Policy Recommendations for Promoting Touristic Attractivity from Local Government Perspective in Innovative Environments

Manuel Pedro Rodríguez Bolívar[1](✉), Fabiana Roberto[2], and Rosa Lombardi[3]

[1] University of Granada, 18071 Granada Andalusia, Spain
manuelp@ugr.es
[2] University of Naples Federico II, 80126 Naples Campania, Italy
[3] Sapienza University of Rome, 00161 Rome Lazio, Italy

Abstract. The COVID-19 pandemic situation has had unprecedented negative consequences in the tourism sector, especially in the hotel industry, which has implied negative shocks directly and indirectly in city revenues, employment and economy. Recent research has indicated that technology is becoming central in finding solutions for tourism recovery through the development of new or improved ICT-enabled tourism services, which could help to achieving a higher attraction of tourists and other sources of foreign investments to cities. This paper therefore seeks to analyse the impact of blockchain technologies (BCT) on the tourism business for attracting new customers to cities with the aim at gaining insights regarding public policies to be taken by local governments for improving tourism business in their city. To achieve this aim, this paper provides an empirical research on the impact of BCT on both lowering prices and improving service quality of lodging accommodations by a sample of lodging accommodations in different Italian cities, providing insights to know if the implementation of BCT on hospitality business, can help city governments to improve smart living into the urban space, deriving some recommendations for city government to take public policies to favour the implementation of these technologies into the hospitality industry.

Keywords: Smart cities · Touristic attractivity · Blockchain · Hospitality industry

1 Introduction

The COVID-19 pandemic situation has made central governments of countries across the world to implement lockdown measures and border closures to save lives. These public policies have caused business closures due to the downwards of the income and continued uncertainty affecting negatively both the domestic and international tourism notably, especially in the hotel industry [1].

Indeed, the hospitality industry is into danger to survive in a post-COVID-19 world and it has had significant negative shocks in the short run -and it is expected in the long

Published by Springer Nature Switzerland AG 2021
H. J. Scholl et al. (Eds.): EGOV 2021, LNCS 12850, pp. 193–204, 2021.
https://doi.org/10.1007/978-3-030-84789-0_14

run too- in city revenues, employment and economy [2]. There is therefore a need for city governments to accelerate the recovery of the tourism industry, preparing tourism activities for a stronger, more sustainable and resilient tourism economy, within the new post-COVID-19 context [3].

These strategies require ongoing tourism service innovations grounded in the promotion of the digital transition of the hospitality industry [4], mainly to both introduce product adjustments -for example, non-contact, automated check-in/out processes-, and support smaller local businesses that are more potentially exposed to the negative effects of this crisis scenery [5]. Technology has therefore become a central role in finding solutions for tourism recovery through the development of new or improved ICT-enabled hospitality services [6]. Technology could also make a destination more attractive to visitors impacting on their experiences and satisfaction [7]. Hospitality firms are therefore pushed to have an innovative perspective to both recover their business and compete in the short, medium and long-term in the hospitality market [8].

The fast-track implementation of disruptive technologies like that proposed by Blockchain technology (BCT) could help them to radically transform the traditional realm of their hospitality operations [9] with a clear impact on room rates and innovated services. In fact, due to main BCT characteristics (decentralization, transparency, proof of work, immutability and security), this technology provides faster and anytime transactions, better security and privacy, reduced costs, automatization and higher confidence in the process [10]. All these advantages of BCT are not only beneficial for hospitality owners but also for improving customer experiences reducing both room prices and waiting time for checking-in and out processes.

Under this framework, hospitality industry is actively investing in BCT-based start-ups or platforms (decentralized Apps -DApps-) with the aim of better connecting/interacting with the customers [11] with the offer of lower room rates and better hospitality services -rated into the DApps platforms-, due to its capacity for better understanding of tourist preferences [12].

Nonetheless, in general, despite the growing importance of BCT for city developments and the growing BCT-based hotels booking platforms launched, only a few researchers have done empirical studies with respect to BCT applications in tourism and travel industry [13]. It denotes an absolute need for more research to advance the understanding of the nature and functioning of this emerging technology (ETs) in tourism sector, since literature in the subject is still making its first steps [14]. In addition, this research could help cities to wonder the need of undertaking strategies for promoting new technological infrastructure and innovative spaces for the introduction of ETs in smart tourism business into the city, expediting the widespread deployment of the BCT [9].

Under this context, this paper therefore seeks to analyse the impact of BCT on the tourism business for attracting new customers to cities with the aim at gaining insights regarding measures to be taken by local governments for improving smart tourism business into their cities. To achieve this aim, this paper is focused on the impact of BCT on both lowering prices and improving service quality of lodging accommodations.

The remainder of this paper is as follows. The next section describes the need for enhancing smart business in the hospitality industry in cities for improving urban areas,

analysing the impact of tourism activities on city revenues and the innovation role on touristic attractivity, deriving some hypotheses formulation. Then, the empirical research is undertaken describing the sample selection, the research methodology used to test the hypotheses proposed and the analysis of results. Finally, the discussion and conclusion section highlights the main findings and brings the paper to an end.

2 The Need for Enhancing Smart Business in the Hospitality Industry for Improving Smart Tourism in Cities

Prior research has traditionally indicated that governments at National and/or Regional level are responsible of tourism development through the issuance of regulations, tourism planning and development [15]. However, in the last years, the focus put on the smart city movement has made tourism both to be increasingly linked to the urban area and to require cities to improve their attractiveness and functioning of visiting areas [16]. Nowadays, city governments need to put cities into action transforming places of cultural significance into places of consumption, and requiring city government investments in infrastructure facilities [17], technology and innovation to better cope with increasing tourist numbers and expectations [18] with the aim at attracting sustainable revenues to their cities [19].

According to prior research, technological and innovative environments produced into the smart tourism contexts are the major factors for destinations to become more competitive and sustainable [20]. Innovation is especially essential for hospitality organizations' success because it allows gaining a greater market share, competition and differentiating themselves from competitors [21] and let them to generate innovative services that generate customer value co-creation process [22].

In the last years, BCT has opened new opportunities for hotel competition in the market based on the level of differentiation, mainly taking the approach of both room rates [23] and the production of innovative services [24]. Small and medium enterprises (SMEs) on lodging accommodations -b&b, hostels or apartments- being early adopters can improve their position in the hospitality market if disruptive technological innovations are implemented, obtaining commercialisation flexibility advantages over rivals [25].

Under this framework, pricing strategies of lodging accommodations are relevant when examining the impact of radical technological innovations [26]. As these technological advances are immersed into the smartness of the urban area, many cities are putting a lot of effort into the digital transformation of the entire tourism value chain [27].

Therefore, it is expected that cities located on innovative regions could help the hospitality industry to embrace emerging IT prior to other different destinations [28]. An important effect of BCT implementation in the hospitality industry is the fix of different room rates in lodging accommodations located in cities in innovative regions *vs* non-innovative cities based on their current market based on online travel agencies (OTAs). The following hypothesis is thus derived:

H1. There are no differences on dynamic price dispersion among the lodging accommodations located in innovative *versus* non-innovative cities with the implementation of BCT markets regarding those based on traditional OTAs markets.

On another hand, service innovation matters when guests are selecting a hotel, making necessary the implementation of metrics for impact and outcome assessment [29]. Prior research has indicated that online reviews provide feedback on service innovation helping firms in service improvement [30] and are used by tourists to select an accommodation, mainly when they are disclosed together with numerical rating details because it increases both booking intentions and consumer trust [31]. Also, in the OTAs market, customers providing a holistic evaluation of all the hospitality service attributes has different influence on choices according to hotel star ratings [32].

BCT is a technology capable to ensure genuine and trustworthy online reviews creating a unique private key for each identity with several independent verification processes embedded into ranking and review systems [33], which ensures reduced rates of manipulation or duplication of reviews in the OTAs market [34]. Therefore, online reviews using BCT in hospitality seem to be more trusted than those posted using OTAs and could differ from them. Nonetheless, as far as we know, there are no studies testing online reviews and ratings on the hospitality BCT market and its comparison with those based on the OTAs markets. Therefore, the following hypothesis is derived:

H2. There are no differences on online ratings among the lodging accommodations with the implementation of BCT markets regarding those based on traditional OTAs markets.

In brief, there is a need for empirical evidence to understand the impact of BCT on room rates and service innovation, which affects the visitor attraction to cities. It should be a driver for city government to take public policies fostering technological environments for the hospitality industry. Therefore, an empirical research on sample Italian cities is undertaken in the next section of this research.

3 Empirical Research

3.1 Sample Selection

EU Member States are among the world's leading tourist destinations, contributing 10% to EU GDP and creating jobs for 26 million people [35]. This paper is focused on Italy, which is one of the most representative EU countries in terms of destinations for non-residents (217 million nights) and global tourism destinations [36]. In addition, in recent years Italy has enhanced online sales, being the 2nd European country by revenues obtained through online booking platforms and is one of the countries in which hospitality competition is higher [37] and the share of medium size hotels (25–99 rooms) in relation to the share of bed-place capacity (in all types of establishments) is higher [35]. Finally, Italian governments and tourism business are now seriously considering how ETs -especially BCT- can contribute to their growth and create new opportunities for post-COVID 19 outbreak recovering [38]. Thus, Italy fits well with the aim of this research.

The empirical research was conducted selecting accommodation in 4 Italian cities included into the latest official touristic report provided by the Italian Institute of Statistics [39] -the two most touristic cities (Rome and Milan) and the two less touristic cities which are not considered as "smart cities" (Rosolina and Sorrento)- [28]. These cities are located in innovative (Milan and Rosolina) and non-innovative regions (Rome and Sorrento). Consistently with the aim of this study, all sample lodging accommodations located in these sample cities are using DApps for capturing tourists to their accommodations and have implemented BCT for operational processes such as, for example, automated check-in and check-out systems [40], which could have an impact on room booking prices and service quality. Thus, this sample selection fits well with the aim of the paper and the hypotheses testing proposed in this research.

3.2 Methodology of Research

Our empirical research selected 3 leading OTAs by revenues in 2019 according to the companies' financial statements (Booking Holdings, Expedia Group and Ctrip) and 4 Blockchain DApps based on the possibility of paying through a specific token owned by the platform (LockTrip, Trippki, Travala and Xceltrip).

The three sample OTAs are the main ones in its sector by turnover [41] and hold 86% of the total revenues [42], whereas the four sample DApps create a model with 0% or very low commissions, allowing accommodation owners and users to obtain different benefits from the use of BCT.

On each of the platforms and for each sample destination, we selected 6 different types of accommodation facilities: a) 5 *, 4 * and 3 * hotels; and b) b&b, apartment and hostel, which represent the main non-hotel categories [43].

The selection was made according to the following criteria, verified at the time of the search: 1) evaluation of the property by Booking.com guests, which is OTAs market leader; 2) presence of the structure on at least 2 platforms and 3) distance from the city center less than 5 km. Table 1 displays the sample accommodation facilities selected.

Table 1. Accommodation selected.

Italian Regions	**Innovative**		**Non-innovative**	
	Lombardy	**Veneto**	**Lazio**	**Campania**
Type/City	Milan	Rosolina	Rome	Sorrento
5 Hotel*	Hotel Pierre	N.A.	Palazzo Naiadi, The Dedica Anthology, Autograph Collection	Parco dei Principi
4 Hotel*	Hotel Berna	Hotel Formula international	Hotel Artemide	Grand Hotel Aminta
3 Hotel*	Ibis Milano Centro	Hotel formula and puravita SPA	Hotel Santa Maria	Comfort Hotel Gardenia Sorrento Coast
B&B	Libeccio	La Corte	Ventisei Scalini A Trastevere	Palazzo Tasso
Apartment	Vitruvio 43	N.A.	Palazzo Al Velabro	Agora
Hostel	Babila Hostel & Bistrot	N.A.	Hostel Beauty	Ulisse deluxe hostel

Source: author's elaboration.

Legend: N.A. means not available.

On each of the selected OTAs and DApp platforms and for each sample accommodation, we collected information about token prices (and Bitcoin prices) during the period Oct-Nov 2019 (before the COVID-19 pandemic) and the quantity of rooms offered in each structure.

All information was collected by simulating the booking of a room at the date of the search and at 1, 3 and 6 months before the check-in date. This information provides the support for hypothesis testing (H1). In addition, we gathered data about ratings of both the general service of each one of sample accommodations and the services provided by each one of them (location, staff, cleanliness, comfort, value for money, facilities, free WiFi, amenities, vibe, bar, breakfast, food, room and wellness area). This information was useful for testing hypothesis 2.

The data are shown displaying descriptive statistics. Hypotheses have been tested using Wilcoxon test due to violation of normality assumption [44]. The Wilcoxon paired-sample test could be a powerful test of the null hypothesis of differences between paired attributes of the dynamic price dispersion of room bookings and rating differences based on BCT *vs* OTAs [45].

3.3 Analysis of Results

Descriptive Statistics. Descriptive statistics for price dispersion (see Table 2) show that price dispersion is generally higher in BCT markets for all cities and booking horizons analysed in this study. There are some particular exceptions in which price dispersion is slightly higher, but not significant, in OTAs markets (for example, at 6-months prior the check-in date, hotel price dispersion in Rosolina). Price dispersion is also generally higher in both the most touristic cities (Rome -mainly focused on b&b and hotels- and Milan) and the b&b lodging accommodations, than in the less touristic cities (Sorrento and Rosolina) or in hotels and apartments in all the booking horizons.

Table 2. Descriptive statistics in price dispersion between OTAs and BCT DApps (H1).

			PRICE DISPERSION												Mean
			At the date of the search			At 1-month window prior to the check-in			At 3-months window prior to the check-in			At 6-months window prior to the check-in			
			OTAs Ratio	BCT Ratio	%	OTAs Ratio	BCT Ratio	%	OTAs Ratio	BCT Ratio	%	OTAs Ratio	BCT Ratio	%	
INNOVATIVE CITIES	Milan	Hotels	1.083	1.536	41.82%	1.126	1.382	22.68%	1.110	1.525	37.45%	1.112	1.108	-0.43%	**25.38%**
		Apartments	N.A.	N.A.	N.A.	1.080	1.168	8.10%	1.031	1.257	21.93%	N.A.	N.A.	N.A.	**15.02%**
		B&B	1.054	1.089	3.29%	1.086	N.A.	N.A.	1.024	1.132	10.53%	N.A.	N.A.	N.A.	**6.91%**
		Hostels	1.108	1.182	6.71%	1.096	1.469	34.09%	1.076	1.248	16.01%	1.120	1.171	4.61%	**15.35%**
		TOTAL	1.087	1.321	21.48%	1.111	1.382	24.45%	1.079	1.345	24.67%	1.115	1.133	1.61%	**18.05%**
	Rosolina	Hotels	1.083	1.536	41.82%	1.126	1.382	22.68%	1.110	1.525	37.45%	1.112	1.108	-0.43%	**25.38%**
		Apartments	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	**N.A.**
		B&B	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	**N.A.**
		Hostels	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	**N.A.**
		TOTAL	N.A.	N.A.	N.A.	1.082	1.475	36.30%	1.298	1.054	-18.81%	1.055	1.046	-0.88%	**5.54%**
NON-INNOVATIVE CITIES	Rome	Hotels	1.020	1.376	34.87%	1.060	1.347	27.16%	1.059	1.330	25.51%	1.036	1.558	50.37%	**34.48%**
		Apartments	1.382	1.718	24.36%	1.165	1.494	28.26%	1.153	1.420	23.15%	1.138	1.409	23.79%	**24.89%**
		B&B	1.101	1.106	0.49%	1.047	1.943	85.50%	1.073	2.143	99.65%	1.154	1.070	-7.25%	**44.60%**
		Hostels	1.460	1.183	-19.00%	1.263	1.137	-10.02%	1.386	1.258	-9.27%	1.630	1.636	0.35%	**-9.49%**
		TOTAL	1.240	1.379	11.22%	1.110	1.402	26.33%	1.143	1.426	24.84%	1.191	1.526	28.07%	**22.61%**
	Sorrento	Hotels	1.284	1.596	24.31%	1.184	1.389	17.37%	1.116	1.280	14.70%	1.156	1.253	8.33%	**16.18%**
		Apartments	1.068	1.193	11.70%	1.073	1.122	4.50%	1.111	1.222	9.99%	1.097	1.354	23.43%	**12.40%**
		B&B	1.514	1.454	-3.93%	1.110	1.063	-4.23%	1.155	1.225	6.08%	1.139	2.056	80.48%	**19.60%**
		Hostels	1.373	N.A.	N.A.	1.040	1.127	8.41%	1.079	1.368	26.72%	1.080	1.215	12.46%	**15.86%**
		TOTAL	1.279	1.503	17.57%	1.141	1.284	12.51%	1.116	1.275	14.31%	1.133	1.376	21.47%	**16.47%**
	Total	Hotels	1.129	1.503	33.09%	1.113	1.398	25.64%	1.146	1.297	13.22%	1.090	1.241	13.86%	**21.45%**
		Apartments	1.225	1.455	18.84%	1.106	1.261	14.01%	1.098	1.300	18.33%	1.118	1.382	23.61%	**18.70%**
		B&B	1.223	1.216	-0.53%	1.081	1.503	39.02%	1.084	1.500	38.36%	1.146	1.563	36.34%	**28.30%**
		Hostels	1.313	1.182	-9.98%	1.133	1.244	9.84%	1.181	1.291	9.38%	1.277	1.341	5.01%	**3.56%**
		TOTAL	1.202	1.401	16.57%	1.111	1.386	24.74%	1.159	1.275	10.04%	1.124	1.270	13.04%	**16.10%**
				Mean	**12.46%**		**Mean**	**20.17%**		**Mean**	**20.28%**		**Mean**	**17.75%**	

Source: author's elaboration.

Legend: N.A. means not available.

Finally, results do not show a clear trend regarding price dispersion in innovative cities (Milan and Rosolina) *vs* non-innovative cities (Rome and Sorrento). Also, hostels in innovative cities generally obtain higher price dispersion in OTAs markets whereas this is not true in non-innovative cities. Lastly, whereas price dispersion for apartments and b&b is increasingly positive when the booking horizon is longer, price dispersion in hotels decreases as the booking horizon is longer.

Regarding rating scores, Table 3 shows that rating scores included in OTAs platforms are generally both higher than those in BCT DApps (see mean scores) and more homogenous (see standard deviation scores).

Table 3. Descriptive statistics in online ratings between OTAs and DApps (H2).

		Rating OTAs					Rating BCT				
		Mean	SD	Max	Min	Range	Mean	SD	Max	Min	Range
Score by	Hotel 3*	5.83	2.35	3.80	9.50	5.70	5.02	1.57	3.90	7.80	3.90
	Hotel 4*	6.18	2.54	4.50	9.50	5.00	6.56	2.52	4.40	9.60	5.20
	Hotel 5*	5.87	2.42	4.30	8.80	4.50	6.13	2.66	4.50	9.20	4.70
	Apartments	5.70	2.27	4.30	8.50	4.20	4.50	N.A	4.50	4.50	0.00
	B&B	5.70	1.64	4.10	8.30	4.20	N.A.	0.00	0.00	0.00	0.00
	Hostels	4.20	0.00	2.60	6.40	3.80	N.A.	0.00	0.00	0.00	0.00
Hotel 3*	Location	6.64	2.36	4.30	9.80	5.50	5.47	1.93	4.00	9.00	5.00
	Staff	6.03	2.26	3.90	9.90	6.00	5.29	1.80	3.50	9.40	5.90
	Cleanliness	6.01	0.79	4.00	9.70	5.70	5.20	1.82	3.90	9.60	5.70
	Comfort	8.38	0.83	7.70	9.40	1.70	3.66	1.08	2.00	5.00	3.00
	Value for money	8.15	2.25	7.50	9.30	1.80	4.33	1.22	2.60	6.00	3.40
	Facilities	6.00	0.73	3.70	9.30	5.60	N.A.	0.00	0.00	0.00	0.00
	Free WiFi	7.95	0.52	7.20	8.80	1.60	3.60	1.08	2.50	5.00	2.50
	Amenities	4.15	0.00	3.50	4.70	1.20	6.40	2.77	4.80	9.60	4.80
Hotel 4*	Location	6.59	2.44	3.60	9.50	5.90	6.66	2.69	4.50	9.60	5.10
	Staff	6.34	2.36	3.60	9.70	6.10	6.76	2.60	4.70	9.80	5.10
	Cleanliness	6.21	1.28	3.60	9.70	6.10	6.03	2.39	4.70	9.60	4.90
	Comfort	8.68	1.21	6.80	9.60	2.80	4.77	1.72	3.20	6.60	3.40
	Value for money	8.28	2.31	6.50	9.10	2.60	6.26	2.41	4.50	9.00	4.50
	Facilities	6.91	0.36	4.50	9.50	5.00	N.A.	0.00	0.00	0.00	0.00
	Free WiFi	9.10	0.41	8.80	9.50	0.70	7.03	2.75	4.50	9.60	5.10
	Amenities	4.44	0.00	3.60	4.80	1.20	5.25	2.63	2.50	8.80	6.30
Hotel 5*	Location	6.65	2.28	4.10	9.40	5.30	6.43	2.37	4.50	9.60	5.10
	Staff	5.79	2.35	3.80	9.10	5.30	5.90	2.42	3.50	9.40	5.90
	Cleanliness	5.93	0.58	4.10	9.40	5.30	5.25	1.82	3.50	8.40	4.90
	Comfort	8.87	0.30	8.20	9.20	1.00	4.00	0.50	3.50	4.50	1.00
	Value for money	8.00	2.37	7.70	8.30	0.60	4.25	1.25	2.60	5.40	2.80
	Facilities	6.35	0.50	3.80	8.90	5.10	4.00	N.A.	4.00	4.00	0.00
	Free WiFi	8.60	0.23	8.10	9.10	1.00	N.A.	0.00	0.00	0.00	0.00
	Amenities	4.30	0.00	4.00	4.60	0.60	5.56	2.55	2.50	8.40	5.90
Apartments	Location	9.45	2.51	9.40	9.50	0.10	N.A.	0.00	0.00	0.00	0.00
	Staff	6.20	2.60	4.30	9.10	4.80	N.A.	0.00	0.00	0.00	0.00
	Cleanliness	6.22	0.49	4.30	9.40	5.10	N.A.	0.00	0.00	0.00	0.00
	Comfort	8.85	0.49	8.50	9.20	0.70	N.A.	0.00	0.00	0.00	0.00
	Value for money	8.45	2.54	8.10	8.80	0.70	N.A.	0.00	0.00	0.00	0.00
	Facilities	6.06	0.92	4.20	9.40	5.20	N.A.	0.00	0.00	0.00	0.00
	Free WiFi	9.35	2.23	8.70	10.00	1.30	N.A.	0.00	0.00	0.00	0.00
	Amenities	2.57	0.00	0.00	4.00	4.00	N.A.	0.00	0.00	0.00	0.00
B&B	Location	8.43	2.52	4.70	9.80	5.10	4.90	0.14	4.80	5.00	0.20
	Staff	6.59	2.41	4.10	9.70	5.60	4.35	0.21	4.20	4.50	0.30
	Cleanliness	6.56	0.87	4.30	9.70	5.40	4.15	1.20	3.30	5.00	1.70
	Comfort	8.90	0.61	7.90	9.50	1.60	3.80	0.99	3.10	4.50	1.40
	Value for money	8.70	2.50	8.00	9.10	1.10	4.50	N.A.	4.50	4.50	0.00
	Facilities	6.58	0.76	3.80	9.60	5.80	N.A.	0.00	0.00	0.00	0.00
	Free WiFi	8.03	0.37	7.50	8.90	1.40	3.50	N.A.	3.50	3.50	0.00
	Amenities	4.50	0.00	4.10	4.90	0.80	N.A.	0.00	0.00	0.00	0.00
Hostels	Location	6.35	2.33	3.40	9.00	5.60	5.60	2.27	4.40	9.00	4.60
	Staff	5.47	2.20	2.90	9.00	6.10	5.45	2.70	3.30	9.40	6.10
	Cleanliness	5.29	1.57	2.60	9.00	6.40	4.38	2.48	1.60	7.60	6.00
	Comfort	7.70	1.00	5.90	8.80	2.90	4.40	1.45	2.90	5.80	2.90
	Value for money	7.83	2.50	6.70	8.60	1.90	4.15	1.41	3.00	6.00	3.00
	Facilities	5.67	0.81	2.40	8.90	6.50	N.A.	0.00	0.00	0.00	0.00
	Free WiFi	7.93	0.83	7.00	8.50	1.50	4.73	2.64	2.40	7.60	5.20
	Amenities	3.73	0.00	2.20	4.40	2.20	N.A.	0.00	0.00	0.00	0.00

Source: author's elaboration.

Legend: N.A. means not available.

However, although general ratings are similar on OTAs *vs* BCT platforms, there are differences mainly focused on some services provided by the lodging accommodations. To begin with, OTAs platforms do not display rating scores about lodging services provided by apartments. Also, additional services like vibe, bar, breakfast, food, room or wellness area are not scored in lodging accommodations that provide these services. Finally, the main differences are focused on both additional services like cleanliness, facilities and free WiFi, and on aspects like comfort or value for money.

Finally, maximum and minimum rating scores are usually higher in OTAs market than in BCT DApps, mainly in the cheapest lodging accommodations (3-star hotel, apartments, b&b and hostels), where differences are higher see Table 3.

Hypotheses Testing. Table 4 collects information regarding dynamic price dispersion between OTAs and DApps in cities located in innovative *vs* non-innovative regions. Results show that price dispersion in cities located in innovative regions is often higher than in non-innovative cities except for hostels. This difference is significant in Wilcoxon test at 1% of significance level ($p < 0.01$), which means that the mean values of price dispersion are not the same into the sample cities located in innovative *vs* non-innovative regions. Therefore, the attributes compared are significantly different and hypothesis 1 cannot be supported.

Table 4. Hypotheses testing using the Wilcoxon test (H1 and H2).

	Ranges									Test statistics (j)	
	Negative range			Positive range			Balanced				
	N	Average range	Sum of ranges	N	Average range	Sum of ranges	N	Average range	Sum of ranges	Z	Sig. asint. (2-tailed)
H1. No differences on dynamic price dispersion among the lodging accommodations located in Italian innovative versus non-innovative cities between OTAs and BCT markets											
Innovative cities OTAs – Innovative cities BCT	13[t]	24.96	324.50	40[u]	27.66	1106.50	0[v]			-3.461	0.001
Non-innovative cities OTAs – Non-innovative cities BCT	39[w]	66.44	2591.00	127[x]	88.74	11270.00	0[y]			-6.997	0.000
H2. No differences in accommodation ratings on OTAs and BCT platforms											
Rating OTAs - BCT	2[a]	3,50	7,00	2[b]	1,50	3,00	4			-,730[c]	0,465
Rating H 3* OTAs - H 3* BCT	6[d]	4,00	24,00	1[e]	4,00	4,00	7			-1,690[c]	0,091
Rating H 4* OTAs - H 4* BCT	4[g]	5,00	20,00	3[h]	2,67	8,00	7			-1,014[a]	0,310
Rating H 5* OTAs - H 5* BCT	5[j]	4,60	23,00	2[k]	2,50	5,00	7			-1,521[a]	0,128
Rating APT OTAs - APT BCT	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.			N.A.	N.A.
Rating BB OTAs - BB BCT	6[m]	3,50	21,00	0[n]	0,00	0,00	6			-2,201[a]	0,028
Rating HOST OTAs - HOST BCT	6[p]	3,50	21,00	0[q]	0,00	0,00	6			-2,201[a]	0,028

Source: author's elaboration.

Legend: a. RatingBCT < RatingOTAS; b. RatingBCT > RatingOTAS; c. RatingBCT = RatingOTAS; d. THREERATBCT < THREERATOTAS; e. THREERATBCT > THREERATOTAS; f. THREERATBCT = THREERATOTAS; g. FOURRATBCT < FOURRATOTAS; h. FOURRATBCT > FOURRATOTAS; i. FOURRATBCT = FOURRATOTAS; j. FIVERATBCT < FIVERATOTAS; k. FIVERATBCT > FIVERATOTAS; l. FIVERATBCT = FIVERATOTAS; m. BBRATBCT < BBRATOTAS; n. BBRATBCT > BBRATOTAS; o. BBRATBCT = BBRATOTAS; p. HOSTELRATBCT < HOSTELRATOTAS; q. HOSTELRATBCT > HOSTELRATOTAS; r. HOSTELRATBCT = HOSTELRATOTAS; s. is based on negative range; t) H3INNOVABCT < H3INNOVAOTAs; u) H3INNOVABCT > H3INNOVAOTAs; v) H3INNOVABCT = H3INNOVAOTAs; w) H3NOINNOVBCT < H3NOINNOVOTAs; x) H3NOINNOVBCT > H3NOINNOVOTAs; y) H3NOINNOVBCT = H3NOINNOVOTAs. N.A. means Non-available data.

As for the analysis of the rating scores, Wilcoxon test confirms the existence of differences in the services provided by lower-quality lodging accommodations. Except for apartments which are not scored in the OTAs platforms, hypothesis 2 cannot be supported for the particular case of 3-star hotels (significance level at 10% -p > 0.1-), b&b (significance level at 1% -p > 0.01-) and hostels (significance level at 5% -p > 0.05-). The highest differences in the rating scores of the services provided are focused on b&b and hostels accommodations. By contrast, differences for general rating scores in all sample accommodations are not statically different.

4 Discussion and Conclusions

The effective development of new innovative services will be increasingly important for the hospitality industry to recover its financial health in the post-COVID19 period, especially as a result of not only rapid developments in new technologies but also the changes in customer needs or preferences [46]. This research has put the focus on the implementation of DApps for room booking services, analysing the impact of these technologies on both market competition and attraction of new customers to lodging accommodation, which will increase the city revenues. The empirical analysis has been scrutinised in Italian sample cities examining price dispersion in room bookings and service quality of lodging accommodations measured by customers' ratings of the different hospitality services provided.

On the whole, findings demonstrate that BCT implementation can help lodging accommodations to attract a higher number of visitors to the city, lowering room prices and improving the service quality. In particular, price dispersion is generally higher in BCT markets in all sample cities and booking horizons. Therefore, the implementation of BCT helps tourism business to increase competition into the market and, could help SMEs to survive and recover their financial health in the post-COVID19 situation. This finding requires city governments to support the implementation of this ET which will allow the economic recovery of the city: a) supporting SMEs to be competitive in the hospitality market; and b) attracting more visitors to the city increasing the business into the city and city revenues.

Future research should therefore analyse the different technological investments of city governments and its impact on both the economy and, the social area of the urban context. Also, city governments could promote the implementation of ETs through rewarding programs. For example, interested city governments could provide financial compensations to citizens that comply some sustainable practices. The required transactions for these compensations could be carried out by blockchain to meet trust, security and timeliness [47]. This way, ETs could be introduced into the culture of the city (business and citizens) becoming it smart.

On another hand, findings demonstrate that high-quality hotels obtain no differences in their rating scores comparing OTAs *vs* BCT hospitality markets, mainly due to the high-quality accommodation services they provide. Nonetheless, the lower quality in lodging accommodations, the higher differences regarding rating scores. It could indicate that the perceptions of customers about accommodation service quality are only clearly different when a determinate level of service quality is not reached.

Besides, findings indicate that main differences in rating scores among sample lodging accommodations (higher rating scores in OTAs markets) are based on both the additional services they provide (cleanliness, facilities and free WiFi) and on aspects like comfort or value for money. This is especially true for lower-quality accommodations, indicating that customers searching lower-quality accommodations using DApps could be perhaps more focused on chosing their lodging accommodation by room price than on the additional services provided by the lodging accommodation.

Therefore, it would be relevant for city governments to create innovative hubs into the city for implementing ETs in tourism business with the aim at increasing the service quality and innovation, as a main source for higher competition and touristic attractivity. Future research could thus analyse whether innovation hubs in smart cities have led to quality improvement in tourism services and its impact on the economy of the urban context.

In brief, ETs have come to be main drivers for service innovation and service quality in the urban context. City management should put attention to these technologies to increase the smartness of the city and improve the resilience of cities to face disasters like the COVID19 pandemic situation, preparing business to fast-track recover their financial health and the normal business activity of the city.

References

1. Jiang, Y., Wen, J.: Effects of COVID-19 on hotel marketing and management: a perspective article. Int. J. Contemp. Hosp. Manag. **32**(8), 2563–2573 (2020)
2. Škare, M., Soriano, D.R., Porada-Rochoń, M.: Impact of COVID-19 on the travel and tourism industry. Technol. Forecast. Soc. Change **163**, 120469 (2021)
3. OECD Homepage. https://read.oecd-ilibrary.org/view/?ref=124_124984-7uf8nm95se&title=Covid-19_Tourism_Policy_Responses. Accessed 26 Feb 2021
4. WTTC Homepage. https://wttc.org/Portals/0/Documents/Reports/2020/To%20Recovery%20and%20Beyond-The%20Future%20of%20Travel%20Tourism%20in%20the%20Wake%20of%20COVID-19.pdf?ver=2021-02-25-183120-543. Accessed 10 Feb 2021
5. Knight, D.W., Xiong, L., Lan, W., Gong, J.: Impact of COVID-19: research note on tourism and hospitality sectors in the epicenter of Wuhan and Hubei Province, China. Int. J. Contemp. Hosp. Manag. **32**(12), 3705–3719 (2020)
6. Romão, J.: Variety smart specialization and tourism competitiveness. Sustainability **12**(14), 5765 (2020)
7. da Costa Liberato, P.M., Alén-González, E., de Azevedo Liberato, D.F.V.: Digital technology in a smart tourist destination: the case of Porto. J. Urban Technol. **25**(1), 75–97 (2018)
8. Rodríguez-Antón, J.M., Alonso-Almeida, M.D.M.: COVID-19 impacts and recovery strategies: the case of the hospitality industry in Spain. Sustainability **12**(20), 8599 (2020)
9. Bagloee, S.A., Heshmati, M., Dia, H., Ghaderi, H., Pettit, C., Asadi, M.: Blockchain: the operating system of smart cities. Cities **112**, 103104 (2021)
10. Flecha-Barrio, M.D., Palomo, J., Figueroa-Domecq, C., Segovia-Perez, M.: Blockchain implementation in hotel management. In: Neidhardt, J., Wörndl, W. (eds.) Information and Communication Technologies in Tourism 2020, pp. 255–266. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-36737-4_21
11. Nam, K., Dutt, C.S., Chathoth, P., Khan, M S.: Blockchain technology for smart city and smart tourism: latest trends and challenges. Asia Pac. J. Tour. Res. **26**, 1–15 (2019)

12. Seigneur, J.M.: Towards Geneva crypto-friendly smart tourism. https://archive-ouverte.unige.ch/unige:103406. Accessed 15 Mar 2015
13. Ozdemir, A.I., Ar, I.M., Erol, I.: Assessment of blockchain applications in travel and tourism industry. Qual. Quant. **54**(5–6), 1549–1563 (2019). https://doi.org/10.1007/s11135-019-00901-w
14. Antoniadis, I., Spinthiropoulos, K., Kontsas, S.: Blockchain applications in tourism and tourism marketing: a short review. In: Kavoura, A., Kefallonitis, E., Theodoridis, P. (eds.) Strategic Innovative Marketing and Tourism. SPBE, pp. 375–384. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-36126-6_41
15. Kubickova, M.: The impact of government policies on destination competitiveness in developing economies. Curr. Issue Tour. **22**(6), 619–642 (2017)
16. Brent, J.R., Ritchie, J.R.B., Crouch, G.I.: The competitive destination: a sustainability perspective. Tour. Manage. **21**(1), 1–7 (2000)
17. Russo, A.P., Scarnato, A.: "Barcelona in common": a new urban regime for the 21st-century tourist city? J. Urban Aff. **40**(4), 455–474 (2018)
18. Rucci, A.C.: Accessibility as a competitive factor in touristic smart cities. In: 7th Conference of the International Association for Tourism Economics Proceedings, 3–6 September 2019, pp. 9–10, Universidad Nacional de La Plata, La Plata, Argentina (2019)
19. Faraji, A., Khodadadi, M., Nematpour, M., Abidizadegan, S., Yazdani, H.R.: Investigating the positive role of urban tourism in creating sustainable revenue opportunities in the municipalities of large-scale cities: the case of Iran. Int. J. Tour. Cities **7**(1), 177–199 (2020)
20. Buhalis, D., Amaranggana, A.: Smart tourism destinations. In: Xiang, Z., Tussyadiah, I. (eds.) Information and Communication Technologies in Tourism 2014, pp. 553–564. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-03973-2_40
21. Teixeira, R.M., Andreassi, T., Köseoglu, M.A., Okumus, F.: How do hospitality entrepreneurs use their social networks to access resources? Evidence from the lifecycle of small hospitality enterprises. Int. J. Hosp. Manag. **79**, 158–167 (2019)
22. Lee, H.C., Pan, H.L., Chung, C.C.: The study of destination image, service quality, satisfaction and behavioral intention–an example of Dapeng Bay National Scenic Area. Int. J. Organ. Innov. **11**(3), 25 (2019)
23. Becerra, M., Santaló, J., Silva, R.: Being better vs. being different: differentiation, competition, and pricing strategies in the Spanish hotel industry. Tour. Manage. **34**, 71–79 (2013)
24. Hollebeek, L., Rather, R.A.: Service innovativeness and tourism customer outcomes. Int. J. Contemp. Hosp. Manag. **31**(11), 4227–4246 (2019)
25. Zach, F.J., Nicolau, J.L., Sharma, A.: Disruptive innovation, innovation adoption and incumbent market value: Case Airbnb. Ann. Tour. Res. **80**, 102818 (2020)
26. Hill, C.W., Rothaermel, F.T.: The performance of incumbent firms in the face of radical technological innovation. Acad. Manag. Rev. **28**(2), 257–274 (2003)
27. WTCF Homepage. https://prefeitura.pbh.gov.br/sites/default/files/estrutura-de-governo/belotur/2020/wtcf-global-report-on-smart-tourism-in-cities.pdf. Accessed 21 Mar 2021
28. Leydesdorff, L., Cucco, I.: Regions, innovation systems, and the North-South divide in Italy. El profesional de la información **28**(2), 1–15 (2018)
29. Durst, S., Mention, A.L., Poutanen, P.: Service innovation and its impact: what do we know about? Investigaciones europeas de dirección y economía de la empresa **21**(2), 65–72 (2015)
30. Eloranta, T.: Online review site data on service innovation. Int. J. E-Serv. Mobile Appl. **8**(4), 20–34 (2016)
31. Fang, B., Ye, Q., Kucukusta, D., Law, R.: Analysis of the perceived value of online tourism reviews: influence of readability and reviewer characteristics. Tour. Manage. **52**, 498–506 (2016)
32. Sparks, B.A., Browning, V.: The impact of online reviews on hotel booking intentions and perception of trust. Tour. Manage. **32**(6), 1310–1323 (2011)

33. Ye, F., Xia, Q., Zhang, M., Zhan, Y., Li, Y.: Harvesting online reviews to identify the competitor set in a service business: evidence from the hotel industry. J. Serv. Res. 1–27 (2020)
34. Kizildag, M., et al.: Blockchain: a paradigm shift in business practices. Int. J. Contemp. Hosp. Manag. **32**(3), 953–975 (2019)
35. UNTWO Homepage. https://www.e-unwto.org/doi/pdf/10.18111/9789284419470. Accessed 19 Mar 2021
36. European Commission Homepage. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tourism_statistics_-_nights_spent_at_tourist_accommodation_establishments. Accessed 19 Mar 2021
37. Sánchez-Pérez, M., Illescas-Manzano, M.D., Martínez-Puertas, S.: Modeling hotel room pricing: a multi-country analysis. Int. J. Hosp. Manag. **79**, 89–99 (2019)
38. WTTC Homepage. https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2020/To_Recovery_and_Beyond-The_Future_of_Travel_and_Tourism_in_the_Wake_of_COVID-19.pdf. Accessed 19 Mar 2021
39. National Institute of Statistics Homepage. https://www.istat.it/it/files/2018/11/report-movimento-turistico-anno-2017.pdf. Accessed 15 Sep 2021
40. Foris, D., Crihălmean, N., Pănoiu, T.M.: The new technologies and sustainable practices in hospitality. Bull. Transilv. Univ. Brasov Econ. Sci. Ser. V **13**(2), 65–74 (2020)
41. Statista Homepage. https://www.statista.com/statistics/647374/worldwide-blockchain-wallet-users/. Accessed 15 Sep 2021
42. Prieto, M.: The State of Online Travel Agencies. https://medium.com/traveltechmedia/the-state-of-online-travel-agencies-2019-8b188e8661ac. Accessed 15 Sep 2021.
43. Confesercenti Homepage. http://www.assohotelconfesercenti.it/allegati/4/2/426/allegati/Indagine%20Ufficio%20Economico.pdf. Accessed Accessed 15 Sep 2021
44. Good, P.: Permutation, Parametric, and Bootstrap Tests of Hypotheses 3. Springer, New York (2005)
45. Wilks, S.S.: Mathematical Statistics. John Wiley & Sons, Inc., New York (1962)
46. Kitsios, F., Kamariotou, M.: Service innovation process digitization: areas for exploitation and exploration. J. Hosp. Tour. Technol. **12**(1), 4–18 (2019)
47. Gupta, Y.S., Mukherjee S.: A study on smart cities using blockchain. In: Dawn, S., Balas, V., Esposito, A., Gope, S. (eds.) Intelligent Techniques and Applications in Science and Technology. ICIMSAT 2019. Learning and Analytics in Intelligent Systems, vol. 12, pp. 111–118. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-42363-6_13