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ICTs in the hospitality industry: An importance-performance analysis among small family-owned hotels

Abstract

This study delivers the importance-performance analysis of the information and communication technology (ICT) driven solutions among small and family-owned hotels (SFH) in Croatia. The analysis reflects the opinions of owners of 21 SFH, all of which are members of the National Association of Family and Small Hotels (OMH). The findings demonstrated the existence of a significant gap between the perception of the importance of specific innovations and actual hotel performances. In most cases, hotel performances are rated significantly lower than the perceived importance of particular innovation, which indicate that resources should be better and more wisely allocated. In some cases, hotels do not recognise the benefits of ICTs used or are not satisfied with the results. The primary constraint for higher integration of the ICTs within this sample is the lack of financial resources. The study reveals the importance-performance gaps within the perception of technological innovations in the SFHs, elaborates on potential constraints for more substantial reliance on ICTs and discusses the possible implications. Finally, the study provides recommendations for future research.

Key words: ICT; hospitality innovations, importance-performance analyses; small and family-owned hotels; Croatia

1. Introduction

Technological advances are causing fundamental disrupt in the tourism industry by empowering tourism actors to form new markets, shape new services, and manage their businesses more effectively (Law, Buhalis, & Cobanoglu, 2014; Sigala, 2018). They are fostering the transformation of tourism management and marketing in a way that managers are not only using technology as a tool but rather tourism markets and actors, i.e. all stakeholders, both shape and are shaped by technology (Sigala, 2017). Furthermore, ICTs are recognised as the most effective tool for boosting tourism (Navío-Marco, Ruiz-Gómez, & Sevilla-Sevilla, 2018), with the ability to initiate the transition from monologue to dialogue between tourism supply and demand. The increasing pressure to provide more sophisticated and tailored products and to increase business effectiveness has lead hospitality business to become more reliant on ICT in various aspects of their business. The reliance on technologies throughout interoperability and interconnectivity of all network partners increasingly enabled hospitality organisations to develop their competitiveness through a better understanding of customers and market conditions and develop their decision-making process (Buhalis & Leung, 2018).

The role of the ICT in marketing (Aluri, 2017; Kang, Jang, & Jeong, 2018; Kim, Youn, Um, & Lee, 2016; Mandić & Garbin Praničević, 2019; Fwaya & Kesa, 2018; Park & Jang, 2014) and management (Beldona, Buchanan, & Miller, 2014; DeFranco, Morosan, & Hua, 2017; Egger, 2013; Kim, Connolly, & Blum,2014; Kuo, Chen, & Tseng, 2017; Sarmah, Kamboj, & Rahman, 2017a; Yen &

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Tang, 2019) in the hospitality industry, same as information provision (Chu, Lin, & Chang, 2012; Hur, Kim, Karatepe, & Lee, 2017; Li, Hu, Huang, & Duan, 2016; Taylor & Levin, 2014; Wang, Park, & Fesenmaier, 2012) and service co-creation (Marques & Borba, 2017; Martín & Román, 2017; Sarmah et al., 2017a, Sarmah, Rahman, & Kamboj, 2017b; Tom Dieck, Jung, & Han, 2016)to ensure successful implementation of this new technology in the visitor industry, it is essential to understand user requirements from a visitor's point of view. Therefore, the aim of this paper is to investigate visitors' requirements for the development of a wearable smart glasses augmented reality (AR has been widely acknowledged. Within the hotel industry, the impacts of ICTs are mainly reflected in four major areas, namely, strategic planning and revenue management, operations, marketing distribution and communication, customer service and relationship management (Dipietro & Wang, 2010). In this abundance of hospitality and ICT related studies, a little attention has been given to the potentials, adaptation and specifics of ICTs within SFH as a unique and growing segment of the industry. This research contributes to address that gap.

Small businesses form an essential part of the tourism system internationally yet remain relatively under-researched (Soler & Gémar, 2016; Thomas, Shaw, & Page, 2011). According to Škokić, Lynch, and Morrison (2016) significant growth in the number of studies investigating small hospitality firms is evident; however, the knowledge is still limited considering many of them drawn from the perspective of western developed economies exclusively.

This study delivers managers' and owners perception of importance and performance (IP) of proposed technologies for their SFH businesses. The aim is to identify the relevance of the ICTs and their perceived impacts on four aspects of SFH businesses, namely, (1) effectiveness, efficiency and improvement of hotel performances; (2) shaping and delivering of services; (3) customer relationships and communication with guests; and (4) overall financial performances. The study provides the perspective of SFH owners and managers in Croatia, leading southern Mediterranean destination.

2. Technological innovations and hotel performances

The majority of hotels recognized technology „as a backbone of many process innovations" (Hjalager, 2010), and thus rely their activities directly or indirectly on technology, making technological inovations more important to SFH operations, their revenue growth, profitability, business climate and guest satisfaction than ever before. Such technological innovations in hotel industy are (i) designed and built on different technological base (Seggitur & CICtourGUNE, 2014, Jaremen, 2016), (ii) integrated into system on progression rate (Kazandzhieva & Santana 2019) and (iii) more supplier dominated i.e. to the most part implement as developed by their producers/suppliers (Orfila-Sintes, Crespi-Cladera, & Martinez-Ros, 2005; Pivčević & Garbin Praničević, 2012).

The upgraded technological innovations in hotel sector mainly refer on smart mobile technologies, Internet of Things (IoT), cloud computing, big data technologies, smart devices, new social media tools and sensors which become the critical factor of intelligent (smart) tourism and hospitality' business. Each of these solutions in smaller or greater extent is relevant for SFH businesses, and their benefits range from allowing hotels to improve hotel processes performance, through the delivery of a better guest experience (Evans & Peacock, 2000; Irvine & Anderson, 2008). Moreover, it seems that framework linking technological innovation with any small tourism firm performance over time become necessary for strategic business planning (Zapalska, Brozik, & Zieser, 2015).

In this regard, the hotel performances can be enhanced via *(i) integrated hotel information systems* with direct impact on numerous hotel departments, e.g. accounting, sales and front desk, marketing and

housekeeping (Fucks, Scholochov, & Höpken, 2009; Leung & Law, 2012), and *(ii) business intelligence (BI) tools*, which are designed to analyse large quantity of data collected from a hotel property management system, processed and visualized with the analytics tools (Korte, Ariyachandra, & Frolick, 2013).

Technological solution that enable shaping and delivering of innovative services to guests mainly refer to (i) *virtual and artificial reality, i.e.* computer-based 3D technology used to provide artificial environment and transports the guests to the real world or to enable the (potential) guests to view the hotels from their homes through the virtual technology (Guttentag, 2010); (ii) *voice/control technology* which is based on the usage of Internet protocols instead of analog media to transfer voice data (Cobanoglu, Berezina, Kasavana, & Erdem, 2011) allowing guests to use their voice to control many issues of their room, such as the air conditioning, heating and entertainment devices; and (iii) *Internet of things (IoT) technologies.* The last mentioned, process the data collected through the networked devices (Roblek, Meško Štok, & Meško, 2016; Ali Köseoglu, Ross, & Okumus, 2016) and makes overall visitors experience more convenient, e.g. when guests check in to the hotel or unlock their room via their mobile-connected devices.

The specific technological innovative solutions have been also influencing customer relations and communication with visitors, especially throughout social networks and online platforms and encourage visitors to co-create hotel services. Thus, *smart devices, in particular smartphones and apps,* enable the creation of user-generated contents, e.g. online reviews (Akehurst, 2008; Buhalis & Foerste, 2015; Del Vecchio, Mele, Ndou, & Secundo, 2018). Smartphones enable guests to share their reviews and to exchange opinions about the hotels. Subsequently, the hotels benefit form these valuable, free of charge information and accordinglly improve their services and internal processes. Furthremore, the smart apps facilitate numerous daily operations, as well as the provision and accessibility of hotels services, e.g. selection of the hotel, check-in/check-out, the keyless entry to the room, controlling of the lights, easy connection with the hotel staff, and many more (Kärle & Fensel, 2015; Ozturk, Bilgihan, Nusair, & Okumus, 2016). Besides, using smart cards bring valuable services to hotel guests, but also enhance the effectiveness in revenue generation and hotel internal organization (Najafipour, Fallah, Foroozanfar, & Ziaee Adib, 2019). The ICTs likewise foster communication with potential visitors via *chatbots and robots* (Lassek, 2013; Radde, 2017; Ohlan, 2018). Chatbots, as up to date software, are used by the hotel to simulates an intelligent conversation with webpage visitors providing them quick answers of their queries but also order services and amenities at rooms, inform housekeeping for cleaning of the room, etc. Robots are the product of artificial intelligence with capacity to take the role of „real" concierge and provide information about the food, events, amenities, and hotel services (Zalama, García-Bermejo, Marcos, Domínguez, Feliz, Pinillos, & López, 2014; Tung & Law, 2017).

Finally, hotel financial performances over time become more positively influenced by ICT, as the example of the *cloud computing* based on data processing and data exchange from the cloud which practically does not require investments in ICT infrastructure (Chen, Wang, & Wang, 2012). Hotel revenue management is also supported by, as above mentioned, chatbots, wireless and mobile technology (smartphones and apps), but also by property management systems that enable managing building, steering, controlling and reporting the condition and changes of all facility components (Bader, 2005; Priyadarsini, Xuchao, & Eang, 2009; Jaremen, Jędrasiak, & Rapacz, 2016). On the same line, the IoT technologies facilitate hoteliers, for instance to analyse the room's occupancy and to reduce energy costs without negative impact on a guest's comfort. Mihalič and Buhalis (2013) highlight the indirect positive impact of ICT innovations on a small hotel's financial performance that over time emerge among others such as market differentiation and robust image, and which help small hotels to remain competitive in the markets.

3. Empirical research

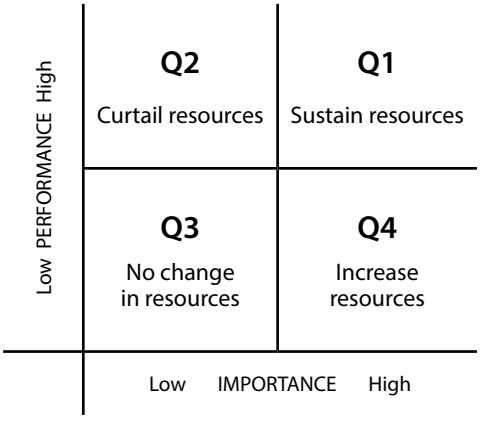
3.1. Methodology

The analysis encompassed two steps. First, we have conducted a literature review to explore the concept of innovations and progress induced by ICT in the hotel industry. Following, we have constructed a semi-structured questionnaire and have sent it to 21 purposely sampled small hotel in Croatia. We have used a convenience sample for pilot research (Kuo, Chen, & Lin, 2010) to test a proposed questionnaire before conducting a regional-scale comparative study. The questionnaire focused on collecting (1) general information about the hotel, i.e. category, specialization (unique standard, e.g. wellness and spa, golf resort etc.), is it open during the year or seasonally; number of employees and region in which they are settled; (2) attitudes toward proposed innovative solutions in the hotel industry and their impacts on hotel performances; (3) individual attitudes toward the fundamental limitation of implementation of innovative solutions in small hotels; individual investment in R&D; individual opinions regarding the technological innovations and their relevance for the hotel industry in future.

The convenience sampling took part in December and January 2019. The questionnaire was sent via Google form to hotel owners and managers.

To analyse obtained data, we have applied the Importance-Performance analysis (IPA). IPA is a diagnostic methodological tool, often used in hospitality and tourism industry (Azzapardi & Nash, 2013; Liu, Liu, Huang, & Wen 2010; Oh, 2001; Dwyer, Knežević Cvelbar, Edwards, & Mihalič, 2012) to distinguish discrepancies between stakeholders attitudes regarding importance and performance of specific phenomenon (Boley, McGehee, & Hammett, 2017). IPA combines measures of perceived individual performance and importance in a two-dimensional plot to facilitate data interpretation (Martilla & James, 1977). The plot classifies attributes into four categories (Figure 1), i.e. four quadrants namely, Q1 – keep up the good work, Q2 – possible overkill, Q3 – low priority, and Q4 – Concentrate here (Sever, 2015).

Figure 1
The IPA plot



Source: Adjusted from Azzopardi (2013).

First quadrant (Figure 1) reflects major strengths, i.e. potential competitive advantages of a service (Sever, 2015). These attributes are considered to be well and do not require additional investments or improvements. The second quadrant reflects attributes that have low importance and high performance,

which means that service providers are wasting their money or resources on services that are not important to visitors and which by that might be allocated. The third quadrant reflects attributes that have low importance and low performance, and thus should be ignored by hotel managers. Finally, the fourth quadrant reflects attributes that are highly important to visitors but have low performances. Following, hotel managers should allocate resources to improve them and by that hotel's performances and visitors satisfaction.

O`Leary and Deegan (2005) agree that pilot studies applying IPA should be conducted to test content validity and to minimise the possibility of misunderstanding and misinterpretation. Furthermore, Johanson and Brooks (2010) suggest that 30 representatives of the target population would be an acceptable minimum. However, there is an intense debate on the sample size when applying IPA analysis, i.e. from 1:4 item-to-response ratios (Rummel, 1970) to most recently 1:20 ratio (Kline, 2011). Considering this is a pilot study, encompassing five items, the latter will be taken into consideration when conducting the regional study. Furthermore, convenience sampling is often used in studies relying on IPA (Kuo et al. 2010), considering it is easier to manage. Additionally, Tafesse, Korneliussen, and Skallerud (2010) conclude that in case the population is limited, and all respondents can be reached, full sampling is recommended. Regarding the questionnaire design, most researchers in hospitality and tourism studies apply a 5-point Likert-type scale (Lai & Hitchcock, 2015). In this study we use 7-point Likert-type scale, considering latest research (Chen, 2014; Mudy & Pike, 2012; Coghlan, 2012) proves this scale provides more reliable results in measuring the importance-performance gaps between the attributes. Furthermore, we follow the recommendations of O`Neill and Palmer (2004) to run paired-sample t-tests to confirm that the differences among the level of perceived importance and performance are significant ($p<0.05$), and thus retain only significant attributes for further analysis.

Below are the results of the conducted empirical analysis on a sample of 21 small and family-owned hotels in Croatia.

3.2. Findings

The finale sample encompassed twenty-one SFH in Croatia, out of which 57% were three stars, and 43% four stars rated. Only three hotels in the sample have been awarded unique standard, out of which two as eco-friendly and one as bike hotel. Majority of hotels in the sample (61.9%) are open throughout the whole year. The average number of permanent employees is 10 (minimum 3, maximum 31), while the average number of fixed-term employees is 9 (minimum 0, maximum 50). Considering number of hotels, the most significant individual share holds two regions, namely, Split (33%) and Istria (24%). The rest of the sample is almost equally distributed between the following regions, namely, Continental Croatia, Zagreb, Dubrovnik, Šibenik, Zadar and Kvarner.

Results of the conducted analysis demonstrate the perceived importance and performance of the innovations and new technologies in SFH. We have decided not to test the validity and the reliability with Confirmatory factor analysis, considering we have already grouped the variables, i.e. technological innovation in factors, based on previous research findings. Following, the first step was to conduct paired sample t-tests (Lai & Hitchcock, 2015) to identify and retain for further analysis only those attributes with significant IP gaps (Table 1).

Table 1

The importance-performance scores and paired sample t-tests for small hotels, n=2

	I(b)	P(a)	P1	P2	P3	P4		I-P(c)			
Innovations and new technologies	**mean**	**mean**	**mean**	**mean**	**mean**	**mean**		**mean**	*** t-Value**	**Sig.**	**DCQ**
T1	4.857	3.857	4.905	5.048	4.190	3.905	A	1.000	3.240	**0.004**	**Q1**
T2	2.429	2.143	3.714	3.667	3.143	3.333	B	0.286	0.834	0.414	-
T3	6.048	4.762	5.952	6.048	5.524	5.190	C	1.286	3.897	**0.001**	**Q1**
T4	5.381	4.286	5.429	5.429	5.095	4.619	D	1.095	3.641	**0.002**	**Q1**
T5	3.429	2.333	4.143	3.857	4.000	3.952	E	1.095	4.464	**0.000**	**Q3**
Grand mean	4.4286	3.4762	4.8286	4.8095	4.3905	4.2000					

		I-P1					I-P2					I-P3					I-P4			
		mean	*** t-Value**	**Sig.**	**DCQ**		**mean**	*** t-Value**	**Sig.**	**DCQ**		**mean**	*** t-Value**	**Sig.**	**DCQ**		**mean**	*** t-Value**	**Sig.**	**DCQ**
T1	A1	-0.048	-0.224	0.825	-	A2	-0.190	-0.638	0.531	-	A3	0.667	2.054	**0.053**	**Q4**	A4	0.952	3.943	**0.001**	**Q4**
T2	B1	-1.286	-3.897	**0.001**	**Q3**	B2	-1.238	-3.331	**0.003**	**Q3**	B3	-0.714	-2.084	**0.050**	**Q3**	B4	-0.905	-2.702	**0.013**	**Q3**
T3	C1	0.095	0.403	0.691	-	C2	0.000	0.000	1.000	-	C3	0.524	1.439	0.165	-	C4	0.857	2.133	**0.045**	**Q1**
T4	D1	-0.048	-0.146	0.885	-	D2	-0.048	-0.117	0.908	-	D3	0.286	0.596	0.558	-	D4	0.762	1.811	0.085	-
T5	E1	-0.714	-2.046	**0.053**	**Q3**	E2	-0.429	-1.178	0.252	-	E3	-0.571	-0.999	0.329	-	E4	-0.524	-1.023	0.318	-

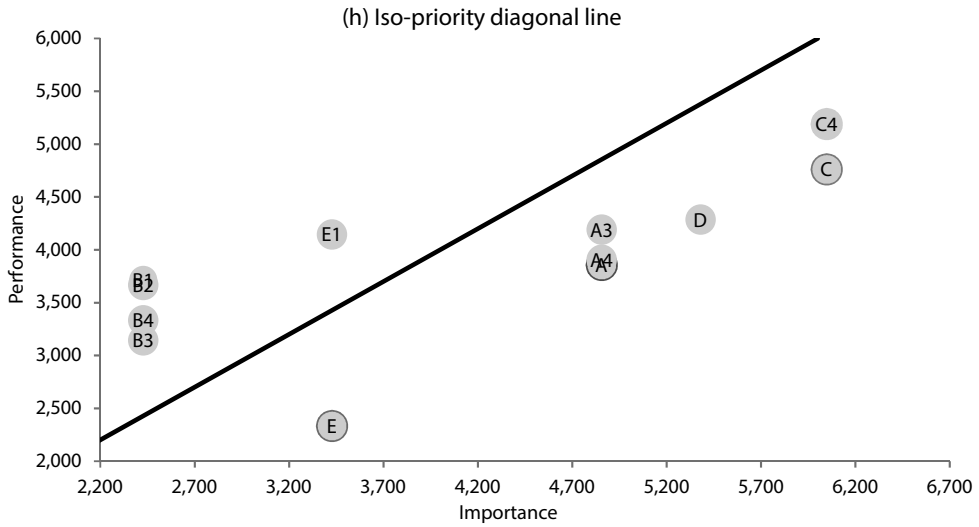
T1 - Virtual and artificial reality (VA and AR); T2 - Artificial intelligence and robots; T3 - Wireless and mobile technologies and smart devices;
T4 - Internet of things and sensors; T5 - Voice control technology.
I - perceived importance.
P - Perceived performance (in general, all elements).
P1 - Perceived performance (impacts of innovations and new technologies on processes in hotel – effectiveness and efficiency, improvement of hotel performances).
P2 - Perceived performance (impacts of innovations and new technologies on hotel services – the way hotel products are shaped and delivered).
P3 - Perceived performance (impacts of innovations and new technologies on customer relationships – overall communication with guests).
P4 - Perceived performance (impacts of innovations and new technologies on hotel revenue – overall financial performances).
DCQ - data centred quadrant.
*Paired Samples Test for each question.
(a) Mean value: Performance questions asked as "How well is your hotel doing regarding…?" on a scale with 1 - Poor and 7 - Excellent.
(b) Mean value: Importance questions asked as "How important is following to you?" on a scale with 1 - Not At All Important and 7 - Extremely Important.
(c) Performance - importance gap.

Source: Authors' research.

To deliver conclusions, we have constructed five models.

In the first model, the respondents were asked to rate in overall perceived importance and their performance regarding the proposed innovations and new technologies. Paired sample t-tests (Table 1) demonstrate the IP gaps are significant for four proposed elements, i.e. *VA and AR (A), wireless and mobile technologies and smart devices (C), Internet of things and sensors (D), and voice control technology (E)*. These four elements were retained for visual analysis. The Iso-priority diagonal line (Figure 2) indicate IP gaps are positive, for following cases, namely, A, C, D, E, A3, A4, C4 which means that hotel owners perception of the importance of these innovations and technologies is higher than their perception of performance (performance rate is lower than importance rate). Furthermore, the gaps are negative for the following cases, namely, B1, B2, B3, B4, E1, which means that the performances are better than the actual perception of importance. The IP mapping for direct measures (Figure 3 – GM), i.e. data cantered line indicates three elements are in first, i.e. *keep up the good work* quadrant (A - VA and AR, C - wireless and mobile technologies and smart devices, D - Internet of things and sensors), while one element (E - voice control technology) is in third, i.e. *low priority quadrant*.

Figure 2
Iso –priority diagonal line

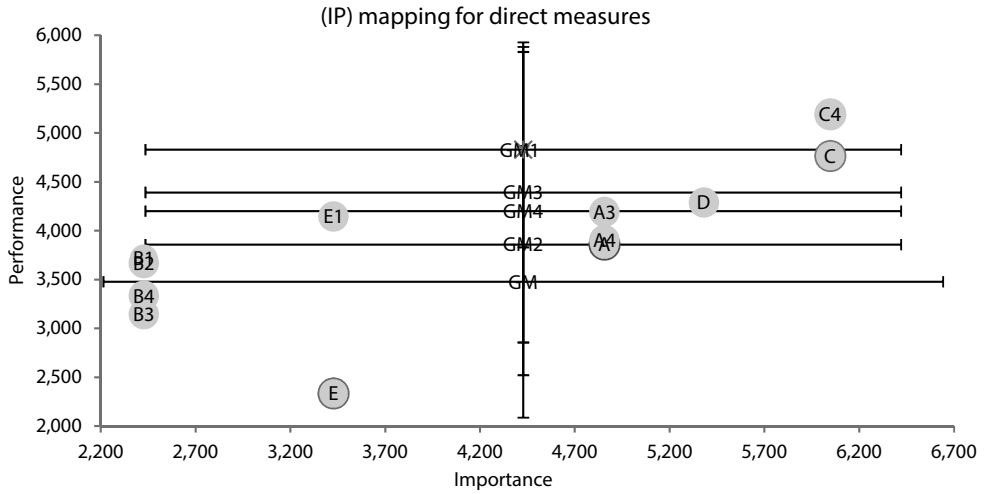


Source: Authors' research.

In the following four models, respondents were asked to rate the impact of innovations and technologies on specific segments of their business, i.e. *processes, services, customer relationships and hotel revenues*. The aim was to link innovations and technological solutions with specific aspects of hotel operations.

Processes. Regarding the perceived importance and performance of proposed elements, pair sample t-tests have demonstrated IP gaps are significant for two elements, namely, *artificial intelligence and robots* (B1) and *voice control technology* (E1) (Table 1). Regarding the Iso-priority diagonal line (Figure 2), in both cases, the perceived level of performances is higher that importance level. Furthermore, the IP mapping for direct measures (Figure 3 - GM1) indicates that both elements fall into third, i.e. *low priority quadrant*.

Figure 3
IP mapping – data cantered line



Source: Authors' research.

Hotel services. All of the proposed elements scored low records for both importance and performance except wireless and mobile technologies and smart devices, with both I and P rated with six. The results of the paired sample t-tests (Table 1) indicate that IP gaps are significant only for one element, namely, *artificial intelligence and robots* (B2). Both average records are low, i.e. I=2,429 and P=3,667, and thus IP mapping with direct measures (Figure 3, GM2) place this element in third, i.e. *low priority quadrant*.

Customer relationships. Considering the perception of importance and performances regarding the application of proposed technologies in hotels customer-service-related operations, paired sample t-tests (Table 1) indicate IP-gaps are significant for only two categories, namely, *virtual and artificial reality* (A3), and *artificial intelligence and robots* (B3). The Iso-priority diagonal line (Figure 2) suggests that for the VR and AR hotel performances are higher than the importance hotel owners place on this element. Regarding artificial intelligence and robots, hotel owners consider these technologies to be more important than they perform. The IP mapping for direct measures (Figure 3, GM3) suggests, *virtual and artificial reality* are in first, i.e. *keep up the good work* quadrant and *artificial intelligence and robots* in third, i.e. *low priority quadrant*.

Hotel revenues. Paired sample t-test results have demonstrated IP-gaps are significant for three elements, namely, virtual and artificial reality (A4), artificial intelligence and robots (B4) and wireless and mobile technologies and smart devices (C4). Considering A4 and C4, Iso-priority diagonal line suggests the perceived level of importance is higher than hotel performances. From the other side, for the B4 elements, the results are opposite, i.e. perceived performances are higher than actual importance this element has. The IP-mapping for direct measures (Figure 3, GM4) place *virtual and artificial reality* into fourth, i.e. *concentrate here quadrant*. The *artificial intelligence and robots* are placed in third, i.e. *low priority quadrant*, and *wireless and mobile technologies and smart devices* in first, i.e. *keep up the good work* quadrant.

Furthermore, the significant limitations for implementation of innovative solutions in the hotels within this sample could be classified into three broad categories, namely (1) financial reasons, i.e. price of such solutions, and expenses related to maintenance; (2) infrastructure-related reasons, i.e. old hotel building, and poor internet and supporting infrastructure; and (3) other, including the age of the hotel, human resources, and inadequate public governance. The answers regarding the hotels' investments in research and development and integration of new technologies in hotel operations indicate rather mediocre performances. Moreover, hotels in the sample have invested in last five year approximately 200.000€. The average amount was 10.000€ per hotel. One hotel has invested 60.000€, while eight hotels have indicated they have not invested in new technologies. Finally, considering their expectations regarding the technological solutions that will affect hotel businesses in future, the respondents have pointed out the following technologies, namely, automation, smart control and smart devices, robots, clouds, AR, sensor and artificial intelligence.

4. Discussion and conclusion

This study analyses the relevance of innovations and new ICTs for small and family-owned hotels. We apply importance-performance analysis to explore the impact of technological advances (*virtual and artificial reality, artificial intelligence and robots, wireless and mobile technologies and smart devices, Internet of things and sensors, and voice control technology*) on improvement of *hotel performances, shaping and delivery of hotel products, communication with visitors and overall financial performances*.

Based on the analysis, two significant conclusions could be drawn. Firstly, in a large number of cases, the respondents' perception of performance was significantly lower than the importance rate. In such

cases, the small hotel owner's perception of the particular technological innovation importance is higher than performances realised due to their implementation and due to their contribution to the hotel business within one of analysed aspects, i.e. processes, services, customer relationships and hotel revenues. The results indicate that there is an obvious need to reconsider current resource allocation. In that context, we encourage all activities that could potentially produce higher level of technological innovation awareness among hotel owners and staff and enable them to improve their ICT skills and ICT usage. The better understanding of potential benefits of technology increases their application in hotel businesses, e.g. the potential benefits from IoT relate to the personalisation of hotel rooms, location-based information, predictive repairs and maintenance, electronic key cards, etc. Moreover, learning and innovation are entirely conceived as determinants of competitiveness (Fraj, Matute, & Melero, 2015).

Secondly, several technological advances record gaps, where the perceived level of ICT performances is higher than the ICT importance. In such cases, the hotel staff perception of the particular technological innovations importance is lower than the actual performances. The latter indicates that the hotels are potentially wasting their financial resources. The recommendation would be that hotel managers should reconsider their decision about the implementation of the particular technical innovation and focus their activity on other competitiveness factors as elaborated in Mihalič and Buhalis (2013).

The conducted importance-performance analysis provides an insight into the role of ICTs for SFH in Croatia and allows their mutual comparison. The research results potentially guide hotel managers to allocate their resources on technological innovations which could contribute improvement of their business performance, internal processes, customer relations and finally financial performances. However, it should be noted that in this pilot study, we have used a convenient sample of 21 small and family-owned hotel, which constrains the generalisation of results.

However, as much as technological advances relate to numerous benefits, specific ongoing potential weak points still call for attention. Namely, for all devices connected online threats like cyber-attacks and security breaches appeared as a challenge for security staff. Each device incorporated into a hotel's digital infrastructure can be exploited by hackers with potential access to hold a hotel's systems hostage or jeopardise the security and comfort of guests (McCurdy, 2018; Fox, 2019; Berkowitz, 2019). The additional issue that alert for thoughtfully consideration in whole service industy is facing with resistance when high tech capabilities (such as robots) significantly increase and consequently augment or replace human labour (Ivanov, Webster, & Seyyedi, 2018). Consequently, hotel managers and the responsible are expected to continually reconsider both, advantages and drawbacks (Najda-Janoszka & Kopera, 2014) of any innovations, to upgrade and beyond processes, products and services in SFH but also simultainously taking into account their reflection of sustainability issues as far as each SFH stakeholder is considered.

Still as the main research reflection remains that all technologies considered in IPA analyses produce several value added points and enable small family owned hoteliers to: (i) shift present business systems to more interconnected and interoperable ones, (ii) keep guests more engaged throughout their stay and journey, (iii) easier recognize the opportunity to take more market share away from OTAs, and consequently to (iv) improve the collective efficiency and hotel profitability. Since hotel owners are one of main stakeholders in the broader hospitality ecosystem long term (Buhalis & Leung, 2018) as summing up we recommend also SFH owners to introduce and face with new technologies on daily base, than critically approach and evaluate their real contributions and consequently integrate them in the hotel system or just upgrade the present one. Finally, along with a further study on the type of the

technological innovations applied in the sector of SFH, we encourage any future research that would focus on factors influencing the ICT adaptation in this hotel segment.

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