

Age Structure of Inhabitants in the Czech Republic in Relation to ICT Usage for Searching for Travel and Accommodation Information

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Abstract: At the present time we can observe significant changes in customers' behavior in creating demand for particular goods. ICT usage plays more and more important role in this process. Information technologies bring higher availability of information necessary to apply a purchase decision, which increases demand elasticity. This article analyses the ICT usage development in regard to an age structure of inhabitants in the Czech Republic since 2009 to 2018. Crucial role in this development has been played by availability of a mobile internet connection. In the article there were used source data of the Czech Statistical Office. In the observed period there was found out an increasing linear trend in all age categories for the variable "Individuals using ICT for searching for travel and accommodation information in the Czech Republic" in percents. All regression functions have shown high values of coefficients of determination (0.675 - 0.933). The method of double sorting analysis of variance at the level of importance $\alpha = 0.05$ found out statistically conclusive F-tests for the sorting criteria "Age Category" and "Year". Detailed evaluation of the analysis of variance differentiated individual pairs of averages of the analyzed sorting categories.

Keywords: Time series; ICT; Age; the Czech Republic; statistical analysis

JEL Classification: C10; D83; J1

1. Introduction

Creation of demand for particular goods has been undergoing significant changes in the last decade. The crucial role in this process is played by ICT usage and related higher availability of information necessary to apply a purchase decision. However, access to ICT and its use in the Czech Republic is very various as per the age of inhabitants. In the observed period there can be found significant differences between averages of component groups of inhabitants, divided into seven basic age groups, and also between the years of the analyzed time series.

Using ICT by respective age groups in the observed period has been considerably variant. Crucial factor for ICT availability was the price. In the beginning of the observed period financial possibilities to get access to Internet were limited, and hardware (PC, laptop, mobile phone) was hardly accessible or almost inaccessible for the groups with lower income. Especially older inhabitants (age groups 55-64, 65-74 and 75+) could hardly get access to Internet; the individuals so far economically active compensated it by using such technologies in their employment.

Problematic access to Internet has been quite long-lasting in the Czech Republic. The first connection to Internet was carried out in the former Czechoslovakia as early as on 13/02/1992; however, until the end of 1995 there was a data-transmission monopole of the telecommunication company Eurotel in the Czech Republic. Such a situation strongly limited availability of Internet connectivity, as the prices for data transfer were relatively high. Even after partial liberalization of telecommunication market at the turn of 1995 and 1996 the number of Internet access points was not growing very quickly and remained deeply below the international average. Faster development of Internet connectivity came as far as after the full liberalization of telecommunication services between 2002 and 2005. Until 2009 the number of constant internet access points increased to 1.8 million; and

until 2018 to almost 3.5 million. At the same time the prices for standard connection (50 Mb/s) decreased significantly by 65.46% (Lupa 2019). Price development of constant internet connection led to strongly higher accessibility of Internet also for groups of inhabitants for whom the Internet had not been considered as a priority till then. It concerned especially the older age groups for whom the penetration by Internet connectivity had been distinctively lower at the beginning.

Even more important than increase in constant access points was a fast increase in mobile connectivity in the observed period. At the beginning its general usage had been inhibited by very low transmission speed of the network in the major part of the Czech Republic. However, at the present the high-speed mobile connection is quite common within entire Czech Republic. Number of mobile internet users reached almost 9 million in 2018, which exceeded the number of constant network access points. Significant limit of even faster development of mobile internet is its price, which is still far higher than the EU average. According to Ruiz-Gomez (2018) differences have been detected between the more developed and less developed areas of Europe, which could indicate a digital divide. Therefore, the results indicate divergent behaviour patterns in digital travel and accommodation, as well as divergent trends in different EU geographical areas.

Development in ICT usage by the general public also relates with searching for the travel and accommodation information. There we can identify several aspect of ICT usage. One of them is a support of searching, booking and payments for services. In the customers perspective ICT provides numerous information on conditions of the visit with regard to season, natural and geographic conditions in the destination – weather within a year, current weather forecasts, holidays, snow conditions, vegetative season, eco-touristic conditions, traffic accessibility to- and within the destination, local culture info, visualization (virtual sightseeing, video-presentations etc.).

Development in ICT usage for travel and accommodation information relates directly with availability of information technologies. While in 2005 ICT was used by only 12.3% people searching for travel and accommodation information, in 2018 it was already 52.4% (ČSÚ 2019). At the beginning of the observed period ICT was used for searching for travel and accommodation information especially by the people of the three youngest age categories (16-24, 25-34 and 34-44 years), thus the people who use ICT and Internet familiarly. For example, Wu (2019) studies ICT usage in adult young. Remaining age categories fell short in ICT usage. However, there came significant increase in ICT usage also in the three older age categories in the following period.

It bears evidence of a grand change of the consumers in the travel market and accommodation services. In addition, such a trend is accentuated by the fact that as early as in 2017 there were 19.1% customers purchasing accommodation services directly on Internet; in the same year there were 9.4% customers purchasing travel passes and fly tickets through ICT. Nevertheless, a general usage of ICT for searching for travel and accommodation information has an evident impact on a demand elasticity, which is becoming more and more sensitive towards price changes and other factors affecting the consumers' decision-making.

Regarding the development in accessibility of ICT in the Czech Republic and its usage for searching for travel and accommodation information we can presume that such a trend would strengthen also in the following period, and would gradually prevail. Decisive factor for this development would probably be a development in ICT usage by particular groups of consumers groups, which is the scope of the following analysis.

2. Methodology

Out of the Czech Statistical Office source data there was analyzed the time series of the number of individuals searching for travel and accommodation information (in %). The trend was examined in the time series 2009 – 2018 for seven age categories (16-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75+ years) (ČSÚ 2019). Quality of the regression model was verified with the determination index (Novák, 2015). Regression and correlation analyses have been described for instance by Hendl (2004) or Johnson & Wicher (2007). Time series analyses have been summarized for example by Arlt & Artlová (2009). Linear regression and correlation in the time series have been described by Skupinová (2012). Using the double sorting analysis of variance at the level of importance $\alpha = 0.05$ it was searched

whether there exists at least one pair of statistically conclusively varying averages for the variable „Individuals searching for travel and accommodation information“ (in %) it the light of the two sorting criteria – „Age category“ and „Year“. In order to evaluate the analysis of variance in detail there was used the Tukey method. Techniques of the analysis of variance have been described for instance by Hebák et al. (2007). Analysis of variance has been processed with usage of the statistical program Statgraphics.

3. Results

The trend analysis in the time series 2009 – 2018 has been carried out for the variable “Individuals searching for travel and accommodation information” (in %). Out of the Graph 1 it results that in the current time series 2009 – 2018 we can observe a linear increasing trend for all the examined categories.

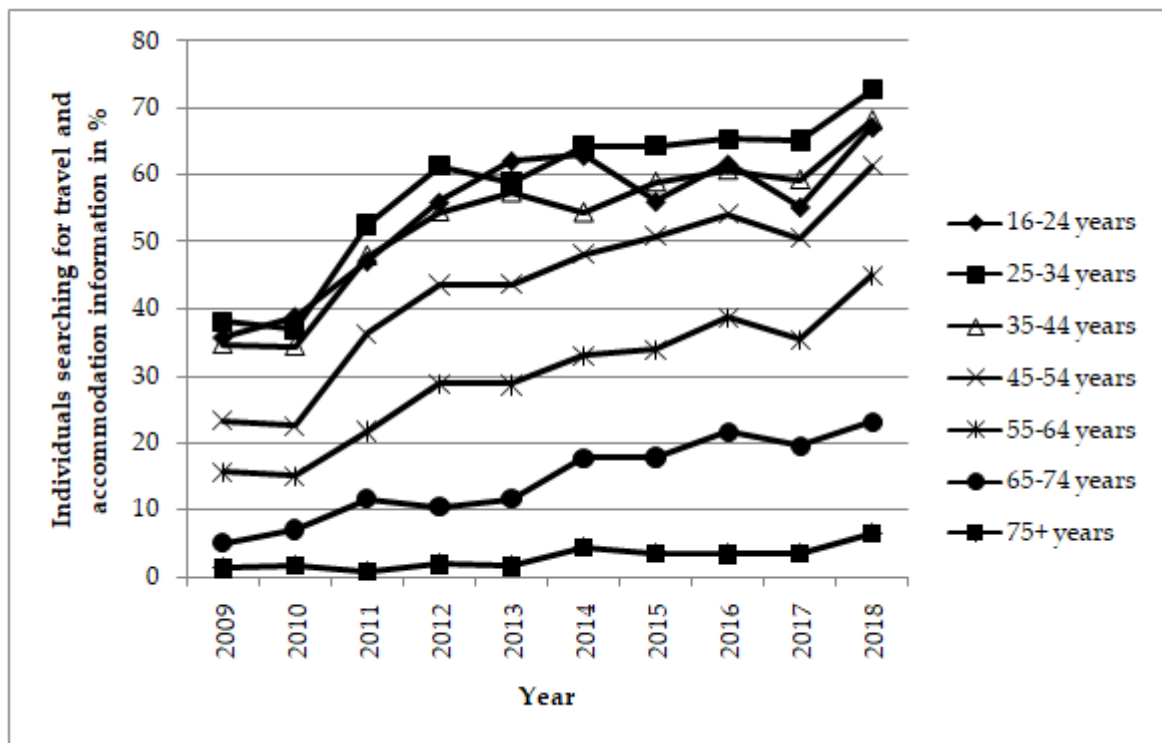


Figure 1. Linear increasing trend in the current time series 2009 – 2018 for the variable „Individuals searching for travel and accommodation information“ by the age groups.

Quality of the regression model has been evaluated with the coefficient of determination; in all categories the regression model shows good or very good quality. The coefficients of determination in time for particular age categories are summarized in the Table 1. The trend which is possible to be described with the regression line is an appropriate function in time for all the age categories. Interesting was the year 2017 when there occurred a slight decrease of individuals searching for travel and accommodation information in all the age categories, except the 75+ category which was equal to 2016. However, this fluctuation has no definite economical nor social background.

Table 1. Determination Index for Particular Age Categories in the Time Series.

Age Category	16-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75+ years
Determination Index	0.675	0.814	0.836	0.889	0.927	0.933	0.713

Out of the double sorting analysis of variance it results that in both sorting categories (Age category and Year) there was found out statistically conclusive F-test at the level of importance $\alpha = 0.05$ (Figure 2).

Analysis of Variance for HED.Data					
Source of variation	Sum of Squares	d.f.	Mean square	F-ratio	Sig. level
MAIN EFFECTS	32583.842	15	2172.2561	107.974	.0000
HED.Rok	4974.298	9	552.6998	27.472	.0000
HED.Vek	27609.544	6	4601.5906	228.726	.0000
RESIDUAL	1086.3906	54	20.118344		
TOTAL (CORR.)	33670.233	69			

Figure 2. Double Sorting Analysis of Variance According to Age Category and Year – Conclusive F-test.

Using the Tukey method detailed evaluation there were differentiated statistically conclusively varying averages at the level of importance $\alpha = 0.05$ in both sorting categories. The detailed evaluation by the Tukey method for the sorting criterion „Year“ is shown in the Table 2; for the sorting criterion „Age“ in the Table 3.

Table 2. Tukey Method Detailed Evaluation of Analysis of Variance for Sorting Criterion "Year".

Time t	Average	Homogeneous Groups
1	21.94	*
2	22.33	* *
3	31.17	*
4	36.61	* *
5	37.69	* *
6	40.70	*
7	40.76	*
9	41.19	* *
8	43.66	* *
10	49.11	*

Key: 1: 2009; 2: 2010; 3: 2011; 4: 2012; 5: 2013; 6: 2014; 7: 2015; 8: 2016; 9: 2017; 10: 2018

The years 2009 and 2010 do not differentiate with one another, but they conclusively vary from the other years. The years 2018, 2017 and 2016 do not differ from one another, but they vary from 2011, 2010 and 2009. The year 2018 differs from 2015 – 2019. The years 2012 – 2017 create a homogeneous group with no statistically conclusive variations. No conclusive variations were found also between the years 2011, 2012 and 2013. Thus, out of the detailed evaluation there conclusively results a variation of averages of individuals searching for travel and accommodation information (in %) between the early years (2009 and 2008) and the most recent years (2016, 2017 and 2018).

Table 2. Tukey Method Detailed Evaluation of Analysis of Variance for Sorting Criterion „Age”.

Age	Average	Homogeneous Groups
7	2.85	*
6	14.53	*
5	29.55	*
4	43.41	*
3	53.06	*
1	54.24	*
2	57.97	*

Key: 1: 16 - 24 years; 2: 25 - 34 years; 3: 35 – 44 years; 4: 45 – 54 years; 5: 55 – 64 years; 6: 65 – 74 years; 7: 75+ years

At the level of importance $\alpha = 0.05$ the age categories 75+, 65-74, 55-64 and 45-54 years are statistically conclusively varying from one another; along with it all these categories statistically conclusively differentiate from the categories 35-44, 25-34 and 16-24 years. The age categories 35-44, 25-34 and 16-24 years show no statistically conclusive variations at the level of importance $\alpha = 0.05$. Thus, out of the analysis of variance it results that the individuals of the age category 16-44 years, searching for travel and accommodation information (in %), create one homogeneous group varying from older people.

4. Discussion

Out of the regression analysis of the variable “Individuals searching for travel and accommodation information” (in %) in the time series it results that there have been found a linear increasing trend for all the age categories in 2009 – 2018, which can be described with a regression line. As all seven trend models by the age groups show high values of the coefficient of determination, the recognized models can be considered as of a high quality. Accordingly, we can presume that an increase in the number of individuals searching for travel and accommodation information (in per cents) would grow in all the age categories in the following year as well. Besides, this fact is conditioned by constantly developing ICT market and price availability of such technologies also for the citizens of older age categories.

Increase in living standards of the Czech citizens and increase in pensions unambiguously support the theory that the recognized trend would retain also in 65-74 and 75+ categories for at least two more periods. Out of the double sorting analysis of variance it results that there are statistically conclusive variations in the age categories 45+. However, thanks to a positive economic background we can presume that especially 65-74 and 75+ categories would also create a homogeneous group, such as the 16-44 age categories. It is evident that we will find statistically conclusive variations between the age categories also in future; nevertheless, the number of homogeneous groups will increase.

The statistically conclusive variations in the sorting category “Year” will differ older age categories from the younger ones even more sharply in the future; however, it is unambiguous that the younger age categories will only display one homogeneous group in the future, which will relate not only with financial availability of ICT but also with educational rate, when current technologically educated scholars will come to the age category 16+. Also, the fact is that the current young population educated in ICT will simply grow old and there will be a majority of the retired capable to use ICT. Thus, the future time series will only show conclusive variations between the oldest and the youngest age categories.

5. Conclusions

Development in ICT usage to search for travel and accommodation information have been considerably unequal by particular age categories in the observed period. The age category 25-34 displayed the largest usage of ICT almost all of the time. This group also displayed the most rapid

increase in the beginning of the observed period. The age categories 16-24 and 35-44 then display similar, slightly lower ICT usage. In the age category 16-24 the development is considerably less stable and display distinctive fluctuation. However, these three categories significantly converge by the end of the observed period.

The age category 45-54 display lower usage of ICT all along. However, at the same time it shows similar development as in the categories 16-24 and 35-44, to which it approximated by the end of the observed period. We can presume that it will approximate even nearer in the following period.

Accordingly, the category 55-64 displays an increasing trend similar to a development in the category 45-54. Also, in this category we can presume a significant increase in ICT usage; however, it will probably keep certain distance from the younger age groups in the following period.

The oldest age categories (65-74 and 75+) display just a slow increase in ICT usage, starting at almost zero values. In these categories we can expect more significant increase in ICT usage as far as in longer time horizon in context of a demographic development and a shift of people from younger age categories.

We discovered that the recognized trend would retain also in 65-74 and 75+ categories for at least two more periods. And we also could state positive economic background we can presume that especially 65-74 and 75+ categories would also create a homogeneous group, such as the 16-44 age categories.

Generally, we can agree that the ICT usage to search for travel and accommodation information is currently considerably inhomogeneous in relation to the age structure of inhabitants. However, we can presume the future gradual approximation of the younger age categories, together with a gradual increase in ICT usage by the oldest categories. It would apparently lead to partial decrease of inhomogeneity.

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