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Source / Izvornik: **ECONOMIC AND BUSINESS REVIEW, 2011, 13, 227 - 249**

Journal article, Published version

Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

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Download date / Datum preuzimanja: **2024-12-02**

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INFORMATION SYSTEM MATURITY AND THE HOSPITALITY ENTERPRISE PERFORMANCE

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ABSTRACT: *The purpose of this paper is to empirically evaluate the relationship between the maturity of hotels' information systems and their performance. This study uses customised models of information system (IS) maturity and hotel performance measurement. Since we wanted to include the intangible aspects of performance, we opted for an adapted application of the Balanced Scorecard model. In the empirical part of the paper, fundamental constructs of the model are verified, while the individual items are further evaluated by employing discriminant analysis to distinguish hotels with relatively low and high performance levels. The findings demonstrate the existence of a significant and positive relationship between IS maturity and two dimensions of performance in the hospitality industry – process quality and guest relationships. The level of employee development and financial performance do not seem to be related to IS maturity. Although representative, the sample is relatively small, and the primary data were collected in a single country. The paper provides a framework of IS maturity items in the hospitality industry which seem to contribute to hotels' business performances. As such, it can serve as a practical framework relevant for IT management in tourism and hospitality. The paper addresses a topic already discussed in a range of industries, although it does not seem to have been empirically evaluated by many studies of the tourism and hospitality industry. In addition, a new theoretical model of IT maturity in tourism and hospitality is proposed.*

Keywords: *information system maturity, hotel performance, cluster analysis, discriminant analysis*

JEL classification: L86; L83

1. INTRODUCTION

Throughout the period of mass tourism, the natural resources were considered as the most significant factor 'selling' the hotel product and services. In this context, informa-

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tion technology (IT), serving as the basis of information systems (IS) can be considered as useful tools in managing hospitality enterprises, although conventional research does not identify them as critical success factors (CSFs) for attaining exceptional performance. For instance, initial identification of CSFs by Brotherton and Shaw (1996) for a UK case, followed by their further verification (Brotherton, 2004), concentrated on areas of services and operations. However, further empirical research, such as a study of small hotel businesses in Turkey (Avcikurt, Altay & Ilban, 2010), has identified different marketing and customer relationship management practices, performed over the Internet, to be one of significant CSFs in hospitality industry⁴.

Nevertheless, contemporary hospitality industry, as well as tourism, is highly dependent on successful information management (Buhalis and Costa 2006). There are three fundamental dimension of IT's influence to the hospitality industry (DiPietro & Wang, 2010): firstly, IT is used for business process streamlining/automation and cost reduction. After ensuring that individual processes are performed in the most effective way, additional benefits are obtained from improved communication within a hotel (or a hospitality enterprise). Lastly, marketing and customer relationships are improved by means of IT. Namely, majority of tourist products/services are sold before it is consumed, which emphasizes the quality and distribution of hotel presentations and the distribution of such information to the right audience(s). IT mediates and fosters these processes, which is the source of its influence on the experience and purchasing behaviour of tourists (Chiang and Jang, 2006; Law and Hsu, 2006). In addition, consumers are increasingly aware of the opportunities offered by the Internet for collecting tourist-related information, as well as for communicating and engaging on-line customers (Buhalis and Law, 2008, Xiang, 2011). Therefore, website design (Gregory *et al.*, 2005, Gruter *et al.*, 2010) is proving to be essential for the success of hospitality enterprises. The industry is also taking advantage of social software (Web 2.0) which enables networking with existing and potential customers (O'Reilly, 2005).

There are, also, effects of IT/IS application at the level of the entire tourist/hospitality industry (Connolly, 2005; Singh and Kasavana, 2005). Some applications, such as Computer Reservation Systems (CRS), even have a strategic impact with far-reaching implications (Buhalis and Law, 2008). Specifically, usage of such systems can be described as providing new opportunities, they also represent a potential threat to the existing profit levels, since online distribution channels might also erode pricing levels, due to their extensive bargaining power (DiPietro & Wang, *op. cit.*).

However, there are still significant research questions to be addressed in the empirical analysis of the hospitality industry. Although there may be specific characteristics of the industry itself, it is even more important to determine which specific aspects of IS maturity especially influence the hotel performance. In the following discussion, we describe the theoretical constructs and their hypothesised relationships, the indicators used to measure them, the resulting theoretical model, the methodology and the results of the

⁴ Other significant CSFs, identified in this study, include service quality determinants, 'traditional' marketing activities and cost/sales management.

empirical research. Before concluding the paper, a modified theoretical framework is proposed consisting solely of those IS maturity items which seem to strongly contribute to business performance of hospitality enterprises.

2. INFORMATION SYSTEM MATURITY AND HOSPITALITY ENTERPRISE PERFORMANCE

The concept of IS maturity is not so new, but we consider it useful for this study, since it is often used in IT research. It is conceptually based on the maturity model as a general framework for describing the attained level of sophistication within a certain field (Tapia, 2007). In the IT field, there are several conceptualizations of the maturity concept (cf. Popović, Coelho & Jaklič (2009), with the groundbreaking work performed by Nolan⁵, who uses the notion of ‘maturity’ to denote the growth and development of IT infrastructure and functioning, as well as by McFarlan et al⁶. They use this term to denote how (information) technology is being adopted by an organization, which includes the manner in which it is being managed. The most popular application of the concept in the IT field is the Capability Maturity Model for software applications (Persse, 2001), which develops upon the generic ‘Capability Maturity Model’, developed in order to improve the outcomes of the software development process. However, the maturity concept has been applied to more than 150 IT fields such as software maintenance (April et al., 2004), data management (Xu Zhao, 2005), business management (Levin and Nutt, 2005), project management (Kerzner, 2005), information management (Venkates et al., 2003), e-business (Earl, 1989, Gardler and Mehandljev, 2000; Laudescher and Usrey 2000), etc.

Following the concepts derived from different Total Quality Management frameworks, the developed (‘mature’) software development process can be described is (Paulk, 2002): initial (i.e. characterized as ad hoc and occasionally, even chaotic – Level 1), repeatable (i.e. based on adequate rules and procedures – Level 2), consistent (Level 3), managed well enough to become predictable (Level 4) and, at the highest level (Level 5), continuously improved. Such a development toward higher maturity levels helps to reduce variations in cost, meeting planned schedule and quality objectives, etc., i.e. leads toward a higher level of software project performance (Paulk, op. cit.).

It is important to note that this implication of the maturity concept, related to linking the attainment of higher levels of sophistication with improved performance, can be generalized and used in other areas of IT, such as e-business (Zumpe and Ihme, 2007). The same has been the case in studies of maturity models in other areas, such as IS strategic planning (Cerpa and Verner, 1998), Enterprise Resource Planning systems (Light and Holland, 2001), new product development (Dooley et al., 2001), software project manage-

⁵ Nolan, R.L. (1979): “Managing the crises in data processing”, *Harvard Business Review*, Vol. 57, No. 2, pp. 115-126, as cited by Popović, Coelho & Jaklič (op. cit.).

⁶ McFarlan, F.W.; McKenney, J.L. and Pyburn, P. (1983): “The information archipelago: plotting a course”, *Harvard Business Review*, Vol. 61, No. 1, pp. 145-156, as cited by Popović, Coelho & Jaklič (op. cit.).

ment (Jiang et al, 2004), IS improvement and performance measurement (Subramaniana et al., 2006) etc.

Therefore, our hypotheses will incorporate the presumption that *IS maturity level of hospitality enterprises should be associated with their performance*. Namely, it has already been established that business processes in hotels are highly dependent on IT (Buhalis and Costa 2005; Buhalis and Egger, 2008). In addition, relationship between maturity of business processes, methodologies, IT infrastructure or information systems and the resulting performance, is usually found to be a positive one. In accordance with previous studies in other areas, we expect to find a direct relationship between IS maturity and hospitality enterprise performance. This was also the case with previous studies on the impact of other IT aspects on performance in the tourism and hospitality industry (Gregory et al., 2005; O'Reilly, 2005; Chiang and Jang, 2006; Law and Hsu, 2006; Buhalis and Law, 2008; Buhalis and Egger, 2008). However, due to the common roots a generic approach has been extracted from different theoretical frameworks, with three levels of IS maturity being proposed (see Table 1).

Table 1: *Generic levels of IS maturity*

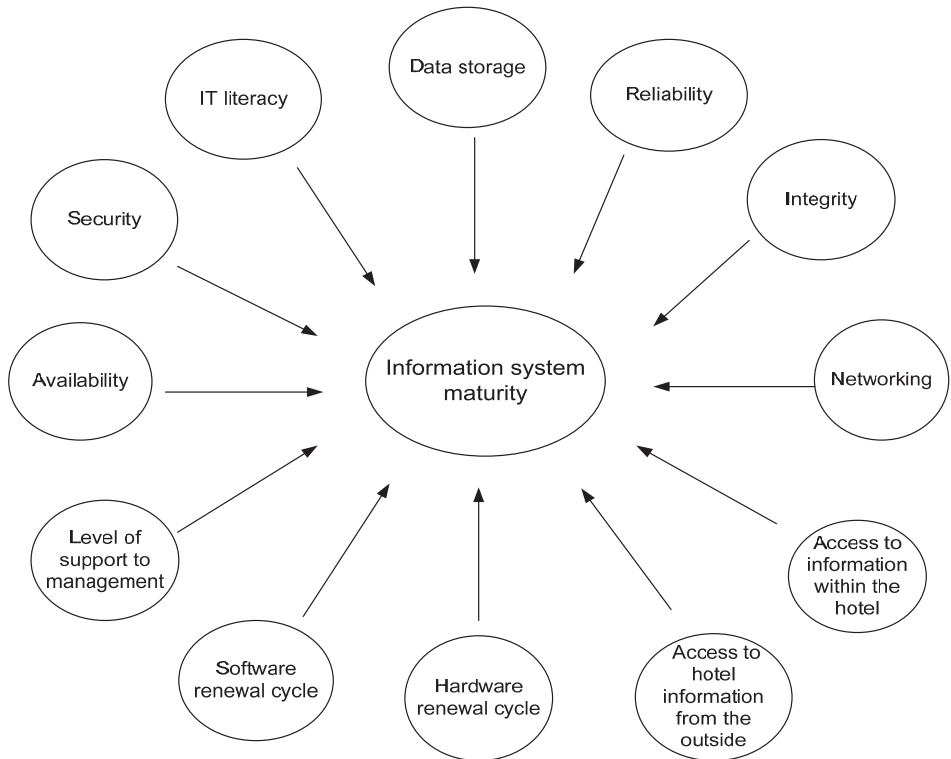
Level I	IS is a "technological partner" to the business side of an enterprise. Its focus is the automation of data processing.
Level II	IS is a process manager and a "service partner" to the business side of an enterprise. Its focus is on integration and comprehensive support to all business functions.
Level III	IS is a "strategic partner" to the business side of an enterprise. Its focus is on achieving a competitive advantage.

The 12 specific items (see Figure 1), representing the IS development elements to be used in this study, were also identified and adapted from previous empirical studies, with special emphasis placed on items identified within the 'organization technology environment' concept, developed by Wang & Qualls⁷. Those include the existing technological level of an organization (referring both to hardware and software), IT-related knowledge and skills, involvement received by IT projects from top management and the IT budget available. Our items approximately fit these theoretical categories.

Nelly (2003) claims that frameworks based on the Balanced Scorecard (BSC) arising from Kaplan and Norton's initial study (1996) are the most appropriate for the hospitality industry. In spite of fact the BSC has been already used to evaluate relevant web sites, there is still ample opportunity to apply the BSC methodology to the hospitality industry (cf. Evans, 2005). Accordingly, we decided to develop an adapted application of the BSC tool for hotel performance measurement (see Table 2).

To provide easier referencing to the three generic levels of IS maturity, we measure the process and employee development by developing qualitative descriptors of the three

⁷ Wang, Y.C. and Qualls, W. (2007), "Technology adoption by hospitality organizations: towards a theoretical framework", *International Journal of Hospitality Management*, Vol. 26 No. 3, pp. 560-73, as cited by DiPietro & Wang (op. cit.).

Figure 1: *Items used to measure IS maturity*Table 2: *Hotel performance items according to four BSC dimensions*

Non-financial performance dimension	Financial performance dimension
<ul style="list-style-type: none"> • <i>business/hotel processes</i> (speed and accuracy of performed business activities for processes related to sales/marketing, accommodation, preparation and serving meals, procurement, facility maintenance and administrative support) • <i>guest relationships on the web</i> (website usability assessment, website interactivity assessment, Web 2.0 functionality assessment) • <i>employee growth and development</i> (acceptance of new technologies) 	<ul style="list-style-type: none"> • profitability • efficiency • profit margin

levels of performance attainment so they could be used in the research instrument. The performance dimension of the guest relationship on the web was analysed by the authors, by using the scales with three qualitatively different levels of attainment (good, average, weak).

In order to summarize the theoretical concepts (constructs) used in this study and the manner in which they are measured in empirical research, we have created the following table. It provides additional information on variables used to operationalize individual

constructs, as well on individual questionnaire items and measurement scales used. Only the financial performance values have been extracted from the official annual reports for responding hospitality enterprises.

Table 3: *Summary of theoretical constructs and variables used in empirical research*

CONCEPT/CONSTRUCT	VARIABLE	MEASUREMENT SCALE ⁸	QUESTIONNAIRE ITEMS ⁹
IS maturity	Data storage	1-3 ¹⁰	1.
IS maturity	Reliability	1-5	2.
IS maturity	Integrity	1-5	3.
IS maturity	Networking	1-5	4.
IS maturity	Information access within the hotel	1-4	5.
IS maturity	Access to hotel information from the outside	1-4	6.
IS maturity	Hardware renewal cycle	1-3	7.
IS maturity	Software renewal cycle	1-3	8.
IS maturity	Level of support to management	1-3	9.
IS maturity	Availability	1-3	10.
IS maturity	Security	1-3	11.
IS maturity	IT literacy	1-3	12.
Hotel Process Performance	Sales and marketing	1-3	13.
Hotel Process Performance	Guests cycle	1-3	14.
Hotel Process Performance	Food cycle	1-3	15.
Hotel Process Performance	Procurement	1-3	16.
Hotel Process Performance	Maintaining process	1-3	17.
Hotel Process Performance	Support process	1-3	18.
Employee Growth and Development Performance	Management support	1-3	19.
Employee Growth and Development Performance	Changes acceptance	1-3	20.
Employee Growth and Development Performance	E-learning practice	1-3	21.
Guest Relationships on the Web Performance	Website utility	1-3 ¹¹	22.
Guest Relationships on the Web Performance	Website interactivity	1-3	23.
Guest Relationships on the Web Performance	Web 2.0 concept application	1-3	24.

⁸ The measurement scale are ordinary for all variable, with exemption of variable named Integrity (question no.3.; the offered particular answers are evaluated at cumulative base)

⁹ See research instrument (questionnaire) in Appendix III.

¹⁰ 1=low; 2=medim; 3=high; if the measurement scale is 1-4 or 1-5 the activity of normalisation is applied automatically within SPSS

¹¹ 1=1-3 observed items; 2=4-6 observed items; 3=7-9 observed items (see Appendix III)

3. THEORETICAL MODEL AND HYPOTHESES

In our model, we tried to isolate those items of IS maturity that significantly affect the performance of hospitality enterprises. Therefore, we hypothesised the existence of empirical verifiable relationships between hotel IS maturity and the four dimensions of the hotel performance originally proposed by the BSC model:

Hypothesis H1. There is a positive relationship between IS maturity and business process quality.

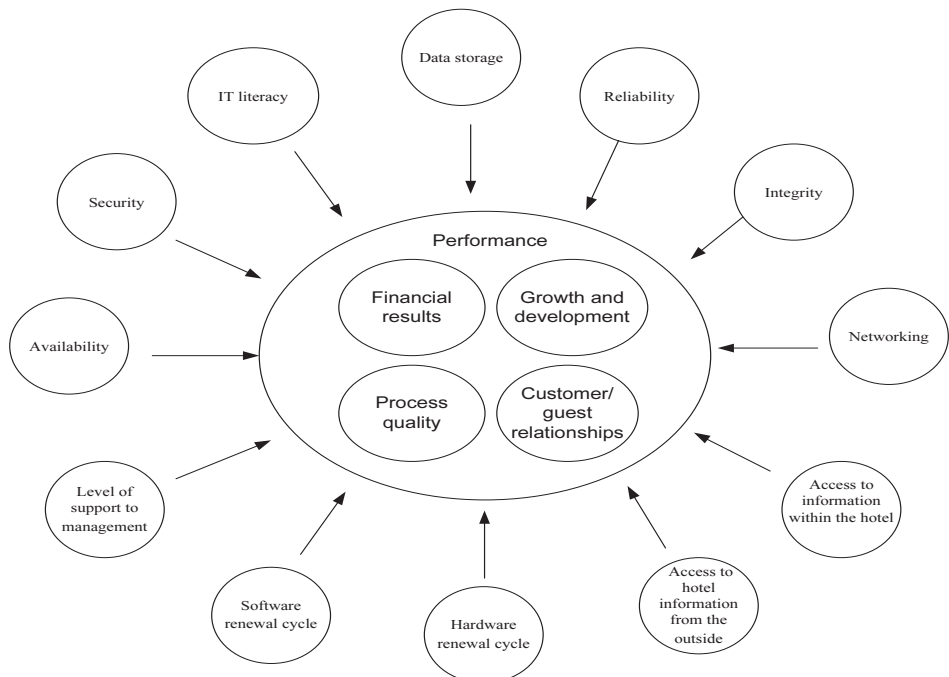
Hypothesis H2. There is a positive relationship between IS maturity and guest relationships on the web.

Hypothesis H3. There is a positive relationship between IS maturity and employee growth and development.

Hypothesis H4. There is a positive relationship between IS maturity and financial performance.

The hypothesised relationships, including structures of the IS maturity and the hotel performance constructs, constitute the research model (see Figure 2).

Figure 2: *Theoretical constructs and their measurement*



4. RESEARCH METHODOLOGY

The study has been conducted in the Croatian hospitality industry. Although the industry does not significantly differ from its major Mediterranean competitors, the transition period has not been easy for the country's hospitality industry, although the tourism is, in general, expected to serve as one of Croatia's sources of national economic competitiveness (WTTC, 2011). In this context, the supply and quality of accompanying services should be constantly improved, including upgrading quality of accommodation facilities. Faced with the performance improvement imperative, the information systems' performance effects in Croatian hotels are addressed in the empirical research.

Since smaller hotels involve less formalisation, it is appropriate to define the population for the empirical research in terms of large hotels. Namely, larger hotels, especially if they are owned by a hotel chain, tend to have mechanistic organisational structures and more elaborate formal mechanisms (Pizam, 2005), including information systems. Given that the threshold of 150 bedrooms (accommodation units) is often cited for a hotel to be classified as large (Galičić *et al.*, 2005), the same criteria were applied to defining the population of large Croatian hotels.

The questionnaire used for primary data collection had three sections related to general information about a hotel, indicators of IS maturity, business processes and employee growth/development. Guest relationships on the web were independently assessed¹², while the financial performance data were obtained from the hospitality enterprises' annual reports. The questionnaire was distributed to hotel CEOs by post to the registered addresses of 134 Croatian hotels categorised as large. The official categorisation by the Croatian Ministry of Tourism¹³ was used as the sampling frame.

The data were collected in late 2009, with the 39 original questionnaires being received. However, so as to map the collected primary data to the available financial performance data, the resulting sample was reduced to 24 Croatian hospitality enterprises consisting of large hotels. Given that there were 65 such hospitality enterprises in the sampling frame, the final response rate is 36.9%, with the sample representing the entire population in an adequate manner. The collected data were entered and analysed by using the SPSS statistical package.

5. RESULTS OF THE EMPIRICAL RESEARCH

Some of descriptive statistics related to the state of the IS in large Croatian hotels are not directly related to the hypotheses, but they demonstrate the overall level of IT/IS

¹² The grading of guest relationships included: (a) a lower level of maturity – based on the existence of up to three items out of nine as provided in the following list(s); (b) a medium level of maturity – based on the existence of three to six items as provided in the same list(s); and (c) a higher level of maturity – based on the existence of six to nine items from the same list(s) – see Appendix III for assessment items.

¹³ www.mint.hr (retrieved July 2009)

development in the Croatian hospitality and tourism industry. Those show that 47% of responding hotels in this study provide guests with broadband Internet connectivity and 61% offer some form of integrating guests' electronic equipment with the hotel's IT systems. CRS seem to be well implemented in the Croatian hotel industry, with 69% of respondents using such a system for centralised reservations within their entire company. An integrated IS, which includes accounting applications, is implemented by 47% of respondents. Only 39% of respondent enterprises do not have their own IT department and instead rely on an outsourced service, although the average size of such a department is relatively small, with an average of just one full-time IT professional.

Multiple criteria for assessing the IS maturity required a classification of sample units via clustering. Ward's hierarchical cluster analysis was used since it does not presuppose the number of clusters obtained. The clusters obtained consist of a cluster with a more mature IS, another cluster with a less mature IS and 1 outlier, although three IS maturity clusters were expected. However, those two clusters are belonging to the 2nd and 3rd levels of the generic IS maturity framework (presented in Table 1), which can be concluded from modes of the variables (indicators) used for the clustering (see Appendix I). In addition, there are significant differences between almost all the items used for clustering, for the two identified clusters (also see Appendix I).

Table 4: *IS maturity clusters*

	No. of members	
Cluster	1	15
	2	8

In the following part of the study, the respondent hotels' performance levels are analysed. First, a clustering according to all four performance dimensions was conducted, again by using Ward's hierarchical cluster analysis method. Once again, two distinct clusters were identified: high-performing and low-performing¹⁴. The first non-financial dimension of performance relates to business processes quality (sales and marketing, guest cycle, meal preparation and serving – food cycle, procurement, facility maintenance and support processes) and was assessed by the primary data. A non-parametric Mann-Whitney test confirmed the existence of significant differences in performance between the two clusters for all analysed business processes, except for the facility maintenance process (see Table 5).

Table 5: *Differences between clusters related to process performance*

Process performance	Sales and marketing	Guest cycle	Food cycle	Procurement	Facility maintenance	Support processes
Mann-Whitney test value	18.000	12.000	24.000	24.000	48.000	35.000
Asymp. Sig. (2-tailed)	.000**	.000**	.002**	.002**	.176	.006**

Note: **significant at the 1% level

¹⁴ Values of individual performance indicators for both clusters are available from the authors.

The largest mean differences between clusters were identified for sales and marketing, as well as for the guest cycle (accommodation) processes which again confirms the importance of website functionalities related to online booking and its integration into a hotel's IS. The performance of guest relationships on the web was assessed for all respondent hotels according to three qualitative sets of criteria, which include website usability and interactivity, as well as Web 2.0 integration (Vrdoljak and Šolomon, 2010)¹⁵. The Mann-Whitney test confirmed the existence of significant differences between the clusters created according to web-based guest relationship performance, as demonstrated in Table 6.

Table 6: *Differences between clusters related to the web-based guest relationship perspective*

Web-based guest relationship performance	Website usability	Website interactivity	Web 2.0
Mann-Whitney U	17.500	16.500	2.500
Asymp. Sig. (2-tailed)	.029*	.013*	.000**

Note: * significant at the 5% level; **significant at the 1% level

Employee growth and development performance were measured by the employees' adoption of technological innovations. However, there were no significant differences among the previously identified clusters. In the financial performance dimension, an analysis of variance and an F-test were used to analyse differences in financial indicators' means between the two clusters.

Table 7: *Differences between clusters related to financial performance*

Financial indicators		ANOVA				Sig.
		Sum of Squares	df	Mean Square	F test value	
Profitability (return on assets)	between groups	.005	1	.005	63.856	.000**
	within groups	.002	21	.000		
	Total	.007	22			
Efficiency	between groups	.055	1	.055	2.966	.100
	within groups	.388	21	.018		
	Total	.443	22			
Profit margin	between groups	.012	1	.012	2.670	.117
	within groups	.093	21	.004		
	Total	.105	22			

Note: * significant at the 5% level; **significant at the 1% level

To examine the relationships between affiliations to IS maturity and performance cluster membership(s), we used a Chi-square test with Yates' continuity correction to ensure

¹⁵ See Appendix III for assessment items.

that small absolute frequencies of cluster membership in 2x2 crosstabs did not affect the test's statistical reliability (see Table 8).

Table 8: Relationships between IS maturity and performance cluster membership(s)

		Test or corr. coefficient value	Df	Sig. (2-sided)
IS maturity vs. process performance	Pearson's Chi-Square	6.542	1	.011*
	Continuity Correction	4.402	1	.036*
	Phi (correlation coefficient)	.533	Not relevant	.036*
IS maturity vs. guest relationships on the web	Pearson's Chi-Square	7.425	1	.006**
	Continuity Correction	4.989	1	.026*
	Phi (correlation coefficient)	.581	Not relevant	.026*
IS maturity vs. employee growth and development performance	Pearson's Chi-Square	3.630	1	.057
	Continuity Correction	2.152	1	.142
	Phi (correlation coefficient)	.397	Not relevant	.142
IS maturity vs. financial performance	Pearson's Chi-Square	.321	1	.571
	Continuity Correction	.015	1	.903
	Likelihood Ratio	.323	1	.570
	Linear-by-Linear Association	.306	1	.580
	Phi (correlation coefficient)	.121	Not relevant	.571

Note: * significant at the 5% level; **significant at the 1% level

Therefore, it can be concluded that IS maturity is associated with some of the non-financial dimensions of hotel performance, included into our performance measurement model. These are, specifically: business process performance and guest relationships on the web. The relationship between IS maturity and employee growth/development, as well as financial performance, is statistically insignificant. These results can be compared to the conclusions of previous studies, since Škrinjar *et al.*, (2008) did not find a direct relationship between patterns of IT usage and financial performance. In previous empirical research, relationship between IT usage patterns and non-financial performance has already been established by previous empirical studies, using constructs, such as process performance (Ham *et al.*, 2005), customer relationship performance (Baloglu and Peckan, 2006; Bai *et al.*, 2008) and employee growth and development (Connolly and Lee, 2006; Niininen, *et al.*, 2007). These conclusions are supported by this study, as well.

A relatively strong correlation between IS maturity and two dimensions of non-financial performance (business process performance and guest relationships on the web) is observed. Such an empirical relationship cannot link IS maturity to financial performance, which should be further discussed in the context of analysing the return on IT investments, since IT projects are often viewed as providing inadequate results, in comparison to costs created by technology implementation and maintenance (Lucas, 1993; Brynjolfsson, 1993; Shafer and Byrd, 2000; Sigala, 2003; Strassman, 2004).

Therefore, hypotheses H1 and H2 are supported, which corresponds to the findings of Škrinjar, *et al.*, (2008) with a high level of inadequate attention being paid to employee development, which probably explains why H3 needs to be rejected. Even in this case, there is a direct influence of process orientation on the non-financial performance indicators, but not the financial ones. Due to these considerations, H4 must be rejected with further research being needed to identify the much disputed relationship between IT/IS influence to financial performance improvement. These findings are illustrated by the following table.

Table 9: *Summary of research findings*

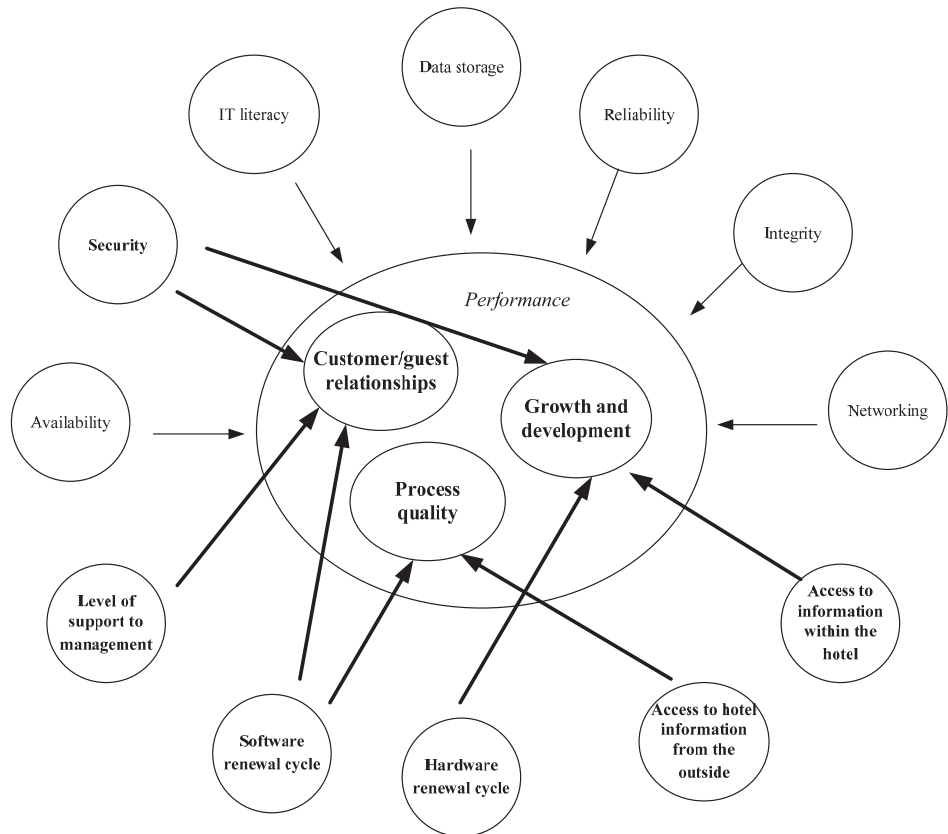
Hypothesis H1	Supported	Hypothesis H3	Not supported
Hypothesis H2	Supported	Hypothesis H4	Not supported

To assess the strength of our theoretical model for explaining the aspects of the IS maturity – performance relationship in further research, we employed a discriminant analysis to single out those indicators of IS maturity that explain the largest amount of observed hotel performance. Wilks' lambda value (see Appendix II) suggests the existence of significant differences among the observed hotels in terms of process performance, clustered according to IS maturity (with a level of significance of 1%).

As much as 69.9% hotels were classified as expected (when using all elements of IS maturity), according to process performance, if only two IS maturity items are used - the software renewal cycle and access to hotel information from the outside. Those items, selected by the stepwise method¹⁶, result in a rather robust model, which eliminates as much as 10 items, originally used to measure IS maturity, which still captures significant amount of variations in process performance. Another 81.8% hotels are correctly classified according to guest relationship performance, if only three items of IT maturity are used – the software renewal cycle, IT security and the level of support provided to managers (see Appendix II). Finally, three IS maturity items were singled out as significantly affecting the hotel classification according to employee growth and development performance. Once again, 69.9% hotels were classified as expected (when using all elements of IS maturity), according to employee growth & development performance, if only three IS maturity items are used - information access within the hotel, the hardware renewal cycle and IS security (see Appendix II).

Discriminant analyses of the initial research model demonstrated that it can be reduced to six factors (software and hardware renewal cycles, access to information within and outside the hotel, level of support provided to management and IS security), which seem to hold the greatest power for classifying cases of low versus high performance (see Figure 3).

¹⁶ For stepwise method selection process, see Appendix II. Other detailed tables available from authors, upon request.

Figure 3: *The modified research model*

7. MANAGERIAL IMPLICATIONS OF THE STUDY AND DIRECTIONS FOR FURTHER RESEARCH

The paper empirically evaluated the relationship between the IS maturity and performance of hotels. Enough evidence was found to support the hypothesised relationship between IS maturity and the majority of relevant non-financial performance indicators. In addition, the study demonstrated that many generic items commonly used to describe IS maturity are equally relevant for performance in the tourism and hospitality industry. These items, which include the hardware and software renewal cycle, both internal and external access to relevant information, IS security and level of support provided to management, seem to represent the critical success factors (CSFs) relevant to the contemporary, information-intensive tourism and hospitality industry.

These CSFs, although broadly defined, should be included into the relevant performance management frameworks for hospitality industry, which could be developed by building

upon the 'generic' approach, such as the BSC. In addition, several managerial implications, especially for large hotels, can be identified from this study:

- Issues related to IT/IS security should be added to formal job description(s) of IT personnel, as to ensure that information security is successfully addressed;
- Presentation of a hotel on the Web, in social media (Facebook, Twitter, blogs, etc.), and other relevant technology-based communication channels should be regularly evaluated by the marketing department staff. At least one member of the marketing team should be formally assigned with such a responsibility;
- Internal communication channels should be evaluated in terms of ensuring service quality for the hotel visitors;
- The proper hardware and software renewal cycles should be maintained, but the IT costs should be meticulously managed, since there is not enough evidence that they are linked to improved financial performance.

However, opportunities (or, even, imperatives) for further research on IT/IS in hospitality and tourism have not been depleted. Further research should especially address the issue of IT investments' financial viability, i.e. their financial performance, since the tightened supply of capital and other effects of the economic crisis require the increased attention toward the return on IT (and other) investments.

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APPENDIX I

Information system maturity in analyzed Croatian hotels

Table 1: *Mann-Whitney test of cluster differences*

Element of IS maturity	Measurement scale	Mode values	
		Cluster 1	Cluster 2
1. Data storage	1-3	1	2
2. Reliability	1-5	4	5
3. Integrity	1-5	3	5
4. Networking	1-5	2	3
5. Information access within the hotel	1-4	3	4
6. Access to hotel information from the outside	1-4	4	4
7. Hardware renewal cycle	1-3	2	3
8. Software renewal cycle	1-3	2	3
9. Level of support provided to management	1-3	1	3
10. Availability	1-3	2	3
11. Security	1-3	3	3
12. IT literacy	1-3	2	1

Table 2: *Mann-Whitney test of cluster differences*

IS maturity items (indicators)	Mann-Whitney test value	Asymp. Sig. (2-tailed)
Data storage	30.000	.034*
Reliability	8.000	.000**
Integrity	25.000	.019*
Networking	20.000	.006**
Information access within the hotel	13.000	.000**
Access to hotel information from the outside	42.500	.143
Hardware renewal cycle	21.000	.001**
Software renewal cycle	19.500	.002**
Level of support provided to management	26.500	.022*
Availability	28.000	.012*
Security	56.000	.465
IT literacy	52.000	.558

Note: * significant at the 5% level; ** significant at the 1% level

APPENDIX II

Discriminant analysis of the research model

Table 1: Wilks' lambda value for the original model

Test of Function(s)	Wilks' Lambda	Chi-square	Df	Sig.
1	.716	6.861	1	.009**

Note: * significant at the 5% level; **significant at the 1% level

Table 2: IS maturity items affecting the process performance classification

Step	Entered	Wilks' Lambda				Exact F			
		Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	Software renewal cycle	.590	1	1	21.00	14.609	1	21.00	.001**
2	Access to hotel information from the outside	.429	2	1	21.00	13.326	2	20.00	.000**

Note: * significant at the 5% level; **significant at the 1% level

Table 3: IS maturity items affecting the guest relationship performance classification

Step	Entered	Wilks' Lambda				Exact F			
		Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	Software renewal cycle	.612	1	1	20.000	12.656	1	20.000	.002**
2	IT security	.419	2	1	20.000	13.170	2	19.000	.000**
3	Support to management	.306	3	1	20.000	13.585	3	18.000	.000**

Note: * significant at the 5% level; **significant at the 1% level

Table 4: IS maturity items affecting the employee growth & development performance classification

Step	Entered	Wilks' Lambda				Exact F			
		Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	Information access within the hotel	.443	1	1	21.000	26.441	1	21.000	.000**
2	Hardware renewal cycle	.248	2	1	21.000	30.283	2	20.000	.000**
3	IS security	.206	3	1	21.000	24.351	3	19.000	.000**

Note: * significant at the 5% level; **significant at the 1% level

APPENDIX III

IS maturity, hotel process quality and employee growth and development

1. In the hotel information system hotel data storage is organized in:
 - a) few different databases
 - b) a common database
 - c) a data warehouse

2. Rate (1-5) to which extent the hotel information system supplies help managers oversee:
 - a) flow of required information within the hotel 1 - 2 - 3 - 4 - 5
 - b) flow of required materials within the hotel 1 - 2 - 3 - 4 - 5
 - c) monetary (cash) flows within the hotel and with the hotel's partners 1 - 2 - 3 - 4 - 5

3. Which hotel processes are supported by the hotel information system:
 - a) guest cycle process
 - b) procurement process
 - c) food cycle process
 - d) hotel maintenance process
 - e) support activities

4. Rate how integrated are the components of the hotel information system:
 - a) there is no connection between applications
 - b) applications are connected to the local network without Intranet
 - c) applications are connected to the local network and use the Intranet additionally
 - d) applications are interconnected within Intranet only
 - e) the activities are carried out on the Web only

5. **Information access within your hotel** is available via:
 - a) paper-based notes
 - b) an application not integrated with other applications
 - c) an application integrated with others applications
 - d) within the hotel intranet

6. **Access to hotel information from the outside** is available by:
 - a) fax
 - b) telephone
 - c) e-mail (email)
 - d) Web site

7. How many times have you changed your hardware (computer) equipment?
 - a) no changes
 - b) 2-4 times
 - c) more than 4 times

8. How many times have you changed your software (applications) used by the hotel information system?
 - a) no changes
 - b) 2-4 times
 - c) more than 4 times

9. Regarding the level of support provided to managers, the hotel information system supports:
 - a) operational decisions
 - b) tactical decisions
 - c) strategic decisions

10. Relevant information is available to the authorized staff users at any time:
 - a) no
 - b) sometimes
 - c) yes

11. Contents is protected from disclosure to unauthorized persons:
 - a) no
 - b) in most cases
 - c) yes

12. How would you rate the level of IT literacy of your staff?
 - a) basic IT literacy (able to use and understand application functionalities)
 - b) advanced IT literacy (able to evaluate existing functionalities and propose required improvements)
 - c) creative IT literacy (able to use applications to innovate and improve business processes)

13. The **process of hotel sales and marketing** can be described as follows:
 - a) hotel booking is carried out only by traditional distribution channels (phone, fax, presentations at fairs, personal contacts)
 - b) hotel is presented on-line, but there is no on-line booking functionality
 - c) hotel is presented on-line, with the on-line booking functionality

14. The process of accommodating guests (**guest cycle process**) can be described as follows:
 - a) staff uses the front office application, not integrated with other applications
 - b) staff uses the central reservation system, integrated with the front office application
 - c) guests can use the on-line reservation functionality, integrated with the front office application

15. The process of providing food and beverage to guests (**food cycle process**) can be described as follows:
 - a) staff is using point of sales computers to register food and beverage sales
 - b) staff is using intelligent cash registers to register food and beverages sales and changes in inventories
 - c) hotel staff is using pocket-based devices to register food and beverage sales, register changes in inventory and send orders directly to hotel kitchen

16. The **hotel procurement process** can be described as follows:
 - a) staff is using the application not integrated with other applications
 - b) staff is using the application integrated with the hotel information system
 - c) contact with suppliers in a hotel procurement is carried out within an extranet, virtual private network, or a similar network facility

17. The **hotel maintenance process** can be described as follows:
 - a) staff is aware of guests' presence only if receptionist informs them
 - b) staff is aware of guests' presence by querying the hotel information system
 - c) staff is actively informed of guests' presence by the hotel information system (based on 'smart room' technology)

18. The **hotel background processes** (accounting, finance,) can be described as follows:
 - a) they are supported by applications, not integrated with other applications
 - b) they are supported by applications integrated into the hotel information system
 - c) they are supported by web applications

19. Do you agree that the information technology opens new opportunities for development of hotel staff?
 - a) I do not agree
 - b) I partially agree
 - c) I agree

20. How does your staff accept the changes in technology?
 - a) There is a constant resistance
 - b) There is periodical resistance
 - c) There is little or no resistance

21. The hotel staff has practiced e-learning (online learning):
 - a) Never
 - b) Only once
 - c) More than once

* * *

Guest relationships on the web independently assessment items (authors' evaluation)

22. Website usability items:

1. Width of the web page (100%)
2. Website navigation controls
3. Additional navigation controls
4. Presence of the company's logo
5. Personalisation options
6. Background images (decorative background image associated with the destinations and hotel personalities)
7. News section
8. Headings in the news section
9. Facilities (privilege, serviceability,...)

23. Website interactivity items:

- a) Static information about the offer (including "offline" contact information)
- b) Registration and website personalisation, including availability information
- c) Online booking, with or without online payment

24. Web 2.0-related items:

- a) Mash-up integration of multimedia elements
- b) Integration with social networking sites
- c) Delivery of website news through a RSS (Really Simple Syndication) channel