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Vladimir Krajcik,

D.Sc., University College of Business in Prague, Czech Republic

Aleksandr Kljucnikov,

D.Sc., University of Entrepreneurship and Law, Czech Republic

Elena Rihova,

Ph.D., University of Business in Prague, Czech Republic

INNOVATIVE SHARING ECONOMY'S BUSINESS MODELS IN TOURISM: CASE OF AIRBNB IN PRAGUE

Abstract. *This paper sums up one of issues in tourism industry within scientific framework by analysing the relationship between average daily rate and occupation rate of rentals in a sharing economy platform. The main aim of the current research is to verify the existence of a dependency between the property type and the occupancy rate, and, identify if the specific property type is more demanded on the market and confirm or reject an existence of the dependency between an average daily rate and the occupancy rate. Systematization of literary sources and approaches show that the evolution of Airbnb affects the hotel market by offering the property owners a possibility to easily share their accommodation with the visitors for a fee. The relevance of the decision of this scientific problem is that while the scale of the offered accommodation possibilities grows, the segment of the sharing economy starts to significantly change the accommodation market and attracts the attention of regulatory authorities and entrepreneurs. In this paper, the researchers discuss the structure and the segmentation of the Airbnb activities in Prague and present some descriptive statistics on Airbnb activities in this city. The research is based on the data set monitoring 13918 units in Prague offering accommodation in April 2016. Analyses of variance and correlation analysis were performed by the authors to verify scientific hypotheses. The research empirically proves that there is a negative linear relationship between the Average Daily Rate and Occupation Rate. Based on the analysis of variance, it can be stated that there are differences in occupation rate by property type. Entrepreneurs, hotels and other accommodation providers in tourism and hotel industries and visitors of accommodation services can gain benefits from the findings of this study.*

Keywords: Airbnb, ANOVA, correlation, sharing economy, tourism, hotel, management.

Introduction. Rapidly grown sharing platform Airbnb, where the owners share their properties with the visitors, leads to the fact that it influences not only on the hotel market, but also competes with the private rental market. Most of the authors state that the concept of accommodation sharing brings benefits not only to the customers, but also to the cities, by attracting more tourists and bringing financial and economic benefits, but unfortunately at the same time imposes the quality of life of the local citizens, influences housing and hotel markets (Rodas Vera and Gosling, 2017; Barata-Salgueiro, 2017; Horn and Merante, 2017; Gurran and Phibbs, 2017; Yrigoy, 2017; Wegmann and Jiao, 2017; Jenckova and Abrham, 2016). While most of the specified authors state that sharing economy concept has a disruptive influence on the local accommodation business performance, Horn and Merante (2017) claim that the evidence on whether home sharing affects the housing market is quite limited.

This paper aims to provide some empirical research of the structure and the segmentation of the Airbnb, and then present some descriptive statistics on Airbnb activities in Prague. This work provides the primary descriptive information of the data on Airbnb in Prague. The data set includes the web scraped data on AirBnB in Prague, provided by the company Airdna for a period between April 2016 and March 2017. The data set includes huge number of variables, and for current research the more significant variables were selected. The size of the data set, including the information about 13918 accommodation units, allows to make statistically valid statements. In this research, we try to understand the mechanism of AirBnB, try to understand if such essential parameters as the type of real estate property and the daily

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rate influence the customer's decision. The other criteria will be a subject of our next studies. The content of this paper is following: in the first part we summarize the results of the published researches of the other authors in this area for the last three years. In the second part called Methodology the aim of the research, data set and statistical analysis are described. After that the results of statistical analysis are presented. The third part of paper called Result and Discussion compare our results with the outcomes of the other researches. And the last part is Conclusion, where the results of current research were summarized.

Literature Review. Sharing accommodation through the internet platform is quite new service and a lot of people are not familiar with it yet. The rapid growth of the digital technology, intensive presence on social media platforms leads to the emergence of online sharing (people to people), that leads to the emergence of sharing economy. The sharing economy platforms, as Airbnb or Uber, at large are surveyed in books and papers, including Coyle (2016), Edelman and Gerardin (2015) and Sundararajan (2016), Kljucnikov (2018) and others. Russell (2014) tries to assess the parallels and changes between sharing consumption and collaborative consumption. We try to examine various parts of the «sharing economy» that really implicate sharing. For instance, authors Felson and Speath in their work «Community structure and collaborative consumption» from 1978 define acts of collaborative consumption as «those events in which one or more persons consume economic goods or services in the process of engaging in joint activities with one or more others» (p. 614). Other authors Bardhi and Eckhardt (2012) in their work called Access based consumption: The case of car sharing tries to add up collaborative consumption and sharing economy in to the new model of access-based consumption. As we can see, the collaborative consumption is a part of Bardhi and Eckhardt's (2012) market-mediated access. Belk (2007) state that this market-mediated model has the main assumption: sharing involves «the act and process of distributing what is ours to others for their use and/or the act and process of receiving or taking something from others for our use». During the last few years this business model grown rapidly. While many authors are trying to identify the cause of the success of «people to people» sharing platforms, a large number of them devotes their work to the following question, how the rise of the sharing economy influences the ownership of the properties, consumers and the whole welfare of the economy. Sharing or «digital» economy/business use only technological or internet platforms. And Airbnb is one of those form of business. Airbnb was founded in 2007 by two university graduates who reportedly offered air mattresses on the floor of their San Francisco (CA) apartment to conference delegates wanting to save money.

Airbnb has evolved rapidly, before August 2016 Airbnb has already had more than 2 million accommodation offers in 34000 cities in 191 countries around the world (Airbnb, 2016). As it was mentored, Airbnb has evolved rapidly, and this fact caused considerable complications in planning and regulatory concerns. The researches Gurran and Phibbs (2017) noticed that Airbnb platform calls the tourists to taste to «live like a local», and that means, that AirBnB guests impose no additional burdens on neighbours, and bring profits to local business, moreover, guests and local can rate each other on public internet platform. This model helps to build a positive reputation of guests and hosts, build a essential trust, which leads to the good-working business model (Boswijk, 2016). Another author Guttentag (2015) defines Airbnb in his work as «informal tourism accommodation sector», that allows persons to compete with hotels without main investment. Moreover, he noticed, that this platform has an important disrupting potential. The impacts on economy from Airbnb are argumentative. For understanding Airbnb emergence, it is helpful to recall Coase's famous article «the Nature of the Firm» published in 1937. In this research after the description of the development of the firm by, he devoted attention to the decrease and regulation of the business costs. And what kind of costs he meant? Probably the are costs of doing two-sided trade through contracts on a market, other than the price of the good (Ytreberg, 2016). According to Coase's theory, we can notice that the business deals depend on the dealings' prices. The market players have tree possibilities in order to fulfil their needs: a) organizes a transaction internally, b) buys the input, a) uses a service on the open market. In order to grow, companies need to change these costs.

The other researcher Einav notices the following thing. First of all, there is a perfectly competitive market with two kinds of retailers. The other one is professional vendors who incur an up-front cost. The model detects three main assumption. The first is related to the relative costs between professional and peer vendors, the second is tall size costs and more numerous low-end marginal costs help peer sellers (Ytreberg, 2016). Understanding the structure of the AirBnB market in in Prague may bring substantial implications for the entrepreneurs, that are planning to operate on the accommodational market, and also to the state authorities in relation to the market and economics environment regulation.

Methodology and research methods. The main aim of the current research was to verify the existence of a dependency between the property type and the occupancy rate, identify if the specific property type is more demanded on the market and confirm or reject an existence of a dependency between an average daily rate and the occupancy rate. Our assumption was that the cheaper accommodation has higher occupation rate. The current data set is analysed with the use of the Correlation Analysis and Analyses of Variance. The Pearson correlation model helps to study the relationship between two variables. In this model, the parameter p_{xy} offers information about the degree of the linear relationship between the two variables x and y (Johnson and Wichern, 2007). This estimator is often called the Pearson product-moment correlation coefficient (r_{xy}). It is a biased estimator of, p_{xy} , but the bias is small when number of data points is large. The Pearson correlation coefficient indicates the strength of linear relationship between two variables and calculated by the following formula (Meloun and Militky, 2002):

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}} \quad (1)$$

where x_i the data points of the first variable from i to n , y_i the data points of the second variable from i to n , \bar{x} the mean of the values of the first variable, \bar{y} the mean of the values of the second variable, and n the number of data points (Meloun and Militky, 2002).

The formula returns a value of correlation coefficient between -1 and 1. The value 1 shows a strong positive linear correlation, and the value of -1 shows a strong negative linear correlation. A result of zero indicates no linear relationship at all. Achieving a value of +1 or -1 means that all data points are included on the line of best fit. After that, need to provide Correlation Coefficient Hypothesis Test for testing the population correlation coefficient (Hardle and Simar, 2015).

Firstly, the null and alternative hypotheses should be specified: The null hypothesis is $H_0: \rho = 0$, which means, the population correlation coefficient is zero. Alternative hypothesis $H_1: \rho \neq 0$. Secondly, the test statistic t should be calculated. For this calculation the following formula can be used:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad (2)$$

Thirdly, the resulting test statistic t is used to estimate the P-value. The P-value answers the question «how likely is it that we'd get a test statistic t as extreme as we did if the null hypothesis were true?» (onlinecourses.science.psu.edu). Finally, the decision based on comparison P-value to the significance level α was made. There are two options:

1. If the P-value is lesser than the significance level α , the H_0 is rejected in favor of the H_1 . In practice it means, that there is a linear association in the population between two variables.

2. If the P-value is greater than the significance level α , the H_0 is failed to reject. In other words, it means, that there is no linear relationship in the population between two variables.

The other one statistical approach is Analysis of Variance (ANOVA). Analysis of variance (ANOVA) is a test for equality of several population means (Bradley, 2007). As he states: «In no significant difference between the means is found, then the test is concluded that at least one mean is different from others» (Bradley, 2007). There are two types of analysis of variance: one-way and two-way. In this research is used one-way analysis of variance. The main idea of a one-way ANOVA is to estimate the influence of one factor on one response variable. As all statistical tools, ANOVA has some important assumptions. First of all, the dependent variable must be a continuous level of measurement. Then independent variables must be categorical. And the data must be normally distributed (Hardle and Simar, 2015). Also, analysis of variance assumes homogeneity of variance.

ANOVA held in the following steps. The first step is to stand the null hypothesis for the test: the two means (mean of independent and mean of depended variable) are equal. A significant result means that the two means are unequal. $H_0: \mu_1 = \mu_2$, H_1 : not all μ_1 are equal. The test statistic for testing is following:

$$F = \frac{\sum_{i=1}^k (\bar{y}_i - \bar{y})^2 n_i}{\frac{\sum_{i=1}^k \sum_{j=1}^{n_i} (y_{ij} - \bar{y}_i)^2}{n - k}} \quad (3)$$

The critical value is found in a table of probability values for the F distribution with the following degrees of freedom $F \approx F(k - 1, -k)$. It is important, that the test statistic F assumes equal variability in the k populations. If the variability in the k comparison groups is not similar, then alternative techniques must be used. (Myers et al., 2010) Third, the t test statistic is used to calculate the P-value. Finally, make a decision based on comparison P-value to the significance level α . There is two possibilities:

1. The P-value is lesser than the significance level α , the H_0 is rejected in favor of the H_1 .
2. The P-value is larger than the significance level α , the H_0 is failed to reject.

Results. Based on the Airdna database, 13918 accommodation units were offered via Airbnb in Prague in April 2016. Figure 1 displays the categories of property type, which were offered in Prague in 2016. The most part of property market were apartments, it is almost 89%, and only 4% for houses, the remaining percentages are divided between campers, hostels, dorms and other types.

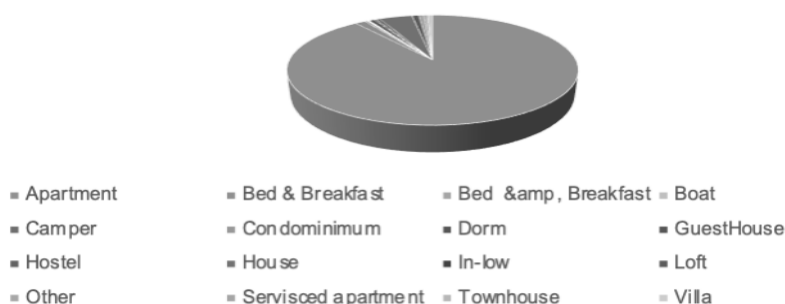


Figure 1. Property type on Prague AirBnB market

Sources: developed by the authors on the basis of the authors' own results (2019).

Although the largest share of the offers belongs to Apartments, the highest occupation rate has Guest House with the median of occupation rate 0.52. The second most popular are Apartments and Lofts with the same medians 0.49. Those types are followed by the Hostels, Condominiums, and Houses. The Most unpopular type on Prague market is Bed & Breakfast with the median of 0.12. Other property types on average by popularity are around at 0.26. First part of our results is in line with the authors Yitberg (2016) and Coylel and Yeung (2016). The occupation rate for all those property types are shown in Table 1 and Figure 2.

Table 1. Descriptive statistics for occupation rate

Property type	Mean	Median	Std. Dev.	Dispersion		Skew.	Min.	Max.	Number
Apart	0,49	0,49	0,27	0,08	-1,12	0,07	0	1	12441
Bed & Breakfast	0,32	0,25	0,25	0,06	-0,15	0,91	0,03	1	187
Bed& Breakfast	0,16	0,12	0,14	0,02	2,44	1,54	0	0,65	52
Boat	0,26	0,27	0,17	0,03	9,3	2,53	0,05	0,84	18
Camper	0,29	0,29	0,04	0	-4,78	0,21	0,26	0,34	4
Condominium	0,38	0,37	0,19	0,04	-0,11	0,59	0,12	0,78	16
Dorm	0,32	0,26	0,23	0,05	0,71	1,17	0,03	1	94
Guest house	0,49	0,52	0,23	0,05	-0,56	-0,06	0,09	1	41
Hostel	0,37	0,38	0,2	0,04	-1,12	0,1	0,03	0,76	69
House	0,4	0,37	0,26	0,07	-0,73	0,5	0,01	1	600
In-low	0,49	0,29	0,39	0,15	-2,83	0,5	0,1	0,97	5
Loft	0,51	0,49	0,26	0,07	-1,01	-0,08	0,03	0,99	121
Other	0,39	0,34	0,25	0,06	-0,81	0,44	0,05	1	94
Serviced apartment	0,31	0,26	0,24	0,06	-0,26	0,72	0,03	1	53
Town House	0,4	0,32	0,29	0,08	-0,43	0,75	0,03	1	34
Villa	0,31	0,31	0,2	0,04	-0,93	0,29	0,03	0,76	75

Sources: developed by the authors on the basis of the authors' own results (2019).

The most expensive offers belong to Serviced apartment (the median of average daily rate is 75.73), with occupation rate 0.26. The second most expensive offers belong to Campers (65.63) with occupation rate 0.29. The other ones are In-low, Lofts, and Condominiums with average daily rate 62.56, 62.26, and 61.42 and the occupation rates 0.29, 0.49, 0.37, respectively.

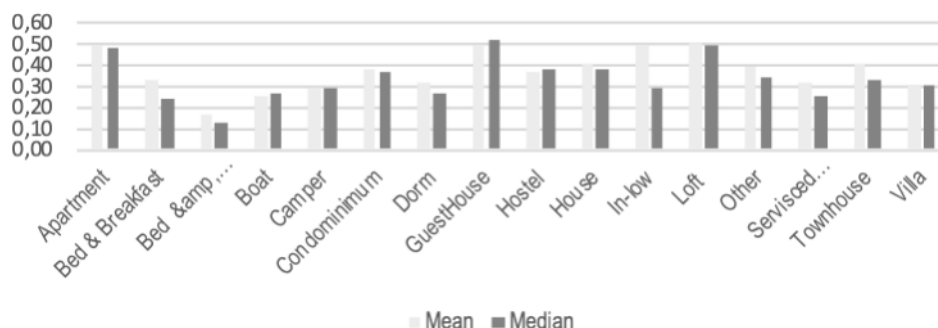


Figure 2. Measurements of central tendency for occupation rate

Sources: developed by the authors on the basis of the authors' own results (2019).

And Apartments has average daily rate less, then 60 (57.86). The lowest average daily rate belongs to Dorms and Hostels with 28.24 and 26.67, respectively.

Table 2. Descriptive statistics for average daily rate

Property type	Mean	Median	Std. Dev.	Dispersion		Skew.	Min.	Max.	Number
Apart	75,95	57,86	66,91	4477,1	103,2	5,97	10	2159,7	12441
Bed & Breakfast	67,43	50,27	56,61	3205,1	11,15	2,79	10	422	187
Bed& Breakfast	87,18	51	145,6	21208,1	22,8	4,62	11,95	902,9	52
Boat	64,49	54,41	50,03	2503	13,9	3,57	26,4	254,7	18
Camper	62,74	65,63	39,87	1589,7	1,54	-0,43	11,25	108,5	4
Condominium	117,2	61,42	157,6	24832,7	5,03	2,37	21	576,1	16
Dorm	37,75	28,24	26,89	722,9	10,66	2,55	10,89	191	94
Guest house	62,43	42,78	50,68	2568,8	5,82	2,07	17	269	41
Hostel	33,57	26,67	33,39	1114,6	8,2	2,89	11,36	174,3	69
House	80,35	53,08	98,44	9690,8	90,21	7,33	10,34	1555	600
In-low	60,13	62,56	17,9	320,3	-1,26	0,15	39,17	83,83	5
Loft	79,1	62,26	55,76	3109,1	3,15	1,75	16,66	285,7	121
Other	77,75	65,21	73,22	5360,9	34,1	5,29	12,44	613	94
Serviced apartment	80,72	75,73	38,86	1510	3,51	1,32	14	235,5	53
Town House	64,08	46,55	55,93	3128	11,69	2,89	12	314,4	34
Villa	73,22	45,72	74,14	5497,1	3,48	2	13,72	312,5	34

Sources: developed by the authors on the basis of the authors' own results (2019).

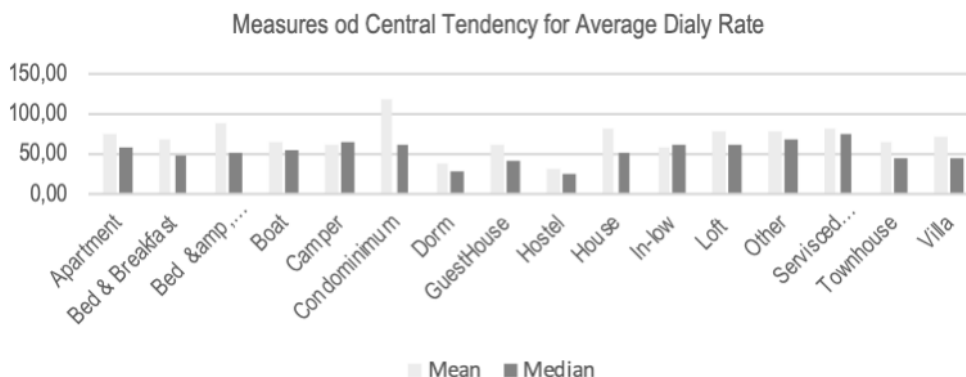


Figure 3. Measurements of central tendency for average daily rate

Sources: developed by the authors on the basis of the authors' own results (2019).

Two variables were selected for Correlation Analysis: Average Daily Rate and Occupation Rate. The distributions in data set is appeared to be approximately normal. Correlation coefficient is calculated by formula 1 and the values -0.173, it confirms an existence of a strong negative linear relationship. In other words, with the rising average daily rate the occupation rate falls. The result of the Correlation Coefficient Hypothesis Test for testing the population correlation coefficient are as follows. Null hypothesis $H_0: \rho = 0$, which means that the population correlation coefficient is zero. Alternative hypothesis $H_A: \rho \neq 0$ population correlation coefficient is not equal to zero. The results of the Correlation Coefficient Hypothesis Test are shown in Table 3.

Table 3 The result of correlation coefficient hypothesis test (on significance level)

Average Daily Rate / Occupation Rate	Correlation Coefficient	-,173
	Sig. (2-tailed)	,000
	N	13918

Sources: created by the authors on the basis of the correlation analysis (2019).

The P-value is the Sig. (2-tailed) 0.000, so the P-value is lesser than the significance level α , the H_0 is rejected in favor of the H_1 . It means, that there is a negative linear relationship in the population between the Average Daily Rate and Occupation Rate.

The other one statistical tool ANOVA will be applied on the following two variables: property type and occupation rate. The independent variable is property type and is categorical. This variable has the following categories: Apartment, Bed & Breakfast, Bed amp, Boat, Camper, Condominium, Dorm, Guest House, Hostel, House, In-low, Loft, Serviced apartment, Townhouse, Villa, and Other. Standing the hypothesis: $H_0: \mu_1 = \mu_2 = \dots = \mu_i$, all means are equal, in other words, there is no difference in occupation rate by property type: not all are equal, the differences are. After that the F statistic and P-value were calculated. The results of one-way ANOVA are shown in Table 4.

All calculations is held on significance level $\alpha = 0.05$. The P-value is lesser than the significance level α , than, the H_0 is rejected in favour of the H_1 . In other words, there are differences in occupation rate by property type.

Table 4. The results of one-way ANOVA

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Property Type/Occupation Rate	Between Groups	23,96009	15	1,59734	21,59029	,000
	Within Groups	1027,492	13888	0,073984		
Total		1051,452	13903			

Sources: created by the authors on the basis of one-way ANOVA analysis (2019).

Based on Varma et al. (2016) research, survey results submit that there are significant differences between the type and motivation of customers that book Airbnb and is finding, that price is the most likely to affect the decision to rent a property. Coyle and Yeung (2016) in their work, based on their research styeed, that the occupancy rate to fall and the Average daily rate to rise, what is in line with our results.

Conclusions. The main aim of the current research was to verify the existence of a dependency between the property type and the occupancy rate, identify if the specific property type is more demanded on the market and confirm or reject an existence of a dependency between an average daily rate and the occupancy rate. The research is based on the data set monitoring 13918 units in Prague offering accommodation in April 2016. The main results of the research are as follows. Although the largest share of the offers belongs to Apartments, the highest occupation rate has Guest House with the median of occupation rate 0.52. The second most popular are Apartments and Lofts with the same medians 0.49. After those types are Hostels, Condominiums, and Houses. The Most unpopular type on Prague market is Bed and Breakfast with the median 0.12. Other property types on average by popularity around at 0.26. First part of our results are in line with the following authors, Yitberg (2016) and Coyle and Yeung (2016). The most expensive offers belong to Serviced apartments (the median of average daily rate is 75.73), with occupation rate 0.26. The second expensive offers belong to Campers (65.63) with occupation rate 0.29. The other ones are In-low, Lofts, and Condominiums with average daily rate 62.56, 62.26, and 61.42 and the occupation rates 0.29, 0.49, 0.37, respectively. And Apartments has average daily rate less, then 60 (57.86). The lowest average daily rate belongs to Dorms and Hostels with 28.24 and 26.67, respectively. Two variables were selected for Correlation Analysis: Average Daily Rate and Occupation Rate. There is a negative linear relationship in the population between the Average Daily Rate and Occupation Rate. Correlation coefficient is calculated by formula 1 and the values -0.173, it told about strong negative linear relationship. With rising the Average Daily Rate falling the Occupation Rate, and with falling the Average Daily Rate rising the Occupation Rate. And the other one statement, based on ANOVA is, that there are differences in occupation rate by property type, in other words, the occupation rates of apartments, of Bed and Breakfast, Bed amp, Boat, Camper, and others type of property are not similar. With our future work we want to contribute to a better understanding of the AirBnB concept and AirBnB functioning, in other word do the prediction model of occupation rate based on above mentored information. We consider the scale and validity of our dataset, covering the real business activities of all AirBnB users in Prague during the 12 months period, that was also validated by our own data scrapping application, for a strength of our research. The research has also some limitations. The most important one is related to the technology of the data collection by webscrapping, but to our opinion the use of the statistical methods lowered the impact of this limitation to the minimum level.

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Володимир Крайчік, D.Sc., Коледж університету бізнесу у Празі (Чеська Республіка);
Олександр Ключніков, D.Sc., Університет підприємництва та права (Чеська Республіка);
Олена Ріхова, Ph.D., Університет бізнесу у Празі (Чеська Республіка).

Інноваційні бізнес-моделі шерінгової економіки в туризмі: на прикладі компанії Airbnb у Празі

Статтю присвячено аналізу та систематизації наукового доробку щодо розвитку туристичної галузі з урахуванням взаємозв'язку між середньою вартістю оренди апартаментів та кількістю клієнтів на платформі шерінгової економіки. Основною метою статті є оцінка взаємозалежності між попитом на нерухомість, середньою вартістю та кількістю клієнтів. Результати аналізу та систематизація наукових джерел з означеної проблематики дають підстави зробити висновок, що стрімкий розвиток Airbnb впливає на ринок готельних послуг. При цьому авторами визначено, що галузь шерінгової економіки починає суттєво змінювати ринок короткострокової оренди житла та привертає увагу регулюючих органів та бізнес-сектору. Окрім цього, розвиток онлайн-платформ шерінгової економіки (таких як Airbnb) провокують зростання пропозиції на ринку житла, а отже й рівня конкуренції на ринку туристичних послуг. У рамках даного дослідження авторами оцінено структуру та проведено сегментацію діяльності Airbnb, представлено описові статистичні дані діяльності Airbnb у місті Прага. Підґрунтям дослідження стали результати даних моніторингу 13918 запропонованих об'єктів нерухомості (заявки яких розміщено на Airbnb) у квітні 2016 року. У статті перевірку гіпотези здійснено з використанням кореляційного аналізу та аналізу змінних величин. Таким чином, отримані результати дослідження емпірично підтвердили наявність негативного лінійного взаємозв'язку між середньою вартістю оренди номеру та рівнем заселення апартаментів. На основі аналізу відхилень авторами виявлено відмінності у рівні заселення залежно від типу нерухомості. Крім цього, авторами наголошено, що отримані результати дослідження можуть бути корисними для широкого кола представників туристичної та готельної галузей, а саме: підприємців, менеджменту готелів та інших орендодавців, а також користувачів послуг проживання.

Ключові слова: Airbnb, ANOVA, кореляція, туризм, шерінгова економіка, готель, менеджмент.

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