E-commerce Obstacles in Small and Medium European Enterprises

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Abstract: - Digital access has become seamless in recent decade, and nowadays it becomes present in almost every aspect of business and everyday way of life. E-commerce changed the way people shop and chose products, enabling better services to clients and increasing profitability of enterprises. However, e-commerce customers are faced with numerous difficulties related to their activities, e.g. lacking product information, aggressive advertising, problems with return policies and attack to privacy and thus decrease of trust. On the other side, enterprises also deal with e-commerce obstacles in the area of employee IT knowledge and technical readiness, strategic orientation toward IT and management support. This paper focuses on the analysis of e-commerce obstacles in selected European countries in 2017, encountered by small and medium enterprises. In order to investigate if there are significant differences across selected European countries, the non-hierarchical cluster analysis was conducted in order to group countries into homogenous clusters. Results indicate that small and medium enterprises from countries which are less developed deal with more difficulties on e-commerce. Therefore, digital divide among European countries plays an important role in e-commerce trade, while enterprises from countries, which are leaders in information technology, face fewer difficulties, related to e-commerce.

Key-Words: - e-commerce, cluster analysis, small enterprises, medium enterprises, European countries

1 Introduction

Development and usage of information and communication technologies improves everyday life [1]. New services and trends facilitate private life and business activities and contribute to wellbeing of the countries [2]. There are approximately 90% of Internet users in European countries, with around 70% of them who are using e-commerce [3]. Besides that, e-commerce has significant positive impact to growth and profitability of small and medium enterprises [4]. Small and medium enterprises strongly influence to national economies and make 80% of global economic growth. Therefore, it is important to various barriers, which will enable more efficient and effective business via Internet [5]. However, there are still obstacles when doing business over Internet for customers and for enterprises [6][7]. Clients prefer to touch the product they intend to buy, do not feel comfortable to give credit card data over the Internet, lack of foreign languages [8]. There are several factors, which are seen as motivators for developing e-commerce and decreasing difficulties about e-commerce for small and medium enterprises [9][10][11]: technical knowledge, highly skilled employees, external factors, management structure, and organizational readiness.

This paper aims to investigate difficulties for web sales in small and medium enterprises in selected European countries. The descriptive and cluster analysis was conducted. The non-hierarchical k-means cluster analysis was applied with the goal of detect specific homogenous groups of European countries for small and medium enterprises that share common characteristics. In order to conduct the cluster analysis, we used the following variables: high costs of delivering or returning products, related to resolving complaints and disputes, adapting product-labelling, lack of knowledge of foreign languages, restrictions from business partners for small and medium enterprises in 28 European countries for 2017. Paper consists of five sections. It starts with Introduction, where topic and goal of the paper are presented. The second section deals with Methodology including data and K-means clustering procedure. The third section provides given results while the fourth section discusses given results. Finally, the last section concludes the paper, including the limitations of the study and future implications.

2 Methodology

In this section, data and cluster analysis will be presented. Firstly, research variables on e-commerce obstacles will be described regarding small and medium enterprises. Secondly, K-means clustering procedure and Anova analysis will be defined.

2.1 Data

In this study, we have used variables on e-commerce obstacles. Variables are available at Eurostat-European Statistical Database. We have analysed seven variables on e-commerce obstacles for small and medium enterprises for 28 European countries in 2017:

- D1. Difficulties for web sales to other EU countries - high costs of delivering or returning products in small and medium enterprises
- D2. Difficulties for web sales to other EU countries - related to resolving complaints and disputes in small and medium enterprises
- D3. Difficulties for web sales to other EU countries - adapting product labelling in small and medium enterprises
- D4. Difficulties for web sales to other EU countries - lack of knowledge of foreign languages in small and medium enterprises
- D5. Difficulties for web sales to other EU countries - restrictions from business partners in small and medium enterprises
- D6. Difficulties for web sales to other EU countries - any (of high costs, complaints, labelling, languages, business partners restrictions) in small and medium enterprises
- D7. Difficulties for web sales to other EU countries - none (of high costs, complaints, labelling, languages, business partners restrictions) in small and medium enterprises

All variables are measuring difficulties related to web sales in EU countries for small and medium enterprises regarding to different characteristics, e. g. high costs of delivering or returning products, complaints, product labelling, lack of knowledge of foreign languages, restrictions, high costs of business, none difficulties (Table 1).

The highest average grade has variable *D7: Difficulties for web sales to other EU countries - none (of high costs, complaints, labelling, languages, business partners restrictions) in small* (28,2) *and medium* (33,7) *enterprises*, following by other two variables *D1: Difficulties for web sales to other EU countries - high costs of delivering or returning products in small* (10,21) *and medium* (9,89) *enterprises* and *D6: Difficulties for web sales to other EU countries - any (of high costs,*

complaints, labelling, languages, business partners restrictions) in small (15,36) *and medium* (15,32) *enterprises*. Average grade for other variables used for analysis is less than five. The lowest average grade has variable *D3: Difficulties for web sales to other EU countries - adapting product labelling in small* (3,43) *and medium* (3,89) *enterprises*.

Table 1 Research variables on e-commerce obstacles

Name of the variable	Means	Std. Dev.
D1_SMALL	10,21	4,46
D1_MEDIUM	9,89	5,25
D2_SMALL	5,21	2,86
D2_MEDIUM	4,93	3,14
D3_SMALL	3,43	2,17
D3_MEDIUM	3,89	3,02
D4_SMALL	4,46	2,33
D4_MEDIUM	3,50	2,12
D5_SMALL	3,43	2,10
D5_MEDIUM	4,46	3,53
D6_SMALL	15,36	6,65
D6_MEDIUM	15,32	8,20
D7_SMALL	28,2	10,9
D7_MEDIUM	33,7	13,2

Source: Authors' work based on Eurostat

2.2 K-means clustering analysis

The cluster analysis present a method used for identifying homogenous groups of objects, which means that objects in particular cluster are similar, while objects from other clusters differ one from another [12] Cluster analysis starts with the selection process of adequate variables following by the decision how the clusters could be formed. It is important to decide the goal of clustering procedure: to minimize variance between units in clusters or to maximize the distance between units in different clusters.

There are two main clustering approaches: hierarchical and non-hierarchical (partitioning) methods. There are several differences between these two mentioned methods. Hierarchical cluster analysis could be defined through following: (i) decision about the final number of clusters is made at the end of the analysis, and (ii) different distance measures are used to group clusters. Non-hierarchical cluster analysis has opposite characteristics: (i) decision about the final number of clusters is made before the analysis, and (ii) clusters are obtained using a within-cluster variation. In our analysis, we have used non-hierarchical cluster analysis. At the beginning of the selection process, we have used seven variables on e-commerce obstacles for the analysis. Furthermore, Anova analysis of k-means clustering showed that

variable D7 for small and medium enterprises is not statistically significant. Therefore, variable D7: Difficulties for web sales to other EU countries - none (of high costs, complaints, labelling, languages, and business partner's restrictions) in small and medium enterprises was not included in the further analysis.

3 Results

In the analysis, seven variables on e-commerce obstacles in small and medium enterprises are observed. The complete list of variables and their description can be found in Table 1. Selected data used in analysis are for European countries for 2017. In this section, basic descriptive results for the selected variables will be presented.

**Figure 1** E-commerce obstacles in small enterprises in selected European countries, 2017
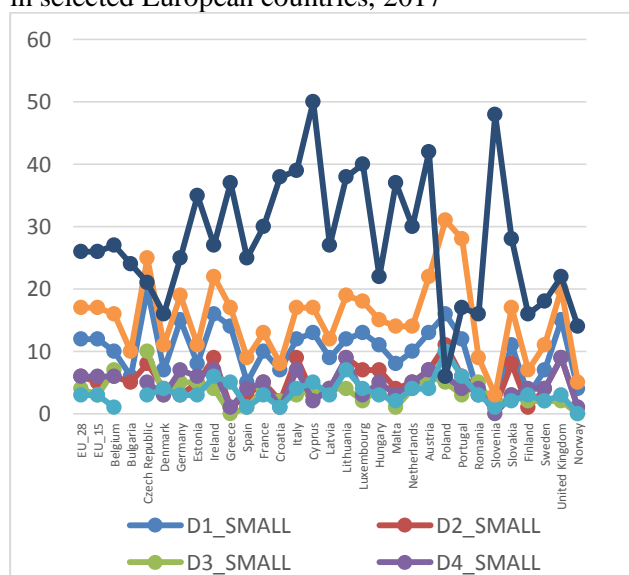
Source: Authors' work based on Eurostat

According to Figure 1, the highest obstacle for small enterprises from selected European countries is variable D7: Difficulties for web sales to other EU countries - none (of high costs, complaints, labelling, languages, business partners restrictions) in small enterprises. The exception is Poland, where the lowest percentage of small enterprises highlighted variable D7 as the main obstacle. Variables D1: Difficulties for web sales to other EU countries - high costs of delivering or returning products in small enterprises and D6: Difficulties for web sales to other EU countries - any (of high costs, complaints, labelling, languages, business partners restrictions) in small enterprises are seen as obstacles for small enterprises in Poland. In addition, less than 10% of small enterprises in Poland named other five variables as obstacles for e-commerce (D2, D3, D4, D5, D7). Similar situation

is for other European countries. Less than 10% of small enterprises named following variables as obstacles for e-commerce (D2, D3, D4 and D5). For most of the countries, the highest percentage of small enterprises highlighted variables D1 and D6 as obstacles. In other words, high costs of delivering or returning products as well as any of other difficulties, e.g. high costs, complaints, labelling, languages, and business partners' restrictions present the main obstacles for small enterprises in European countries.

According to Figure 2, the highest obstacle for medium enterprises from selected European countries is variable D7: Difficulties for web sales to other EU countries - none (of high costs, complaints, labelling, languages, business partners restrictions) in medium enterprises, especially for enterprises in Cyprus. The highest percentage of medium enterprises from Czech Republic, Poland and Portugal named variable D6: Difficulties for web sales to other EU countries - any (of high costs, complaints, labelling, languages, business partners restrictions) in medium enterprises as obstacle for e-commerce. As well as for small enterprises, less than 10% of medium enterprises named following variables as obstacles for e-commerce (D2, D3, D4 and D5). The exception is Czech Republic, where 15% of medium enterprises highlighted variable D3: Difficulties for web sales to other EU countries - adapting product labelling in medium enterprises as obstacle for e-commerce and Poland where 17% of medium enterprises highlighted variable D5: Difficulties for web sales to other EU countries - restrictions from business partners in medium enterprises as obstacle for e-commerce.

Figure 2 E-commerce obstacles in medium enterprises in selected European countries, 2017
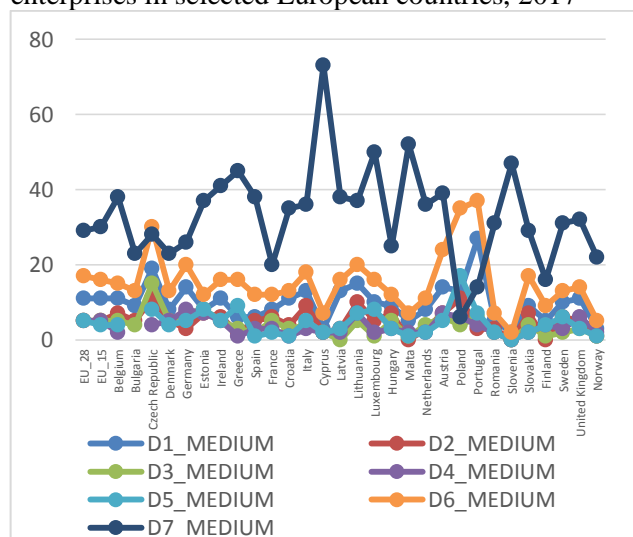
Source: Authors' work based on Eurostat

Table 2 presents Pearson's correlation matrix for the six observed variables while Figure 3 and Figure 4 present scatter plots of research variables for small and medium enterprises.

Table 2 Pearson's correlation matrix, h=12 variables, =28 countries, 2017

	D1_SMALL	D1_MEDIUM	D2_SMALL	D2_MEDIUM	D3_SMALL	D3_MEDIUM	D4_SMALL	D4_MEDIUM	D5_SMALL	D5_MEDIUM	D6_SMALL	D6_MEDIUM
D1_SMALL	1,000	0,50	0,67	0,57	0,51	0,61	0,50	0,43	0,57	0,57	0,88	0,69
D1_MEDIUM		1,00	0,55	0,51	0,48	0,59	0,48	0,44	0,42	0,47	0,73	0,89
D2_SMALL			1,00	0,82	0,49	0,43	0,72	0,47	0,57	0,50	0,75	0,61
D2_MEDIUM				1,00	0,61	0,63	0,61	0,46	0,42	0,57	0,57	0,60
D3_SMALL					1,00	0,77	0,50	0,40	0,24	0,32	0,49	0,48
D3_MEDIUM						1,00	0,43	0,51	0,20	0,38	0,53	0,58
D4_SMALL							1,00	0,78	0,40	0,33	0,53	0,42
D4_MEDIUM								1,00	0,46	0,47	0,49	0,48
D5_SMALL									1,00	0,76	0,74	0,63
D5_MEDIUM										1,00	0,69	0,73
D6_SMALL											1,00	0,87
D6_MEDIUM												1,00

Source: Authors' work

Table 2 presents Pearson's correlation matrix for 12 research variables. Based on the presented values, it can be concluded that there is very good relation between variables. It turned out that the strongest positive correlation is presented between variables D2_SMALL and D2_MEDIUM, D1_ SMALL and D6_ SMALL, D1_ MEDIUM and D6_ MEDIUM and D6_ SMALL and D6_ MEDIUM. There are five more correlations that present strong relation between variables: D3_SMALL and D3_MEDIUM, D4_SMALL and D4_MEDIUM, D5_SMALL and D5_MEDIUM, D2_SMALL and D6_SMALL, D5_SMALL and D6_MEDIUM.

Most of other correlations show also good relation among variables. However, there are several correlation coefficients that have shown that there are no statistically significant correlations between observed variables: D3_SMALL and D5_ SMALL, D3_ MEDIUM and D5_ SMALL, D3_SMALL and D5_ MEDIUM, D3_ MEDIUM and D5_ MEDIUM, D4_SMALL and D5_ MEDIUM.

In general, it can be concluded that there is strong correlation between the observed variables. In addition, a redundancy of information in variables is avoided.

3.1 K-means cluster analysis results

There are several different cluster methods, which can be used to determine the number of clusters. In this analysis, we have used statistical programme Statistica and v-fold cross-validation method to calculate the final number of clusters. In order to group selected European countries, a statistical non-hierarchical cluster analysis was applied. With the intention to get the initial centroids, we have chosen the maximum average distance approach [13].

Figure 3 presents the graph of the cost sequence with two clusters. The graph of the cost sequence implies the error function. The differences in clusters errors between the solutions among clusters are considered sufficiently large, which lead to conclusion that selected European countries should be grouped into two clusters.

Figure 3 Graph of the cost sequence
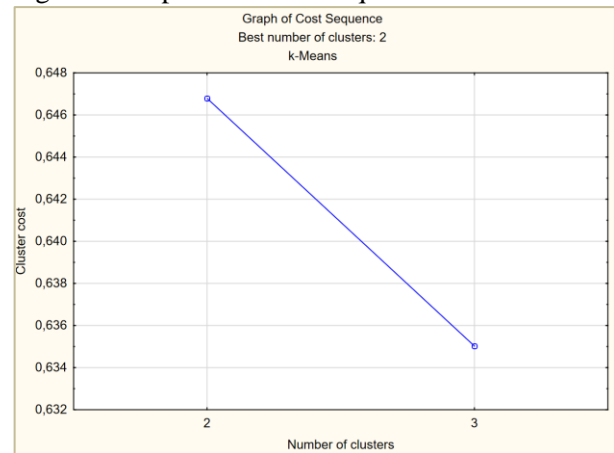
Source: Authors' work

Cluster means of research variables on e-commerce obstacles are shown in Table 3.

Results show that in Cluster 1, the highest cluster mean is for variables D6_SMALL (12,000) and D6_MEDIUM (11,278), while the lowest cluster mean have variables D4_MEDIUM (2,278) and D3_MEDIUM (2,556). In Cluster 2, the highest cluster mean is for variables D6_SMALL (21,400),

D6_MEDIUM (22,600), D1_SMALL (13,900) and D1_MEDIUM (14,500) while the lowest cluster mean have variables D3_SMALL (4,700) and D5_SMALL (4,900).

Table 3 Cluster means, k-means clustering, h=12 variables, n=28 countries, 2017

Variable / Cluster	Cluster 1	Cluster 2
D1_SMALL	8,167	13,900
D1_MEDIUM	7,333	14,500
D2_SMALL	3,889	7,600
D2_MEDIUM	3,667	7,200
D3_SMALL	2,722	4,700
D3_MEDIUM	2,556	6,300
D4_SMALL	3,222	6,700
D4_MEDIUM	2,278	5,700
D5_SMALL	2,611	4,900
D5_MEDIUM	3,056	7,000
D6_SMALL	12,000	21,400
D6_MEDIUM	11,278	22,600
Number of cases	18	10
Percentage(%)	64,286	35,714

Source: Authors' work

Table 4 presents ANOVA analysis of the variables on e-commerce obstacles used in the cluster analysis. Results of the test indicate that all selected variables are statistically significant at 1% of probability, except the variable D3_SMALL that is statistically significant at 5% of probability.

Table 4 Anova analysis, k-means clustering, h=12 variables, n=28 countries, 2017

|	Between SS	df	Within SS	df	F	p value
D1_SMALL	211,314	1	325,400	26	16,884	0,000**
D1_MEDIUM	330,179	1	414,500	26	20,711	0,000**
D2_SMALL	88,537	1	132,178	26	17,416	0,000**
D2_MEDIUM	80,257	1	185,600	26	11,243	0,002**
D3_SMALL	25,146	1	101,711	26	6,428	0,018*
D3_MEDIUM	90,134	1	156,544	26	14,970	0,001**
D4_SMALL	77,753	1	69,211	26	29,209	0,000**
D4_MEDIUM	75,289	1	45,711	26	42,824	0,000**
D5_SMALL	33,679	1	85,178	26	10,280	0,004**
D5_MEDIUM	100,020	1	236,944	26	10,975	0,003**
D6_SMALL	568,029	1	626,400	26	23,577	0,000**
D6_MEDIUM	824,096	1	992,011	26	21,599	0,000**

Source: Authors' work
Note: ** statistically significant at 1%; * at 5%

4 Discussion

Figure 4 presents the mean values of research variables across clusters, which will be discussed in the following text.

Figure 4 Graph of the clusters means
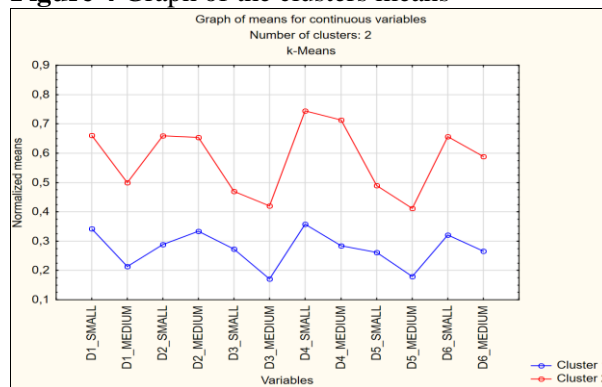
Source: Authors' work

Cluster 1 consists of 18 European countries (Belgium, Denmark, Greece, Spain, France, Croatia, Latvia, Cyprus, Hungary, Malta, Netherlands, Luxembourg, Romania, Slovenia, Slovakia, Finland, Norway, and Sweden). This cluster is made of European countries with lower percentage of small and medium enterprises, which highlighted e-commerce obstacles. Specifically, small enterprises facing with more e-commerce difficulties especially regarding high costs of delivering or returning products and lack of knowledge of foreign languages than medium enterprises.

Cluster 2 consists of other ten European countries (Czech Republic, Germany, Estonia, Ireland, Italy, Lithuania, Austria, Poland, Portugal, and United Kingdom). Small and medium enterprises from ten mentioned European countries have more difficulties when doing business over Internet than those in Cluster 1. In addition, there is high percentage of small and medium enterprises, from Czech Republic, Poland, Portugal, Italy, which are dealing with difficulties for web sales to other EU countries related to resolving complaints, disputes, and lack of knowledge of foreign languages than enterprises from countries grouped in Cluster 1.

5 Conclusion

According to the previous research, we can conclude that there have been many positive changes in using information and communication technologies for doing business. Developments and new trends in information technology facilitate and improve e-commerce sector. However, there are still different difficulties, which negatively effects e-commerce usage. In this paper, we have analysed obstacles for e-commerce usage in European countries. In our research, we applied the hierarchical cluster analysis to 28 European countries using data for 2017 year. We identified

two clusters with distinctive differences according to analyzed variables on e-commerce obstacles.

Based on the presented cluster analysis, it can be concluded that there are not much differences among clusters according to the research variables on e-commerce obstacles. Furthermore, the higher percentage of small and medium enterprises named following difficulties for web sales to other EU countries, e.g. adapting product labelling, lack of knowledge of foreign languages and restrictions from business partners. In addition, digital divide among selected European countries can be seen in the area of e-commerce, which supports the results of our previous research [14]. In other words, countries with less developed and less used information technology, have more difficulties with e-commerce, e.g. Poland, Portugal, and Czech Republic.

Therefore, the results of this research should be analysed considering several limitations and future research directions. First, we selected six research variables on e-commerce obstacles, while the future research might encompass some other variables that also have impact on e-commerce. Second, European countries with no values for selected research variables were excluded from the analysis. Finally, future research should be extended by using other cluster methods, such as hierarchical clustering.

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