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Euripidis Loukis

University of the Aegean, Department of Information and Communication Systems Engineering, eloukis@aegean.gr

Marianna Sigala

University of the Aegean, Department of Information and Communication Systems Engineering, m.sigala@aegean.gr

Fotini Michailidou

University of the Aegean, Department of Information and Communication Systems Engineering, fmichailidou@aegean.gr

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INTERNAL AND E-SALES INFORMATION SYSTEMS: IMPACT ON INNOVATION AND BUSINESS PERFORMANCE IN THE TOURISM SECTOR

Loukis, Euripidis, University of the Aegean, Department of Information and Communication Systems Engineering, Karlovassi 83200, Samos, Greece, eloukis@aegean.gr

Sigala, Marianna, University of the Aegean, Department of Information and Communication Systems Engineering, Karlovassi 83200, Samos, Greece, m.sigala@aegean.gr

Michailidou, Fotini, University of the Aegean, Department of Information and Communication Systems Engineering, Karlovassi 83200, Samos, Greece, fmichailidou@aegean.gr

Abstract

The relation between information systems, innovation and business performance is a critical question for both researchers and practitioners. This paper provides an empirical investigation of this issue in the tourism sector by conducting an analysis of the relations between: I) the exploitation level of two widely adopted types of IS, namely internal and e-sales systems (first level); II) the extent of business innovation and benefits from ICT (second level); and III) business performance (third level). This study has been based on firm-level data from 2665 European tourism firms, which have been used for constructing a structural equation model (SEM) and estimating the interrelationship amongst these constructs. The model provided evidence of a positive impact of the exploitation level of both IS (internal and e-sales) on innovation, with the former being a stronger driver of innovation than the latter. The exploitation levels of the internal and e-sales IS were also found to have both a positive impact on the business benefits that the tourism firms achieve from their ICT infrastructures, which impact is also mediated by innovation; internal IS were found to have a higher impact on ICT business benefits than the e-sales IS. Furthermore, these ICT benefits and innovation (both directly and indirectly through the ICT benefits) were found to have an ultimate positive impact on business performance. Consequently, the findings suggest that tourism firms should combine the development of internal ICT and e-sales IS with innovation if they wish to get more IS driven business benefits and ultimately increase their business performance.

Keywords: *Internal IS, E-Sales IS, ICT Business Benefits, Business Performance, Innovation*

1 INTRODUCTION

The business benefits of information and communication technologies (ICT) and their impact on business performance have been a critical research topic concerning both academics and practitioners for long time. Initially, research in this area focused on investigating whether the use of ICT has a positive impact in some aspects of business performance, in order to address the 'ICT Productivity Paradox' (Brynjolfsson 1993, Landauer, 1995). As this research progressed considerably by providing strong evidence that ICT have a positive impact on some measures of business performance, the next 'wave' of research in this area has started to pay particular attention to the following types of inquiries: i) understanding how this positive impact is generated (mediating factors and mechanisms) and how it can be increased, ii) investigating the above questions for particular types of IS, such as e-business, ERP, CRM, data-warehousing, etc. systems, and also iii) in different sectoral and national contexts (Melville et al. 2004; OECD, 2003 and 2004). As ICT applications have been widely advocated as a critical necessity for the survival and the competitive advantage of tourism firms, research aiming to explore the impact of ICT on the performance of tourism firms has also boomed (e.g. see review by Sigala, 2003a). Similar to research in the mainstream field, tourism studies have also focused on investigating in more depth the mechanisms and the factors driving and enabling the materialisation of the ICT impacts on business performance. Hence, studies have analysed issues such as: the intermediate impacts of ICT on business processes (e.g. Sigala, 2003c, Sigala, 2004; Orfila-Sintes, Cladera & Ros, 2005); the specific operational

benefits of certain ICT applications such as CRM, e-marketing and e-procurement (Sigala, 2003b and 2006; Martin, 2004). All studies concluded that there is not a simple and direct relationship between ICT and business performance but rather a perplex process that grants further investigation. Consequently, different studies advocated the (inter)mediated impact of factors such as business process reengineering (Sigala, 2003a), ICT operational diffusion and knowledge management (Sigala, 2003c and 2004), business innovation (Vadell & Orfila-Sintes, 2008; Orfila-Sintes et al. 2005) and networking (Baggio, 2006; Novelli et al., 2006). However, none of these studies actually measured and provided evidence of such (inter)mediated effects and relationships between ICT and business performance.

In this vein, this paper aims to empirically investigate and compare the impacts of two fundamental IS applications of tourism firms, namely:

- a) the internal IS, used by staff for supporting their internal functions and processes, and
- b) the e-sales IS, representing an 'extrovert' application whose usage and impact expand beyond the firm's organisational borders to also include partner companies, suppliers and customers,

on their intermediate and aggregate performance. In particular, this paper presents a three level empirical study investigating the relations between the following constructs: i) the exploitation level of these two quite different and widely adopted types of IS (namely the internal and the e-sales IS) (at a first level); ii) the extent of innovation (which represents one of the most widely discussed intermediate mechanisms enabling the ICT impact on business performance, e.g. Antonelli 2000, Bresnahan 2003, Hempel 2005) and the resulting ICT business benefits (at a second level); and iii) the ultimate impact of the previous constructs and processes on the aggregate business performance (at a third level). Previous research investigating the relationship between ICT and business performance has been fragmented, as it investigated only some parts of the above network of relations. For example, several empirical studies have investigated the impact of internal IS, mainly of ERP (e.g. Hunton et al 2003, Wieder et al 2006), and of 'extrovert' e-business systems (e.g. Sanders 2007, Soto-Acosta & Meroño-Cerdan 2008) on various measures of business performance. On the other hand, although there are considerable theoretical arguments advocating the potential of ICT to act as catalysts and enablers of important innovations (e.g. Bresnahan & Trajtenberg 1995, Antonelli 2000, Bresnahan 2003), there is still limited research providing empirical evidence of this innovative potential of ICT (e.g. Hempel 2005; Koellinger 2008). Therefore, there is a lack of 'holistic' empirical studies investigating and understanding the whole network of relations between the exploitation level of various IS types, innovation and resulting business benefits.

This paper is structured in six sections. Section 2 reviews the relevant literature, while section 3 presents the research model and hypotheses. The study's methodology is described in section 4 and the empirical results are presented and discussed in section 5. Finally, section 6 provides the main conclusions and the implications of the findings.

2 THEORETICAL BACKGROUND

Previous empirical studies exploring the ICT and business performance relationship have been fragmented, as they have investigated only some parts of the network of the relations between the constructs ICT exploitation level, innovation and business benefits. For example, a considerable number of empirical studies have investigated the impact of internal ERP systems on firm performance (Hitt et al 2002, Hunton et al 2003, Nicolaou and Reck 2004, Nicolaou and Bhattacharya 2006, Wieder et al 2006, Hendrics et al 2006), but they have produced mixed results: some of these studies provided evidence of positive impact of ERP systems on some measures of business performance, while some others did not find a statistically significant effect of ERP systems on the same or other measures of business performance. As a result, researchers have concluded that there should be additional variables affecting this relationship.

There have also been some studies investigating and providing evidence of a positive impact of e-business adoption on various non-financial (Devaraj et al 2007, Sanders 2007, Soto-Acosta and Meroño-Cerdan 2008) and financial measures of business performance (Zhu and Kraemer 2002, Barua et al 2004, Johnson et al 2007, Quan 2008). Studies of this type have been conducted in the tourism sector as well (e.g. Martin, 2004, Sigala, 2003b). These studies have also identified a number of mediating factors intervening this relationship (such as, the development of internal and external e-business capabilities, the digitization of business activities with customers and suppliers, etc.); however, the mediating role of innovation in the relationship between e-business and performance has not been examined yet.

Another research stream has developed a rich theoretical argumentation concerning the potential of ICT to act as catalysts and enablers of important innovations (e.g. Porter & Millar 1985, Hammer 1990, Hammer & Champy 1993, Davenport 1993, Bresnahan & Trajtenberg 1995, Antonelli 2000, Brynjolfsson and Hill 2000, Bresnahan et al 2002, Bresnahan 2003). Specifically, within the tourism industry, business innovation is currently considered as an important factor affecting the materialisation of ICT business benefits (e.g. Orfila-Sintes et al., 2005; Vadell & Francina Orfila-Sintes, 2008). In this vein, this study identifies and stresses a unique characteristic of ICT (in comparison to the other technologies that firms may also use) that further enhances ICT's capabilities to foster business innovation: ICT are 'general purpose technologies', characterised by high flexibility and adaptability, so that ICT can be used in the whole economy in numerous different ways and for many purposes, while also enable important innovations. For this reason ICT can change the way that human work is performed, measured, controlled and reported; ICT also enable significant restructuring of the work allocating routine and well-defined tasks associated with symbols' processing to computers, and separating/redesigning tasks that require human skills; furthermore, ICT enable an individual worker to have access to all the required information for completing a bigger part of a process, so that the existing fragmentation of many processes can be dramatically reduced resulting in large efficiency gains. The literature emphasizes that most of the existing work practices and business processes have been developed in the past and reflect the historically high cost of communication and information processing. So, when considering that modern ICT can reduce dramatically both these costs, ICT can be key enablers and facilitators of new enhanced business processes and work practices, which in turn can lead to big productivity increases initially by reducing costs and increasing output quality and subsequently by designing new products and improving important intangible aspects of existing products, such as convenience, timeliness, quality, etc. Indeed, within the tourism sector, Sigala (2002) has documented the significant impacts of ICT on work and employment redesign as well as their resulting operational efficiencies by analysing the automation, hyperautomation (seamless processes), and informate impacts of ICT on tourism value chains and business operations.

However, a thorough literature review reveals that these theoretical arguments and expectations concerning the innovative potential of ICT have been empirically investigated only to a limited extent. Most of the previous empirical research analysing the relation between ICT and innovation investigates the impact of ICT on business performance and concludes that the combination of ICT investment with innovations increases the contribution of the former to various measures of business performance (Licht & Moch 1997, Hempell et al 2004, Hempell 2005, Loukis et al 2008, Arvanitis & Loukis 2009, Loukis et al 2009). By using data from valve manufacturing plants, Bartel et al (2007) come to the conclusion that plants adopting IT-enhanced equipment tend to shift their products' range towards more customized valve products. Kafourous (2006) collected data from 89 UK based firms over a 14 years period (from 1989 to 2002) and found that the use of Internet increases the efficiency of research and development (R&D). By analysing the data coming from 7,302 European enterprises and collected by the e-Business Market Watch Survey 2003, Koellinger (2008) reaches the conclusion that both innovation and ICT usage have a positive impact on several measures of business performance (including profitability and increase of sales and employment); the ICT usage level of each firm was measured by calculating an index equal to the percentage of the following seven important internal and extrovert ICT used by the firm: ERP, supply chain management systems, customer relationship management systems, knowledge management systems, online sales, online purchases, e-learning). This study has also provided some

evidence of the innovation capabilities enabled by ICT, since 41% of the enterprises of its sample reporting a product/service innovation have also claimed that they have used Internet technologies for enabling this innovation; also 48% of these enterprises reported a process innovation that was also based on Internet technologies for enabling it. Orfila-Sintes et al. (2005) have also found that ICT have been a major driver of process innovation within the hospitality sector and particularly for hotels belonging to a hotel chain, because the latter foster and support knowledge transfer and know-how from corporate offices and other properties. Nevertheless, this limited empirical literature has focused on examining the relation between ICT in general and innovations, while the relation between particular types of IS (such as e-sales and internal systems) and innovation has not been studied and compared yet. However, there is some literature advocating that e-business facilitates and enables innovation in the way firms do business and establish new business models (Timmers 1998, Afuah & Tucci 2001, Tavlaki & Loukis 2005).

Moreover, there is considerable amount of empirical research investigating the impact of innovation on performance (e.g. Cainelli et al 2004, Dunk 2005, Thornhill 2006, Koellinger 2008, De Clerk et al 2008). However, the findings of these studies are contradictory. So, although the majority of these studies shows a positive relationship between innovation and firm performance, few studies also provide evidence of a non significant statistically association between these variables.

In summary, it can be concluded that the previous empirical literature has investigated only some parts of the network of the relations related to the constructs unravelling the impacts of ICT on tourism firms' performance, while some other parts of these relations, such as the mediating role of innovation, have been explored only to a limited extent or they even remain unexplored. Therefore, there is a lack of 'holistic' empirical studies investigating and understanding the whole network of relations between the exploitation level of various IS types, innovation and resulting business benefits (both intermediate and aggregate).

3 RESEARCH MODEL AND HYPOTHESES

The present study contributes to the literature by filling in the abovementioned research gaps. Its research model is shown in Figure 1.

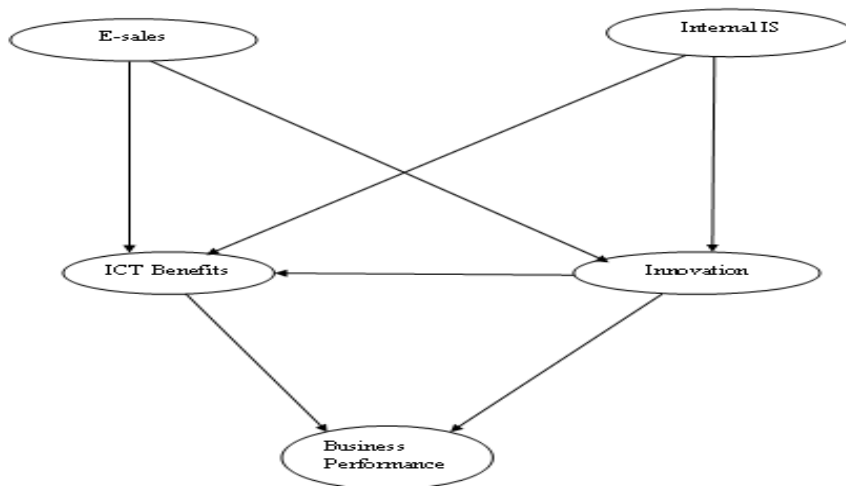


Figure 1. The hypothesized research model.

The first research hypothesis concerns the role of innovation in the relation between the extent of adoption of e-sales systems and the benefits generated to the firm from its ICT infrastructure. E-sales systems provide firms with the capability to reach much wider geographic areas and prospective customers' groups. ICT also enable tourism firms (Sigala, 2003b): to provide to their current and prospective customers more and better information (e.g. enriched with multimedia) of their offerings;

to receive online orders and reservations; to complete economic transactions by receiving online payments from their customers; and to offer better after-sales support and services to customers. After reviewing the related literature, Turban et al (2006) summarized the main business benefits of e-sales as follows: global reach, cost reduction, supply chain improvements, easier customization of products and services, improved customer service and relations, more capabilities for specialization, new business models and partners, and an improved corporate image. These capabilities of the e-sales systems enable firms to further increase the benefits they get from their total ICT infrastructures. Furthermore, as mentioned in the previous section, there is empirical evidence concerning the positive effect of e-business adoption on various financial and non-financial measures of business performance (Zhu and Kraemer 2002, Barua et al 2004, Devaraj et al 2007, Sanders 2007, Johnson et al 2007, Quan 2008 Soto-Acosta and Meroño-Cerdan 2008). Therefore, we expect that the firms' extent of adoption of e-sales systems has a positive effect on the ICT benefits. However, we expect that part of this relationship to be through products, services and processes innovations driven by the adoption of e-sales systems, which enhance the benefits that ICT infrastructure generates. The adoption of e-sales systems in order to be efficient necessitates innovations in business processes, e.g. modifications of some current business processes and probably creation of new business processes. Also, it facilitates and enables the provision of new products and services based on the new electronic channel. As mentioned in section 2, previous literature has identified and described emerging innovative e-business models (Timmers 1998, Afuah & Tucci 2001, Tavlaki & Loukis 2005). The above innovations driven by the adoption of e-sales systems will increase the benefits generated by ICT infrastructure. As mentioned in section 2, previous empirical studies have provided evidence that innovation increases the contribution of ICT to business performance (Licht & Moch 1997, Hempell et al 2004, Hempell 2005, Loukis et al 2008, Arvanitis & Loukis 2009, Loukis et al 2009). For these reasons, our first research hypothesis is:

Hypothesis 1: *The extent of e-sales systems adoption has a positive effect on the extent of ICT benefits, which is partially mediated by the extent of innovation.*

It can be analyzed into the following three sub-hypotheses:

Hypothesis 1.1: *The extent of e-sales systems adoption has a positive effect on the extent of innovation.*

Hypothesis 1.2: *The extent of innovation has a positive effect on the extent of ICT benefits.*

Hypothesis 1.3: *The extent of e-sales systems adoption has also a direct positive effect on the extent of ICT benefits.*

The second research hypothesis concerns the role of innovation in the relation between the extent of adoption of internal systems and the ICT benefits for the firm. Internal systems automate or support important functions and processes of the firm, reducing cost and time, and enable a better management and exploitation of firm resources; also, they improve coordination and control within the firm, while they also provide reliable data for supporting decision making. The above capabilities of internal systems enable firms to increase the benefits they get from their total ICT infrastructures. Also, as mentioned in the previous section, there is empirical evidence of the positive impact of internal ERP systems on some measures of business performance (Hitt et al 2002, Hunton et al 2003, Nicolaou and Reck 2004, Nicolaou and Bhattacharya 2006, Wieder et al 2006, Hendrics et al 2006). Therefore, we expect that the extent of adoption of internal systems by a firm has a positive effect on the ICT benefits it obtains. However, we expect that part of this relationship to be materialised through products, services and processes innovations driven by the adoption of internal systems, which in turn result in higher ICT benefits. Internal systems facilitate and enable innovations in business processes (e.g. processes simplifications, improvements, abolitions, or creation of new horizontal interdepartmental processes), and also new or improved products and services. As it is also mentioned in section 2, the literature provides a rich theoretical argumentation concerning the innovation capabilities offered by internal IS (e.g. Vadell & Orfila-Sintes, 2008; Orfila-Sintes, 2005; Porter & Millar 1985, Hammer 1990, Hammer & Champy 1993, Davenport 1993, Bresnahan & Trajtenberg 1995, Antonelli 2000, Brynjolfsson and Hill 2000, Bresnahan et al 2002, Bresnahan 2003). As it is previously mentioned, these innovations,

will increase the benefits generated by ICT infrastructure. Overall, the second research hypothesis is formulated as below:

Hypothesis 2: *The extent of internal systems adoption has a positive effect on the extent of ICT benefits, which is partially mediated by the extent of innovation.*

It can be analyzed into the following three sub-hypotheses:

Hypothesis 2.1: *The extent of adoption of internal systems has a positive effect on the extent of innovation.*

Hypothesis 2.2: *The extent of innovation has a positive effect on the extent of ICT benefits (it is identical to hypothesis 1.1).*

Hypothesis 2.3: *The extent of adoption of internal systems has also a positive effect on the extent of ICT benefits.*

Finally, we expect that higher ICT business benefits will result in higher business performance. Furthermore, we expect that the extent of innovation will also result to higher business performance, both directly and indirectly, through the increase of ICT benefits. The innovation and the development of new products and services creates new markets that can be monopolised by the firm until the competitors imitate these new products or services. The improvement of existing products and services can also differentiate a firm over its competitors and so, increase its business performance, while process innovation helps firms to improve their operational efficiency. Overall, any type of innovation (product improvement or development or process innovation) can lead to higher business performance. Also, there is considerable empirical evidence that innovation has a positive impact on business performance (e.g. Cainelli et al 2004, Dunk 2005, Thornhill 2006, Koellinger 2008, De Clerk et al 2008). For the above reasons our third and fourth research hypotheses are formulated as follows:

Hypothesis 3: *The extent of ICT benefits has a positive effect on business performance.*

Hypothesis 4: *Innovation has a positive effect on business performance, which is mediated by the extent of ICT benefits.*

4 RESEARCH METHODOLOGY

The data source for the present study was the e-Business W@tch Survey 2006, which has been conducted by the European e-Business Market W@tch (www.ebusiness-watch.org), an observatory organization sponsored by the European Commission. This survey was based on 14,065 telephone interviews with decision-makers of enterprises from 29 countries, including the 25 EU Member States, EEA and Acceding / Candidate Countries. These interviews were carried out during March and April 2006 by using computer-aided telephone interview (CATI) technology and a research instrument that included a large number of closed form questions concerning the firms' usage of various types of ICT, the resulting business benefits and firms' innovation. The population of this survey included all active enterprises of the above mentioned countries that use computers and have their primary business activity in one of the following ten selected highly important sectors (including both manufacturing and services): Food and Beverages, Footwear, Pulp and Paper, ICT Manufacturing, Consumer Electronics, Shipbuilding and Repair, Construction, Tourism, Telecommunication Services and Hospital Activities. From this population a stratified sampling was made with respect to company size and sector. Strata were to include a 10% share of large companies (250+ employees), 30% of medium sized enterprises (50-249 employees), 25% of small enterprises (10-49 employees) and up to 35% of micro enterprises with less than 10 employees. This study used only the data coming from the 2,665 tourism firms that were included and surveyed by the e-Business W@tch Survey 2006.

All the five basic variables of this study, which are shown in Figure 1, were measured as reflected constructs using several items, which corresponding to appropriate questions of this survey and are shown in the Appendix Table 1, so that high levels of validity and reliability can be achieved (Straub et al

2004, Kline 2005). In particular, for measuring the extent of adopting e-sales we used four items, which measure whether the firm uses ICT for publishing offers to customers, answering calls for proposals or tenders, receiving orders from customers and also enabling customers to pay online for ordered products or services. The extent of adoption of internal ICT was measured through four items measuring whether the firm uses ICT for: a) sharing documents between colleagues or performing collaborative work in an online environment; b) tracking working hours or production time c) managing capacity or inventories; and d) whether a firm uses an Enterprise Resource Planning (ERP) system. The extent of innovation was also measured through four items; two of them measure whether the firm during the past 12 months has launched any new or substantially improved products or services (product/service innovations), or has introduced any new or significantly improved internal processes (process innovations); the other two items measure whether any of these product or service innovations, or any of these process innovations, has been directly related to or enabled by ICT. In order to measure the extent of benefits the firm obtained from ICT, six items were used, which measure whether ICT has had a positive influence, no influence at all or negative influence on revenue growth, efficiency of business processes, internal work organisation, quality of products and services, quality of customer service and firm productivity. Finally, business performance was measured through three items, which measure whether the turnover, the market share and the productivity of the firm has increased, stayed roughly the same or decreased over the past 12 months.

5 DATA ANALYSIS AND RESULTS

The hypothesized research model shown in Figure 1 was estimated through covariance-based SEM (Kline 2005), which offers the advantage of estimating at the same time both the measurement part of the model (i.e. paths between each construct and corresponding items) and the structural part of the model (i.e. paths between constructs), using the AMOS 6 software (Byrne, 2001).

Initially we examined the measurement part of the model and assessed the validity and reliability of all constructs. Concerning constructs' validity we assessed its most important dimension, the convergent validity (Straub et al 2004) by examining the loadings of the items for each construct, which are shown Appendix Table 2). We can see that all of them are statistically significant and exceed the cut-off level of 0.6 suggested by Chin (1998) (a few items with loadings slightly lower than 0.6 were regarded as marginally acceptable, so they were retained), therefore our constructs are characterised by convergent validity. Next, we assessed the reliability of each construct by calculating Cronbach's Alpha using the SPSS 15.0 software, which are shown in Appendix Table 3; since all of them have values exceeding the cut-off level of 0.7 recommended by the relevant literature (Gefen et al 2000, Straub et al 2004), we can conclude that all constructs are characterised by reliability as well.

Then, we assessed the goodness of fit of the whole model by examining the values of its basic fit indices, which are shown in Appendix Table 4. We can see that we have acceptable values, in accordance with the recommendations of the relevant literature (Gefen et al 2000, Straub et al 2004), for both the incremental fit indexes NFI, RFI, IFI, TLI and CFI (> 0.9) and for the RMSEA (< 0.05), so we can conclude that the estimated model is characterised by an acceptable fit to the data.

Having confirmed acceptable model fit and validity and reliability for every construct, we finally focused our attention on the structural model, which is shown in Figure 2. We remark that the extent of adoption of e-sales and internal systems have both a positive and statistically significant effect on the extent of innovation (standardised coefficients 0.194 and 0.252 respectively), so hypotheses 1.1 and 2.1 are both supported. Therefore, we conclude both these fundamental types of IS are drivers of innovation in tourism sector firms, with the internal systems having a stronger effect on innovation than the e-sales systems. This identified critical role of both IS types on business innovation can be justified taking into account that nowadays business innovation in the tourism industry is heavily linked with new methods of distribution, client interaction and engagement in business processes (Sigala, 2009) as

well as with the informationalisation of business processes (Sigala and Chalkiti, 2007), that are all fostered and assisted by ICT applications. Moreover, the greater innovation of internal IS systems is also very obvious since the e-sales systems have a limited sphere of influence (i.e. only for interaction with clients) relative to internal IS systems.

Also, we can see that the extent of innovation has a positive and statistically significant effect (standardised coefficient 0.220) on the extent of benefits a firm obtains from its ICT infrastructure, so hypothesis 1.2/2.2 is supported as well. This result is in agreement with conclusions of previous literature that innovation increases the business benefits and contribution of ICT (Licht & Moch 1997, Hempell et al 2004, Hempell 2005, Loukis et al 2008, Arvanitis & Loukis 2009, Loukis et al 2009). Hence, it becomes obvious that tourism firms in order to maximize the business benefits from their ICT should exploit their IS systems for innovating their services and processes. In other words, profitable and efficient tourism firms will be differentiated based on whether they exploit IS systems for supporting business innovation rather based on whether they simply possess or not a specific type of IS.

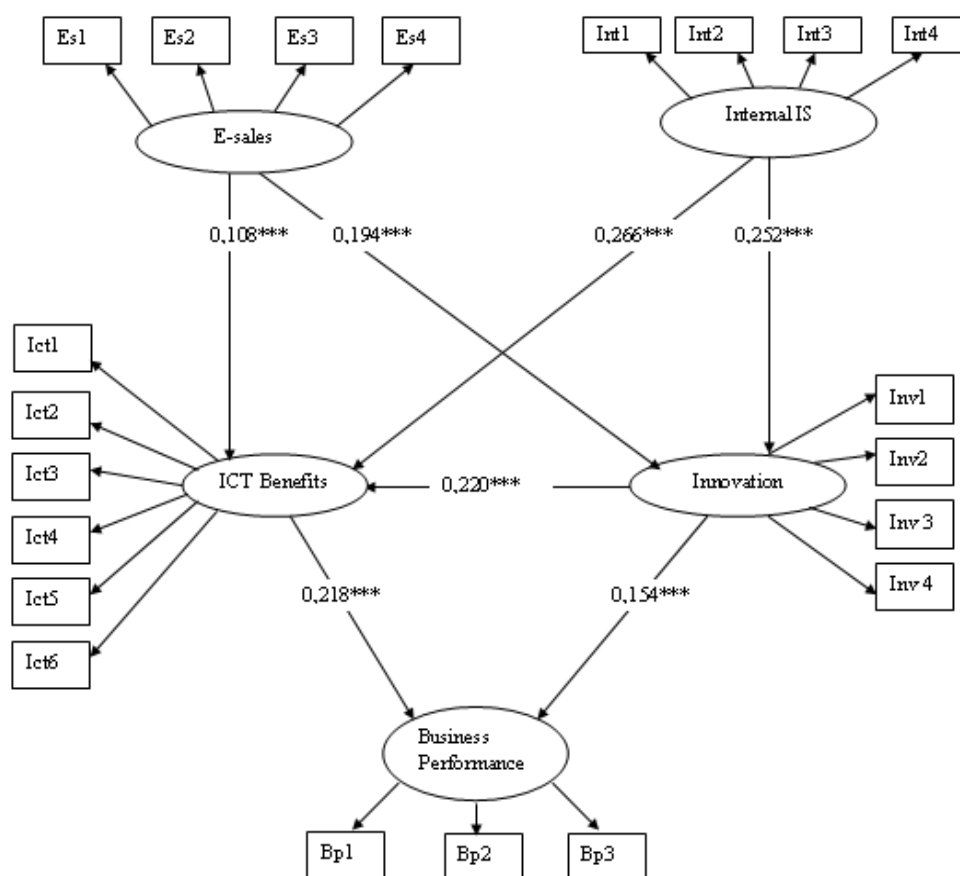


Figure 2. The estimated structural model.

At the same time we remark that the extent of adoption of e-sales and internal systems have both a positive and statistically significant direct effect as well on the extent of ICT benefits (standardised coefficients 0.266 and 0.108 respectively), so hypotheses 1.3 and 2.3 are both supported. From all the abovementioned results, it is concluded that the extent of e-sales and internal systems adoption have positive effects on the extent of ICT benefits, which are both partially mediated by the extent of innovation, so hypotheses 1 and 2 are supported. In particular, we found that the extent of e-sales system adoption has a statistically significant total effect on ICT benefits equal to 0.108 (direct effect) + $0.194 \cdot 0.220$ (indirect effect through the extent of innovation) = 0.151 , in agreement with previous relevant empirical literature concluding that e-business adoption has a positive impact on business performance (Zhu and Kraemer 2002, Barua et al 2004, Devaraj et al 2007, Sanders 2007, Johnson et al

2007, Quan 2008 Soto-Acosta and Meroño-Cerdan 2008); we remark that 28% of this total effect ($0.194 \times 0.220 / 0.151$) is through the innovations that e-sales systems drive, which enhance the benefits that ICT infrastructure generates. Concerning the extent of internal systems adoption, we found that it has a statistically significant total effect on ICT benefits equal to 0.266 (direct effect) + 0.252×0.220 (indirect effect through the extent of innovation) = 0.321; this in agreement with previous relevant empirical literature concluding that the adoption of internal ERP systems has a positive impact on business performance (Hitt et al 2002, Hunton et al 2003, Nicolaou and Reck 2004, Nicolaou and Bhattacharya 2006, Wieder et al 2006, Hendrics et al 2006). We remark that 17% of this total effect ($0.252 \times 0.220 / 0.321$) is through the innovations that internal systems drive, which enhance the benefits that ICT infrastructure generates. From the above results we can conclude that the extent of internal systems adoption has a much larger effect on the extent of benefits a firm gets from its ICT infrastructure than the extent of adopting e-sales systems.

The above mentioned findings provide clear evidence of the business benefits that IS usage offers to tourism firms and its positive impact on business performance. Such evidence is also very crucial in order to persuade tourism firms for the return of investment of IS applications and so, affect their decision to initially adopt IS applications. After tourism firms get more familiar with IS applications and have incorporated them into their operations, then they can further consider on how to further exploit IS systems for enhancing their business innovation benefits.

Finally, we remark that the extent of ICT benefits has a positive and statistically significant effect on business performance (standardised coefficient 0.218), so hypothesis 3 is supported. Also, we can see that the extent of innovation has a direct positive and statistically significant effect as well on business performance (standardised coefficient 0.154). This leads to the conclusion that the positive effect of the extent of innovation on business performance is partially mediated by the extent of ICT benefits, so hypothesis 4 is supported. In particular, we found that the extent of innovation has a statistically significant total effect on business equal to 0.154 (direct effect) + 0.220×0.218 (indirect effect through the extent of innovation) = 0.202, in agreement with previous relevant empirical literature concluding that innovation has a positive impact on business performance (e.g. Cainelli et al 2004, Dunk 2005, Thornhill 2006, Koellinger 2008, De Clerk et al 2008); we also remark that we remark that 24% of this total effect ($0.220 \times 0.218 / 0.202$) is through the increase of ICT business benefits resulting from innovation, which enhance business performance.

The abovementioned statistically significant relations found in this study consist a significant contribution to the literature, since they provide not only hard evidence of the existence of impact of ICT on business performance of tourism firms, but they also explain and unravel how this business performance impact of ICT is created. In this vein, the model provides a good guidance to both academics and practitioners. Researchers are provided with a theoretical and empirically tested framework on how IS systems can positively impact business performance. Tourism managers are also stressed that the sole acquisition of IS systems cannot derive them substantial benefits, Instead tourism managers are suggested that they need to crucially consider and link IS system with business innovation either service based or process based innovation. Successful tourism firms will be characterised by their capability to continually innovate and improve their business models and operations by exploiting IS systems.

6 CONCLUSIONS AND IMPLICATIONS

The previous sections presented an empirical study of the relations between the extent of adoption of two quite different and widely adopted types of IS, the internal and the e-sales ones, the extent of innovation, the ICT business benefits and finally business performance in the tourism sector. It has been based on firm-level data collected through the e-Business W@tch Survey 2006 from 2665 European firms from the tourism sector. Using these data a structural equation model (SEM) connecting the above variables has been estimated. From this model it has been concluded that both these types of IS are

drivers of innovation in tourism sector firms, with the internal systems having a stronger effect on innovation than the e-sales systems. They both have an impact on the benefits generated for the firms from ICT, and through them on business performance, with the internal systems having a higher impact on ICT benefits and business performance than the e-sales systems. The impacts of both these types of IS on ICT benefits are partially mediated by innovation: 17% of the impact of internal systems on ICT benefits is through the innovation they drive, while a much higher 28% of the impact of e-sales systems on ICT benefits is through the innovation drive by them. Concerning innovation, it has been concluded that it has a positive impact on business performance of tourism sector firms, partially mediated by the increase of ICT benefits that innovation causes.

Our findings have interesting implication for research and practice. The significant differences identified in this study between the internal systems and the extrovert external systems, as to their effect on innovation, benefits generated by ICT and business performance, indicate that future IS research (in tourism and all other sectors) on such issues should not deal with IS in general, and should differentiate between particular types of IS. As to IS management practice, the conclusions of this study indicate that tourism sector firms should combine the development of internal ICT and e-sales systems with innovations, in order to get more business benefits from them and have a larger positive impact on business performance. Future research is required to explore the relations between other types of IS with innovation, ICT business benefits and business performance, and to make comparisons between them from the above perspectives.

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Appendix

Table1. Survey questions for measuring each construct.

Constructs	Items
Innovation	Inv1: During the past 12 months, has your company launched any new or substantially improved PRODUCTS or SERVICES? (1)yes (2)no (3)DK/refused/not applicable)
	Inv2: Have any of these product or service innovations been directly related to or enabled by information or communication technology? ((1)yes (2)no (3)DK/refused/not applicable)
	Inv3: During the past 12 months, has your company introduced any new or significantly improved internal PROCESSES, for example for producing or supplying goods and services? ((1)yes (2)no (3)DK/refused/not applicable)
	Inv4: Have any of these process innovations been directly related to or enabled by information or communication technology? ((1)yes (2)no (3)DK/refused/not applicable)
Internal IS	Does your company use online applications OTHER THAN e-MAIL, for example special software, to support any of the following business functions: Do you use online applications other than e-mail ... [item]? ((1)yes (2)no (3)DK)
	Int1: to share documents between colleagues or to perform collaborative work in an online environment
	Int 2: to track working hours or production time
	Int 3: to manage capacity or inventories?
	Int 4: Does your company use an ERP system (that is Enterprise Resource Planning System)?
E-sales	Which of the following marketing or sales related processes does your company support by specific IT solutions? Do you use IT solutions for ... [item]?((1)yes (2)no (3)DK)
	Es1: Publishing offers to customers
	Es2: Answering calls for proposals or tenders
	Es3: Receiving orders from customers
	Es4: Enabling customers to pay online for ordered products or services

ICT Benefits	All in all, in what ways have information and communication technologies influenced the business of your company? Please tell us for each of the following areas whether ICT has had a positive influence, a negative influence, or no influence at all. Would you say the influence of ICT on ... [item] was ...? ((1) positive (2) negative (3) no influence (4) DK)
	lct1: revenue growth
	lct2: the efficiency of business processes
	lct3: internal work organisation
	lct4: quality of products and services
	lct5: quality of customer service
	lct6: the productivity of your company
Business Performance	Bp1: Has the share of your company in this market increased, decreased, or remained the same over the past 12 months? ((1)increased (2)decreased (3)stayed roughly the same (4)DK)
	Bp2: Has the turnover of your company increased, decreased or stayed roughly the same when comparing the last financial year with the year before? ((1)increased (2)decreased (3)stayed roughly the same (4) DK (5) not applicable, e.g. if non-profit organisation)
	Bp3: Has the productivity of your company increased, decreased or stayed roughly the same when comparing the last financial year with the year before? ((1)increased (2)decreased (3)stayed roughly the same (4) DK (5) not applicable, e.g. if non-profit organisation)

Table 2. Loadings of constructs' items.

Item	Es1	Es2	Es3	Es4	Int1	Int2	Int3	Int4	lct1	lct2	lct3
Loading	.884	.829	.925	.634	.656	.581	.590	.593	.623	.689	.581

Item	lct4	lct5	lct6	Inv1	Inv2	Inv3	Inv4	Bp1	Bp2	Bp3
Loading	.588	.649	.731	.760	.875	.848	.942	.591	.722	.870

Table 3. Cronbach Alpha values of constructs

Construct	E-sales	Internal IS	ICT benefits	Innovation	Business performance
Cronbach Alpha	.895	.705	.808	.807	.721

Table 4. Model fit indices

Chi-square	NFI	RFI	IFI	TLI	CFI	RMSEA
254.0	.988	.984	.995	.993	.995	.016