 4. Diagnosis test statistics

	Own website	Portal	Control Group
S	0.08	0.12	63.33
N	4.50	5.40	7.9*
H(43)	0.73	1.34	0.75
DW	2.04	1.64	1.88
Q(11, 9)	7.10	16.73	7.09
R^2	0.34	0.28	0.39

*Legend: * p-value<0.1, ** p-value<0.01, *** p-value<0.001*