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Enterprise Digital Divide: Website e-Commerce Functionalities among European Union Enterprises

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Abstract

Background: Information and communication technologies (ICTs) gained prevalent organizational and structural value in the modern economy. E-commerce is one of the sectors directly influenced by technological change. However, not all countries have the same opportunities to develop e-commerce growth; there are significant discrepancies in ICT utilization worldwide, known as the digital divide. **Objectives:** The purpose of this paper is to explore the level of difference among European countries regarding the e-commerce functionalities in their enterprises using a cluster analysis. **Methods/Approach:** To accomplish the paper goal, the k-means cluster analysis was conducted on the Eurostat data from 2019. Enterprises from 28 European countries were taken into consideration. The Kruskal-Wallis test is used to explore if the differences among clusters regarding the digital development, measured by the Digital Economy and Society Index are significant. **Results:** The investigation confirmed that there are significant differences among European countries regarding the development of e-commerce. However, a similar level of e-commerce is not related to economic and digital development. **Conclusions:** Since the relationship between economic development and e-commerce development in European countries is not linear, country-level policies are likely to be significant factors driving e-commerce development, which leads to the need for further investigation of this issue.

Keywords: e-commerce; website functionalities; digital divide; European Union

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Introduction

ICT gained prevalent organizational and structural value in the modern economy (Pazaitis et al., 2017). It became a significant backbone for economic growth and social development (Latif et al., 2018). Disruptive technologies like robotics, AR, VR, artificial intelligence, and the Internet of things are now used in various business sectors daily (Bongomin et al., 2020). New mechanisms, organizations, relations, and management are being developed by the ICT growth and it will do more in the future (Neirotti et al., 2018).

E-commerce is an industry that lies in ICT development (Cui et al., 2017). It became relevant in the 1990s with Internet expansion (Yue et al., 2020). E-commerce provides various benefits such as overcoming geographical barriers by the ICT utilization, it consolidates dispersed markets which results in a more immense supply of products and services offered by the c-commerce enterprises. E-commerce has evolved with the technological change and it became decisive to understand different dimensions of it from all perspectives. Nowadays, e-commerce sales have reached 4,13 trillion dollars, and it's expected to grow even more extensive, because of mobile commerce which is expected to take a market share of e-commerce of nearly 80% (E-commerce, 2020)

Various authors seek to address questions about factors that affect e-commerce utilization. For instance, Rodríguez-Ardura et al. (2008) stress that Internet security is pivotal for e-commerce enterprises activities, Alnemr (2010) emphasized trust as an essential factor for gaining competitive advantage in the e-commerce industry, which was confirmed by Nica (2015) who also added reputation as a significant element of e-commerce advancement. However, none of the factors could be considered competitive if technology adoption is low in the enterprise, which depends on technology utilization in the country where the enterprise obtains its activity.

The purpose of this paper was to explore if there was a difference among European countries' e-commerce functionalities. Furthermore, this analysis explored if there are similarities between the European countries' e-commerce enterprises, which could divide the countries into homogeneous groups. To accomplish the paper goal, the k means cluster analysis was conducted on the Eurostat data from 2019. Enterprises from 28 European countries were taken into consideration. Kruskal-Wallis test was used to explore tests whether the identified clusters are significant. The e-Commerce functionalities in the European countries were observed thru three dimensions: Website e-Commerce functionalities, CRM indicator variables, and DESI connectivity dimension. Every dimension consists of the indicator variables.

The paper is organized as follows: After the Introduction, the Literature review section presents an overview of the enterprise digital divide, website functionalities, and CRM as support to e-commerce. The methodology section describes the data and the methodology used to fulfil the research goal. The results section describes the descriptive statistic and the cluster analysis results, followed by the discussion where all research results are displayed. The article's final section is the conclusion.

Literature review

Enterprise digital divide

Digital technologies transformed the way people live in the past decade dramatically and they will continue to do it in the future. From the way of communication to training and education, disruptive technologies transformed the mechanisms and relations (Shen et al., 2020). There are numerous positive dimensions of the change, and enterprises intensively invest their efforts to stay up to date with technologies and gain

an advantage from technology utilization (Grover et al., 2018). If the company fails to stay up to date and take advantage of ICT (information and communication technologies) solutions, they are at risk of becoming irrelevant and therefore less competitive. The divergence in the ICT utilization between enterprises resulted in the exclusion, known as the digital divide (Szeles et al., 2018). The concept of the digital divide was initially proposed at the beginning of 21 century to describe the disproportion of the people who have and do not have Internet access (Blank et al., 2018). Over time, the concept became broader, and started to cover diverse aspects of ICT, and began to be considered globally (Chen et al., 2004).

The term digital divide implies the social consequences of the phenomena, and it could be distinguished as (i) global, (ii) social, and (ii) democratic digital divide (Norris, 2001). The global digital divide suggests the discrepancies of Internet access between high and low developed countries, the social digital divide refers to the information gap between highly and poorly developed countries, and the democratic digital divide concerns the differences between countries that use or do not use ICT resources in the public life.

Numerous initiatives seek to reduce the digital divide between countries, for instance, the European information society had a few initiatives where the focus was on government actions that could enhance ICT adoption in European countries (Ojo et al., 2017). The World Economic Forum, OECD, and G20 are the organizations that also pay special attention to the topic and commence different international initiatives and recommendations for countries (Ojo et al., 2017).

The most common barriers to disruptive technologies adoption were split into two distinguished categories: macroeconomic and microeconomic (Giua, 2020). Macroeconomic aspects included problems such as lack of innovation culture, lack of flexibility of the production environment, inoperability, and lack of investments. The microeconomic barriers are concentrated on the lack of customer demand in low-development countries, the lack of adaptation of the education system, and the lack of digital content solutions.

The early investigations on the topic concentrated on the socio-economic dimensions of the digital divide. Newer investigations focused on the digital divide measurements approaches, such as Brynjolfsson et al. (2019) who investigated difficulties in comprehending the value of the digital products and services. Bukht et al (2017) obtained statistical investigations on the topic, and Ahmad et al. (2019) proposed analytical frameworks for measuring the digital divide. The more recent investigations conduct their studies on the large sets of variables where they perform cross-sectional analysis or time-series analysis (Gunn et al., 2019).

Websites functionalities

E-commerce enterprises use their online presence for different reasons such as marketing, employee recruitment, communication with their partners, etc. (Kremez et al., 2019). Enterprises nowadays are aware of the significant impact of electronic Word of Mouth (e-WOM) on their reputation. Internet became the main channel for enterprises to communicate with their audience, reach their potential customers and, finally, sell their product (Tsimonis, 2014). Information about customers provided by the Internet enables e-commerce to create personalized and individual-oriented products. Digital platforms have become a new phenomenon; today they are one of the key components of global economic exchange, creating new market mechanisms (Richardson, 2020). Enterprises often have a presence on social media, but their website remains the primary focus where customers inform, communicate, and buy their products or services (Kim et al., 2018). Websites became a distribution

channel, which is complementary to the physical stores where customers can purchase products and services online (Pénard et al., 2017).

There are close to 2 billion digital buyers worldwide and it climbs every year (Statista, 2021). Since the websites became significant revenue drivers, every e-commerce enterprise should have functional, aesthetic, and relevant websites to stay competitive (Di Fatta et al., 2018). To check if the website is functional, and the evaluation process is critical, the e-commerce enterprises' website evaluation can help the enterprise to modernize their services.

Authors have agreed that some of the website attributes, which should be evaluated, are precise and complete information, loading speed, website aesthetics colors, photo, graphics), interactivity, and accessibility (Kwak et al., 2019). Various techniques are used to evaluate e-commerce website functionalities.

For instance, the authors Albuquerque et al. (2002) created a framework that evaluates e-commerce website functionalities based on several features such as usability and reliability. Akhter et al. (2009) use a fuzzy logic system as an instrument that determines website functionality. Moreover, the authors (Cebi et al, 2013) discuss the characteristics of e-commerce websites where they investigated the functionality factor. The paper where authors Al-Qaisi et al. (2015) investigated e-commerce website functionalities by Mamdani fuzzy system utilization concluded that accuracy and flexibility are the most important dimensions in website functionality. Furthermore, the same investigation confirmed website functionality as a key driver of overall website quality and customer satisfaction.

CRM as support to e-commerce

Customer Relationship Management CRM is considered as a business strategy to decide and manage potential customers and clients to optimize long-term value (Chen et al., 2003). It aims to recognize and predict the needs of both enterprises and potential customers. ICT transformed CRM mechanisms in e-commerce, and without the Internet, we would not know the CRM we know today (Agnihotri, 2021). It provided new marketing techniques and strategies which enable enterprises to attract and retain customers online which enforced them to develop new skills and transform their CRM capabilities online (Li et al., 2020).

Online enterprises need to attract traffic to their website and web stores by the usage of various online marketing tools such as social media marketing, e-mail marketing, SEO optimization, and search engine marketing. Customer relationship management successfully adopted new operations and established personalization and customization as key activities that secure customer loyalty and recurrent shopping of their online products or services (Grover et al., 2020). They use personalization tools, online analysis systems, recommendation platforms, and feedback tools to establish long-term customer e-loyalty (Oumar et al., 2017). The customer data processing evolution is a result of the ICT and online strategies development (Chen, 2017). CRM built its strategies on data analytics results to develop competitive strategies (Harrison, 2019).

CRM in the context of e-commerce is continuously evolving. There are two main impacts of CRM in e-commerce: impact on customers and the impact on suppliers (Thaichon et al.,2020). There are two main CRM strategies on the impact on customers: pushing information that impact and collective behavior and investigating in terms of better customer control over configuration and prices of goods and services and the wider array of options. CRM's impact on supplies considers creating new demand chains, effectively communicating, and technology adopting. CRM has an impact

on overall e-commerce enterprises; it shapes organizational culture, sales and marketing functions, marketing strategies, and support functions (Lin et al., 2010).

Because of the interconnection with digital technologies, the success of CRM depends on ICT adoption. Today, CRM is no longer a competitive strategy, it is a necessity, it is essential for e-commerce enterprises to stay competitive and attract online customers. Therefore, for e-commerce enterprises, being up to date and investing in the technologies is decisive for success.

Methodology

Research variables

The observed research variables were obtained from the Eurostat database for the year 2019. European Union member countries (28 countries) at the given period were taken into consideration. We were concentrated on the EU members only, so we did not include other European countries in the research because of the lack of data and variables of our focus.

The e-Commerce functionalities in the European countries were observed thru three dimensions: Website e-Commerce functionalities, CRM indicator variables, and DESI connectivity dimension.

E-commerce website functionalities were measured for the European countries enterprises, with ten or more employed persons, with the financial sector excluded:

- WEB_PRICE - website describing goods or services, price-lists (% of enterprises)
- WEB_SHOP - website with online ordering or reservation or booking, e.g. the shopping cart (% of enterprises)
- WEB_TRACK - website with order tracking available online (% of enterprises)
- WEB_SOCIAL- website with links or references to the social media (% of enterprises)
- WEB_BOT – website with the chat-bot (% of enterprises)
- WEB_BUY_BOT – website with the chat-bot supporting buying process (% of enterprises)

The CRM indicator variables were measured also for the European enterprise with ten or more employees and without the financial sector included:

- CRM- Enterprises using software solutions like Customer Relationship Management (% of enterprises)
- CRM_ANALYSIS -Enterprises using Customer Relationship Management to analyze information about clients for marketing purposes (% of enterprises)
- CRM_STORE-Enterprises using Customer Relationship Management to capture, store and make available client's information to other business functions (% of enterprises)

DESI index represents a summary of the relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness (EU, 2020). For this investigation, five indicator variables were considered:

- DESI_1_CONN – Connectivity
- DESI_2_HC – Human capital
- DESI_3_UI - Use of Internet Services
- DESI_4_IDT - Integration of Digital Technology
- DESI_5_DPS - Digital Public Services

DESI Connectivity Dimension is measured as the weighted average of the four sub-dimensions: (i) Fixed Broadband take-up, (ii) Fixed broadband coverage, (iii) Mobile broadband, and (iv) Broadband price index.

DESI Human Capital Dimension is calculated as the weighted average of the two sub-dimensions: (i) Internet User Skills, and (ii) Advanced Skills and Development.

DESI Use of Internet Dimension is calculated as the weighted average of the three sub-dimensions: (i) Internet Use (ii), Activities Online, and (iii) Transactions.

DESI Integration of Digital Technology Dimension is calculated as the weighted average of the two sub-dimensions: (i) Business digitization and (ii) e-Commerce.

DESI Digital Public Services Dimension is calculated by taking the score for e-Government.

K-means cluster analysis

Cluster analysis is a knowledge discovery technique that is utilized for the identification and classification of similar groups of statistical indicator variables. The variables are homogenous within the group and heterogeneous among the other groups.

Cluster analysis is a form of unsupervised learning, and the goal of cluster analysis is to explore hidden patterns or to identify groups of objects with similar traits. Partition clustering and hierarchical clustering are two prevalent groups of cluster analysis (Govender et al, 2020). The analysis starts with the research item identification, followed by the clustering procedure selection. For this investigation, the nonhierarchical cluster analysis with the K-means algorithm was calculated to systemize variables into comprehensive groups.

K-means falls under the partition clustering method, where data cluster groups have no overlapping. K-means technique is utilized to divide n observations into k non-overlapping groups where each observation belongs to one cluster with the nearest mean. K-means is often used to process a large of data to be representative data, called cluster centers (San et al., 2004). For this investigation, the K-means algorithm was used to group the indicator variables into nested groups, starting with all statistical units in one group, after which it divides them using the top-down method. A V-fold approach with 10 folds was used to test the validity of the solution. Euclidean distance was used to distribute iteratively research data to the cluster with the closest centroid. The process resulted in the selected three clusters.

Furthermore, the statistical difference between clusters regarding the DESI indicators was investigated by the usage of the Kruskal-Wallis test, which tests whether the identified clusters.

Results

Descriptive statistics analysis

Descriptive statistics are presented in Table 1. For the sample of the enterprises without financial sector (10 persons employed or more) of 28 European countries and 3 encompassed dimensions: Web site e-commerce functionalities, Customer relationship management, and DESI indicators (The Digital Economy and Society Index, 2020).

The majority of the European countries' e-Commerce websites had the highest average grades for the dimension Web site e-Commerce functionalities, especially for the variable WEB_BOT which was found on 62.11% of websites. The second research item with the high average grades was the WEB_PRICE item, which indicates that 61.04% of e-Commerce websites in European countries have a price list or descriptions of the goods and services. On the other hand, the variables DESI_3_UI and DESI_4_ITD for the European countries had the lowest average grade (8.25%), which suggests that the integration of digital technologies and digital public services are utilized the least in e-Commerce between European countries. As for the Customer relationship

management, the CRM_ANALYSIS variable has notably lower results than CRM and CRM_STORE, which puts forward that the e-Commerce enterprises in European countries should broadly implement systems for CRM analysis to enhance client relationships.

Table 1
Descriptive statistics of e-Commerce usage indicators and obstacles for selected European countries

	N	Minimum	Maximum	Mean	Std. Dev.	Skewness	Kurtosis
Web site e-commerce functionalities							
WEB_PRICE	28	34.00	96.00	61.04	16.585	-0.104	-0.764
WEB_SHOP	28	9.00	34.00	20.50	7.351	0.452	-0.820
WEB_TRACK	28	3.00	14.00	8.36	2.313	0.013	0.858
WEB_SOCIAL	28	15.00	68.00	39.54	13.686	0.286	-0.481
WEB_BOT	28	36.00	86.00	62.11	15.586	-0.295	-1.156
WEB_BUY_BOT	28	9.00	34.00	19.50	6.995	0.595	-0.455
Customer relationship management							
CRM	28	12.00	56.00	29.93	10.360	0.437	-0.003
CRM_ANALYSIS	28	7.00	26.00	18.18	5.464	-0.195	-0.945
CRM_STORE	28	11.00	55.00	28.57	10.609	0.428	-0.058
DESI indicators							
DESI_1_CONN	28	7.37	15.01	11.66	1.922	-0.029	-0.206
DESI_2_HC	28	7.13	19.38	12.07	3.139	0.428	-0.323
DESI_3_UI	28	5.24	11.29	8.25	1.617	0.336	-0.254
DESI_4_ITD	28	3.38	13.82	8.25	2.775	0.301	-0.671
DESI_5_DPS	28	6.75	12.74	10.12	1.807	-0.306	-1.081

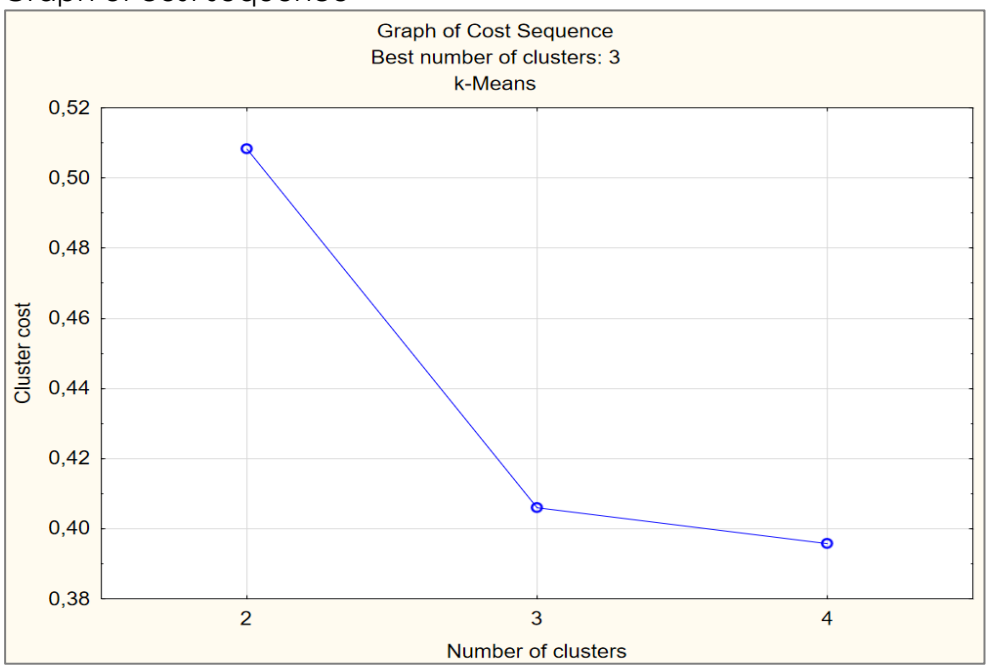
Source: Authors work (Eurostat, 2019)

Cluster analysis

Graph of cost sequence, which displays the error function for the different cluster numbers, was produced to investigate the best number of clusters for the sample data presented. The error function could be interpreted as the average distance of observations of the explored dataset from the cluster centroids to which the observations were assigned (Sugar et al., 2003).

The objective is to minimize the cluster cost to the preferable value (Amaro et al, 2016). Various methods could be used to identify the preferable number of the cluster. For this investigation, the Elbow method was chosen as the decision indicator. Figure 1 shows "the elbow" point on the number of the three clusters. The decrease of the error function is considered to be large to the point of the three clusters, after which it decreases slightly. Decrease between 3 and 4 number of clusters is less than 5%. Therefore, the number of clusters selected is the optimal solution and three clusters will be observed in further analysis.

Figure 1
Graph of cost sequence



Source: Authors work

Moreover, the Anova analysis was undertaken for the three selected clusters and the dimension Website e-Commerce functionalities. The table demonstrates six variables that exemplify the given dimension. Furthermore, the null hypnotizes was proposed. All the variables came out as statistically significant at 1% and the null-hypnotizes were rejected which suggests that the means between the variables observed statistically differ. Table 2 confirms that the selected number of three clusters included in the investigation is justified.

Table 2
The Anova analysis

	Between SS	df	Within SS	df	F	p-value
WEB_PRICE	5851.254	2	1575.710	25	46.418	0.000***
WEB_SHOP	792.444	2	666.556	25	14.861	0.000***
WEB_TRACK	53.305	2	91.123	25	7.312	0.003***
WEB_SOCIAL	3314.990	2	1741.974	25	23.788	0.000***
WEB_BOT	5301.468	2	1257.210	25	52.711	0.000***
WEB_BUY_BOT	904.162	2	416.838	25	27.114	0.000***

Source: Authors work (Eurostat, 2019) **Note: statistically significant at 1%

The descriptive statistics of the e-Commerce variables of the dimension: Website e-commerce functionalities was conducted. Cluster 1 includes 7 European countries and has the highest means and the standard deviations for all the variables included which suggests that the countries included in Cluster 1 have the highest developed e-Commerce functionalities among European Union enterprises. As for Cluster 2 and 3, Cluster 2 which includes the most European countries, a total of 11 have the higher standard deviation and cluster mean in all observed values, except WEB_TRACK where cluster three outperform Cluster 2. Cluster 3 consists of a total of ten European countries. Table 3 shows the cluster means and standard deviations.

Table 3
Cluster means and standard deviations

	Cluster 1	Cluster 2	Cluster 3
WEB_PRICE	77.29 (9.673)	67.73 (7.431)	42.30 (7.166
WEB_SHOP	29.71 (3.773)	17.45 (5.087)	17.40 (5.985)
WEB_TRACK	10.43 (1.813)	6.91 (2.256)	8.50 (1.509)
WEB_SOCIAL	57.71 (6.576)	36.64 (8.869)	30.00 (8.794)
WEB_BOT	77.29 (6.525)	68.73 (7.377)	44.20 (7.131)
WEB_BUY_BOT	29.29 (3.729)	16.91 (4.460)	15.50 (3.866)
Number of cases	7	11	10
Percentage (%)	25.00	39.29	35.71

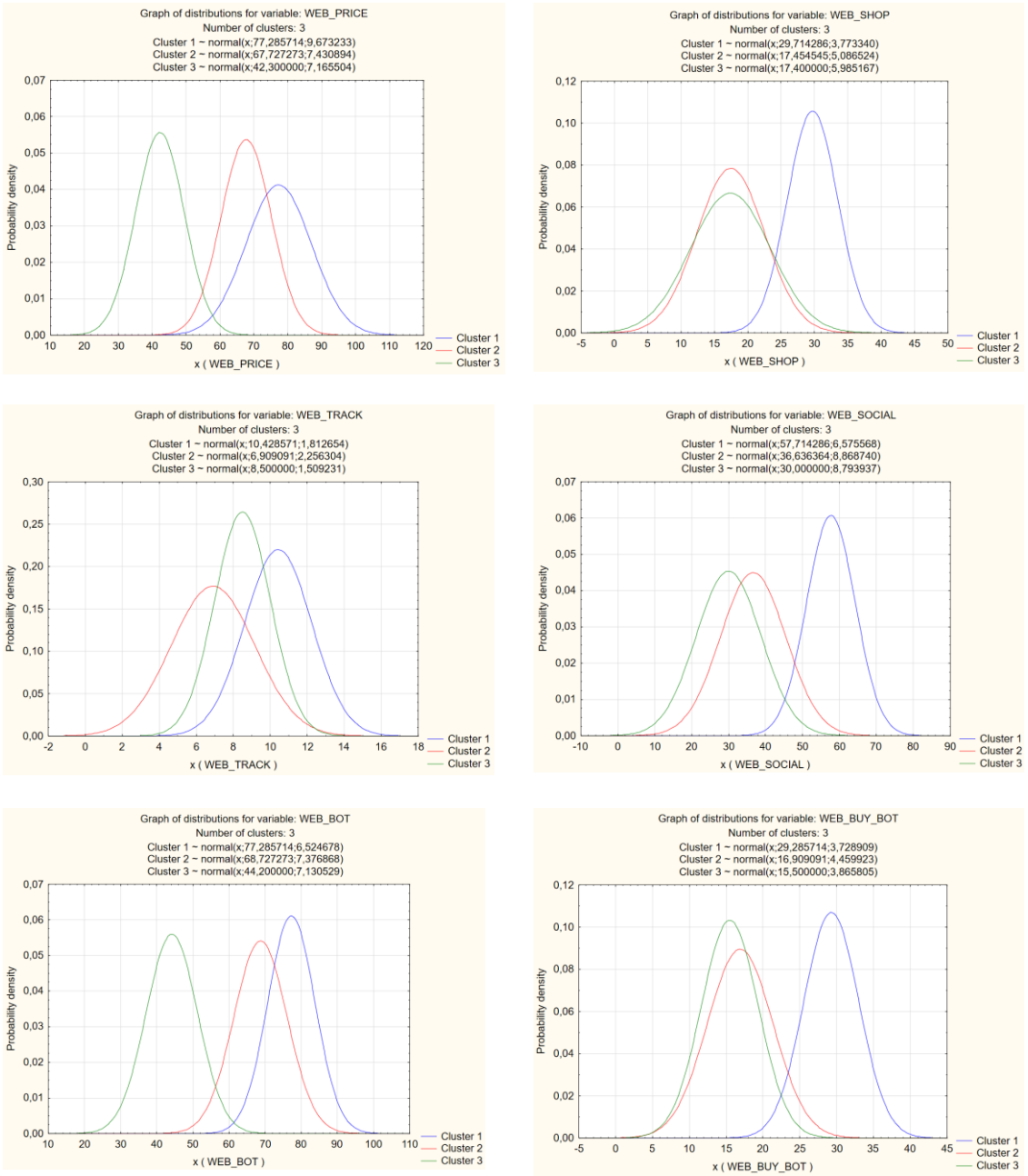
Source: Authors work (Eurostat 2019)
Note: Standard deviations in parenthesis

Figure 2 displays the distribution of variables across clusters for the dimension Website e-commerce functionalities. The distributions can be used to get an insight into how many variables in a cluster differ according to the observed variable. The narrower distribution is the smaller difference among the variables across clusters. Additionally, the taller the distribution is, the differences between variables are larger.

The variable WEB_PRICE that suggests that the e-Commerce websites provided a description of the goods or services or the price lists, shows the normal distribution for all three clusters, with similar values with slightly higher probability density peaks in Cluster 2 and 3 than Cluster 1. The Cluster 2 and 3 distribution are narrower than Cluster 1 distribution. The variable WEB_SHOP shows the European enterprises' website are provided with online ordering or reservation or booking, e.g. shopping cart. Cluster 1 shows the highest distribution peak and the furthest from the graph origin. Cluster 3 shows the lowest probability density peak and the widest distribution of all three clusters.

The variable WEB_TRACK portrays the enterprises where the website provided order tracking available online. The values were the highest for Cluster 3, which correlates with the results from the Cluster means and the standard deviation table following Cluster 1. Cluster 2 showed the widest distribution for the given variable with the lowest peak closest to the origin. The WEB_SOCIAL presents data of the European enterprises where the website had links or references to the enterprise's social media profiles.

Figure 2
Distribution of variables across clusters



Source: Authors work

Discussion

Cluster membership across countries

As mentioned in the previous section, Cluster 1 contains seven countries: Belgium, Denmark, Ireland, Malta; Netherlands; Finland, and Sweden. All countries in Cluster 1 are highly developed. Cluster 2 is the largest; it consists of eleven European countries: Germany, Estonia, France, Cyprus, Latvia, Luxembourg, Austria, Poland, Slovenia, Slovakia, and United Kingdom. The countries' structure for the Cluster 2 is diverse, it consists of both some of the highly developed countries such as the UK, Germany, and France, and some of the countries, which struggled hardly thru economic crises, but recovered, such as Slovakia and Cyprus. Cluster 3 consists of the 10 European

countries: Bulgaria, Czechia, Greece, Spain, Croatia, Italy, Lithuania, Hungary, Poland, and Romania, which are mostly developing countries (e.g. Croatia) and the countries, struggling with the economic crisis (e.g. Greece).

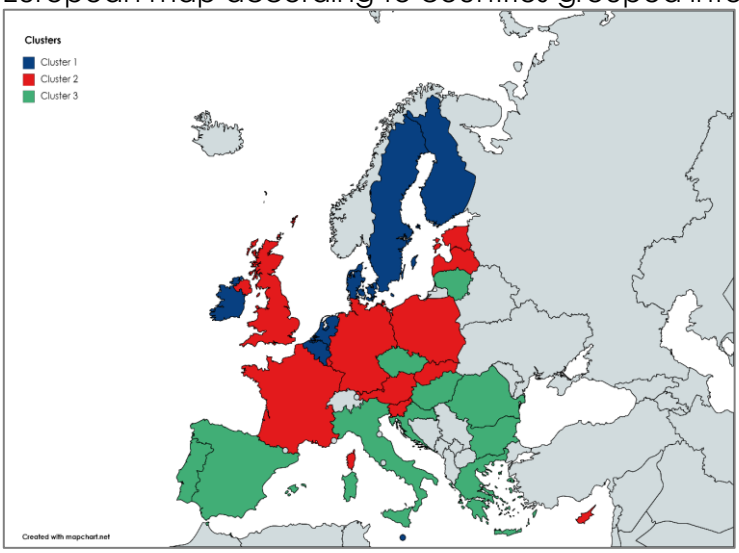
Table 4
Countries across clusters

Cluster	Country
Cluster 1	Belgium, Denmark, Ireland, Malta, Netherlands, Finland, Sweden
Cluster 2	Germany, Estonia, France, Cyprus, Latvia, Luxembourg, Austria, Poland, Slovenia, Slovakia, United Kingdom
Cluster 3	Bulgaria, Czechia, Greece, Spain, Croatia, Italy, Lithuania, Hungary, Portugal, Romania

Source: Authors work

Figure 3 presents the European map according to the three specified clusters. There can be identified similar socio-economic development similarities as well as the close geographic position within clusters. All Scandinavian countries are grouped in Cluster 1 (Denmark, Finland, and Sweden) which are considered highly developed. Alongside Scandinavian countries, Cluster 1 consists of two of three Benelux countries (Belgium and Netherlands), and, Ireland, and Malta which are all highly developed. Therefore, Cluster 1 could be considered as highly developed. Cluster 2 consists of most of the Central European countries, which are presented, in the figure. The countries included are developed, some are highly developed, and the cluster overall could be defined as developed. Cluster 3 consists of developing countries and countries, which are recovering from the economic crises. According to the map, the countries included in the Cluster three are mostly eastern European countries. Therefore, Cluster 3 could be defined as developing.

Figure 3
European map according to countries grouped into specific clusters

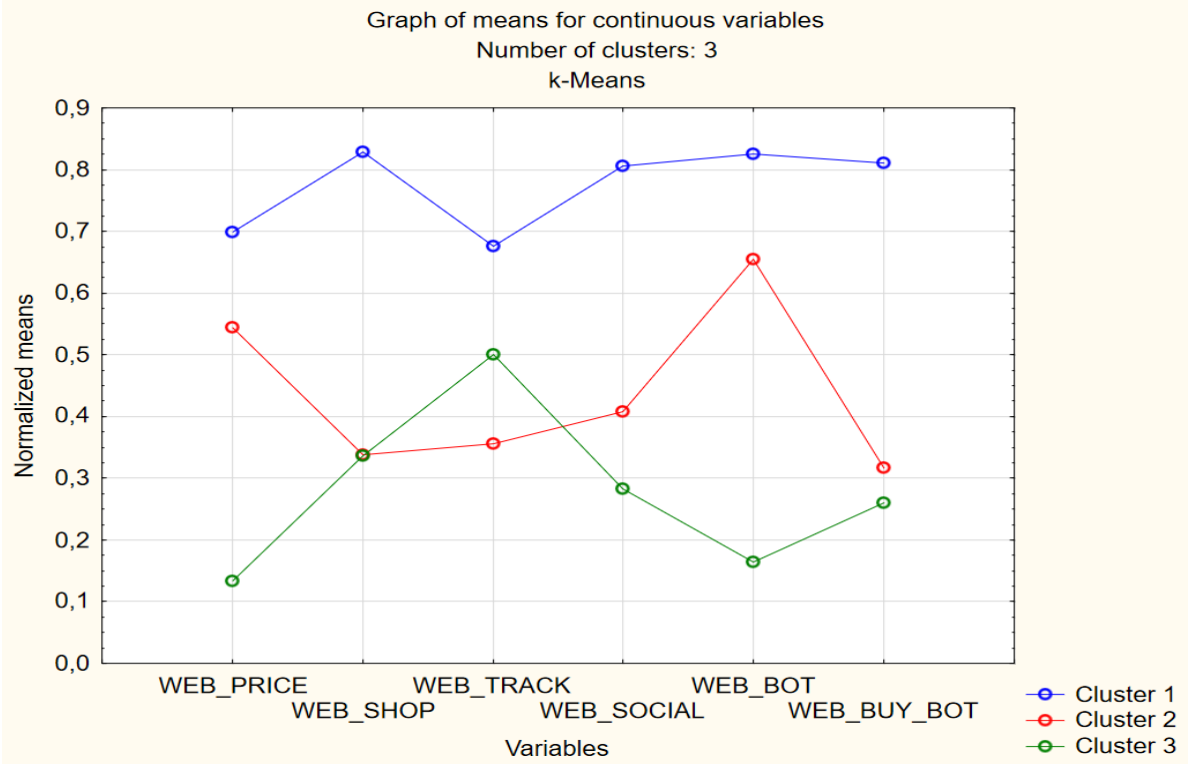


Source: Authors work using mapchart.net

The k-means analysis shows data for a sample of 28 European countries for indicators of the dimensions of the webshop e-commerce functionalities (Figure 4). It represents the mean value for the six observed variables from the given dimension: WEB_PRICE, WEB_SHOP, WEB_TRACK, WEB_SOCIAL, WEB_BOT, and WEB_BUY_BOT. The mean values

were observed within three identified clusters. By comparing result means, interesting conclusions have emerged, such as knowledge that e-Commerce webshops from highly developed countries from Cluster 1 outperform the other two clusters when it comes to all variables (not only webshop). Cluster 1. Also has high means regarding web_social, web_bot, and web_buy_bot. The Cluster 2 countries focus on building customer relationships including innovative digital marketing strategies in their websites. The Cluster 1 values are the furthest from the origin so they show the most significant values.

Figure 4
Cluster means of indicators of webshop e-commerce functionalities



Source: Authors work

European countries grouped in Cluster 1 (highly developed) outperform Cluster 2 and Cluster 3 for all the selected variables from the dimension webshop e-Commerce functionalities. The average means of the observed variables are higher than any variable from Cluster 2 and Cluster 3. This knowledge correlates to the findings of the countries selected for Cluster 1, which are highly developed countries such as Scandinavian countries. Most enterprises in Cluster 1 countries have webshops integrated into their e-Commerce websites, and the least of them have the web track variable.

The Cluster 2 countries (developed) have the highest average means value for the variable WEB_BOT. It suggests digital marketing strategies and customer relationship is essential for the countries from Cluster 2. The average mean for the variable web price is also high, opposite to the values from the other clusters for the given variable, which also could be the strategy to intensify customer relationship. The Cluster 2 European countries have the lowest average means for the variables WEB_SHOP that represents online shop or booking and WEB_BUY_BOT. This could be explained as the Cluster 2 countries' e-Commerce websites focus their website on digital marketing and building customer loyalty.

The Cluster 3 countries (developing) have the highest mean values from the webshop e-Commerce functionalities dimension for the variable WEB_TRACK. This could be explained as the some of the countries from Cluster 3 are the newer members of the EU or they do not have some of the most developed and reliable shipping companies as UPS and DHL so the shipment could last longer than in developed and highly developed countries, so the tracking is essential. The WEB_BUY_BOT and the WEB_PRICE variables have the lowest mean values, which mean that Cluster 3 countries do not yet concentrate on disruptive technology implementation and customer relationships.
The difference between European countries is presented by the cluster analysis. The difference between cluster countries. There are few indicators of diversity between clusters identifies (i) development which explains the outperformance of the highly developed countries related to other clusters, the countries technological structure, and countries orientation to technology development as the online shopping habits.

Relationship between cluster membership and CRM implementation

Table 5 displays the comparison of cluster members according to CRM indicator variables. Descriptive statistic was used to and the Kruskal-Wallis test was used to explore the statistical differences of the standard deviations. The Kruskal-Wallis test confirms that all the clusters are statistically significant at the 1% for the CRM and CRM_ANALYSIS variable, and at the 5% for the CRM_STORE indicator variable.

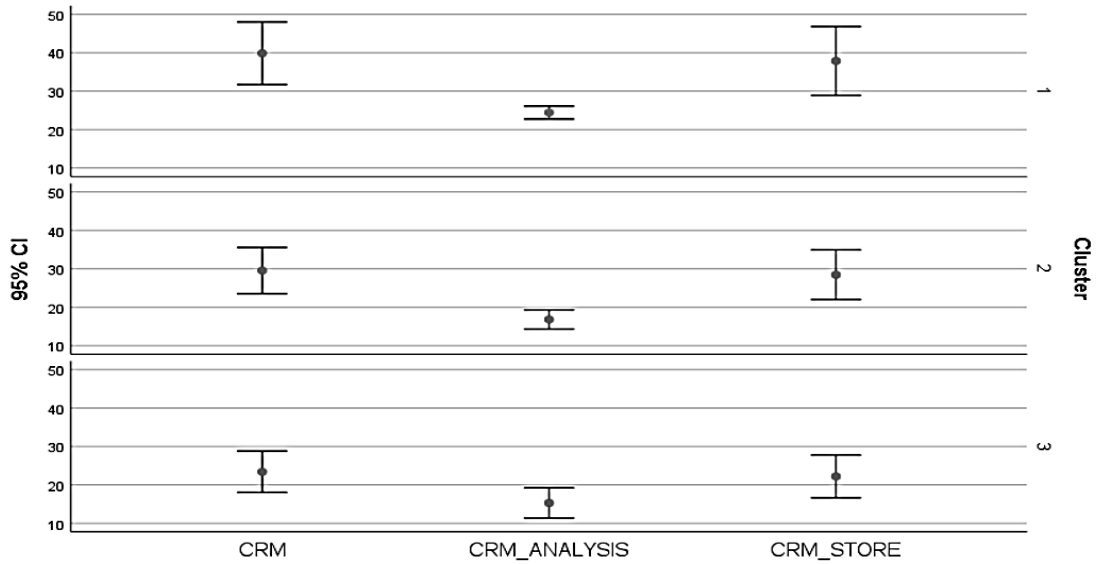
Table 5
Comparison of cluster members according to CRM indicator variables – Descriptive analysis and Kruskal-Wallis test

		CRM	CRM_ANALYSIS	CRM_STORE
Cluster 1	Mean	39.86	24.43	37.86
	N	7	7	7
	Std. Deviation	8.80	1.81	9.67
Cluster 2	Mean	29.55	16.82	28.45
	N	11	11	11
	Std. Deviation	8.96	3.71	9.62
Cluster 3	Mean	23.40	15.30	22.20
	N	10	10	10
	Std. Deviation	7.55	5.50	7.77
Total	Mean	29.93	18.18	28.57
	N	28	28	28
	Std. Deviation	10.36	5.46	10.61
Kruskal-Wallis test	Kruskal-Wallis H	10.118	13.504	9.151
	df	2	2	2
	Asymp. Sig.	0.006***	0.001***	0.010**

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

Figure 5 represent error bars of means of CRM indicator variables across clusters. Standard deviations are the lowest for the CRM_analysis variable indicator and are similar for variables CRM and CRM_STORE. Error bars are the largest for the Cluster 1 values and the smallest for the Cluster 3 variables.

Figure 5
Error bars (95%) of means of CRM indicator variables across clusters



Source: Authors work

Relationship between cluster membership and DESI index

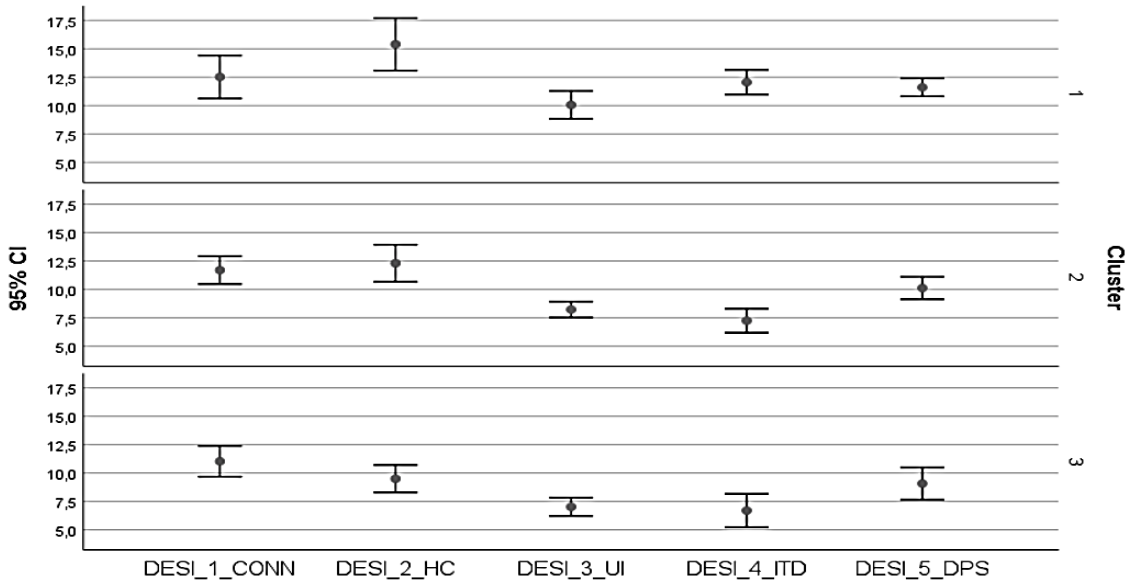
Table 6 present the comparison of cluster members according to DESI index variables. Descriptive statistic was used to and the Kruskal-Wallis test was used to explore the statistical differences of the standard deviations. The Kruskal-Wallis test confirms that all the differences among the variables included are statistically significant. DESI_1_CONN and CRM_ANALYSIS variables are significant at 1%, and the CRM_STORE variable is significant at 5%.

Table 6
Comparison of cluster members according to DESI index variables – Descriptive analysis and Kruskal-Wallis test

		DESI_1_ CONN	DESI_2_ HC	DESI_3_ UI	DESI_4_ ITD	DESI_5_ DPS
Cluster 1	Mean	12.52	15.40	10.06	12.06	11.60
	N	7	7	7	7	7
	Std. Dev.	2.05	2.49	1.33	1.17	0.86
Cluster 2	Mean	11.69	12.30	8.22	7.23	10.12
	N	11	11	11	11	11
	Std. Dev.	1.82	2.43	1.04	1.57	1.47
Cluster 3	Mean	11.03	9.50	7.03	6.70	9.08
	N	10	10	10	10	10
	Std. Dev.	1.89	1.69	1.13	2.06	1.99
Total	Mean	11.66	12.07	8.25	8.25	10.12
	N	28	28	28	28	28
	Std. Dev.	1.92	3.14	1.62	2.77	1.81
Kruskal-Wallis test	Kruskal-Wallis H	1.668	14.226	13.575	14.830	8.102
	df	2	2	2	2	2
	p-value	0.434	0.001***	0.001***	0.001***	0.017**

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

Figure 6
Error bars (95%) of means of DESI index variables across clusters



Source: Authors work

The DESI connectivity dimensions mean values are the highest for the European countries from Cluster 1, which means that the highly developed countries are the most connected between three Clusters. The Cluster 1 counties have the highest mean for the human capital connectivity dimension, so the Internet user skills and advanced skills and development are developed the highest among the given variables.

Oppositely, the Cluster 1 countries have the lowest mean for the DESI indicator Use of Internet which indicates that the Internet usage, activities online, and transaction perform the lowest for the Cluster 1 countries. Cluster 2 have also the highest mean for the variable Human capital with a mean value of 12.30. Cluster 2 performs the lowest at the DESI 4 variable: Digital Public Services Dimension, which is the Government connectivity score. The DESI 4 variable is also the lowest variable for the Cluster 3 European countries, with a mean of 6.70. The Cluster 4 countries perform the best at the Connectivity indicator with a mean of 11.03.

Figure 6 represent error bars of means of indicator variables DESI index variables across clusters. Standard deviations are the lowest for the DESI_3_UI variable indicator. Error bars are the largest for the DESI_2_HC values, which means that human skills are highly developed in the Cluster 1 countries.

Conclusion

E-Commerce is one of the industries where disruptive technologies and internet development had the strongest impact on mechanisms and operation. E-Commerce has transformed during the past decade, and it is now positioned as one of the most competitive industries.

The digital divide is the consequence of the discrepancy between ICT usages in various countries. There is a gap between countries, which are ICT high adopters and low adopters, which affect the global economy

This paper investigated the digital divide between European Union countries enterprises by performing k means cluster analysis and the Kruskal-Wallace test. Interesting knowledge useful for both practitioners and academics has emerged. The

existence of similarities between the groups of European countries has been confirmed.

The k-means cluster analysis divided the European country's enterprises into three separated homogenous groups. The countries in the same clusters showed similarities between the two factors: geographical position and the e-commerce development state.

Therefore, the three identified clusters could be determined as highly developed, developed, and developing. The highly developed cluster countries outperformed other cluster countries in all observed dimensions: website e-commerce functionalities, CRM, and DESI index.

The Highly developed cluster countries are mostly Scandinavian and Benelux countries, which have good technological and internet infrastructure, and high standards. The developed cluster countries are mostly central European countries, which mostly perform higher than the developing countries, and lower than the highly developed cluster countries. The developing countries are mostly eastern European countries as well as the countries who struggled recently with some kind of economic crisis such as Greece and Portugal. The Developing countries cluster mostly performs the lowest on all observed functionalities.

The e-commerce functionalities development across countries are often interrelated with overall economic development, which indicated that the counties which show lower economic growth have also lower e-commerce functionalities.

The European e-commerce enterprise countries clustering could be very useful for further investigations on the topic. The knowledge that e-commerce functionalities are not evenly distributed across European countries could be useful for both investigators and practitioners. The clusters could be analyzed separately or the highly developed cluster practice could serve as a benchmark for other countries. This could be useful for practitioners as well.

Furthermore, this study is not without limitations, further investigations could concentrate on the particular sector to get more comprehensive results. Additionally, more variables could be included, such as more website functionalities, or more CRM dimensions. Future investigations should also consider newer trends in e-commerce such as social media and mobile shopping.

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