

TOWARDS DIGITAL SOCIETY: TWO-STEP EVALUATION APPROACH

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Abstract: Challenges and opportunities of digitalization are a contemporary subject in all spheres of human activities. Digital tools are among main remedies for moving towards the economic development. This paper tackles the issue of emergent of digital tools in routine use among individuals and in society. In this paper we investigate the use of digital tools in Europe. The main focus of the paper is the comparison of European countries in regard to the digital tools use frequency. We have collected the relevant data from European Commission database (Eurostat). As the topic of the research that illustrates an emergent of digital tools in routine use, we have selected the measure "ICT usage in households and by individuals". This topic retains six pillars, and each of them consists of two to ten sub-pillars, as the digital tools use measurements. To perform the suggested analysis, we have used the Two-step I-distance approach. This method allows for the formulation of the single multivariate indicator, based on the set of individual indicators. The first step is applied on each group of sub-pillars, defined in the topic of this research, thus creating the specific multivariate measurement for each of the six pillars. The second step is applied on the six newly created pillar measurements. This approach results in the unique multivariate measure, that allows us to compare the capacities and trends in European countries, and to create the specific ranking scheme. The special consideration in the paper is given to the detailed analysis of the regarded chances in Serbia, and the position of Serbia comparing to the other European countries.

Key Words: Digital tools, Economic development, Europe, Multivariate analysis, Two-step I-distance

1. INTRODUCTION

Challenges and opportunities of digitalization are a contemporary subject in all spheres of human activities. Digital tools are among main remedies for moving towards the economic development (Gruber, 2019). It was shown that digitalization accelerates economic growth (Bürgin, 2019; Hansen, 2019), improves business governance (Manita, Elommal, Baudier, & Hikkerova, 2020), leads to higher prosperity (Martínez Martín, Guilló Rodríguez, & Santero Sánchez, 2019). Information and communication technologies (ICT) usage and investments significantly raise job opportunities, wages, GDP, and welfare (Gómez-Plana & Latorre, 2019). The progress of ICT plays a crucial role in promoting the productivity and efficiency particularly in developing economies during the present period (Sinha & Sengupta, 2019). Moreover, world seems to be on the edge of the next industrial revolution driven by technological developments in ICT, like Artificial Intelligence and the Internet of Things (Edquist, Goodridge, & Haskel, 2019). Some authors have found that the deployment of ICT supports the sustainable economic development of European Union countries (Fernández-Portillo, Almodóvar-González, Coca-Pérez, & Jiménez-Naranjo, 2019).

The augmentation in ICT and digitalization implies the increased use of digital tools among users. Law and Lynch observe the utilization of ICT as an enabler to support city development, enhance urban services, that leads to a concept defined as "smart cities", which drives technological innovation, supports the development of new industries, spurs a stronger economy, maintains a sustainable environment, and enhances the quality of life of citizens (Law & Lynch, 2019). There are recent studies that even found that ICT helps to reduce environmental degradation in a medium and long run (Batool et al., 2019).

This paper tackles the issue of emergent of digital tools in routine use among individuals and in society. In this paper we investigate the use of digital tools in Europe. The main focus of the paper is the comparison of European countries in regard to the digital tools use frequency. As the topic of the research that illustrates an emergent of digital tools in routine use, we have selected the measure "ICT usage in households and by individuals".

2. DATA AND METHODS

Data used in this survey depict the "ICT usage in households and by individuals". This topic retains six pillars that exhibit the frequency of ICT exploitation. Each of these pillars consists of two to ten sub-pillars that represent the digital tools use measurements, as presented in Table 1. Data are collected from the European Commission database Eurostat (<https://ec.europa.eu/eurostat/data/database>). All the collected variables are measured as the total percentage of households/individuals.

The general idea of this survey was to create a single indicator that measure the computer and internet usage, and that depicts the appropriate combination of all the above given pillars and sub-pillars. To perform the suggested analysis, we have used the Two-step I-distance approach (Djurovic, Jeremic, Bulajic, & Dobrota, 2017; Maricic & Kostic-Stankovic, 2016), that is based on the I-distance methodology (Ivanovic, 1973; Ivanović, 1977; Ivanovic & Fanchette, 1973). This method allows for the formulation of the single multivariate indicator, based on the set of

individual indicators (Dobrota, Bulajic, Bornmann, & Jeremic, 2016; Dobrota & Jeremic, 2017; Dobrota, Savic, & Bulajic, 2015; Jeremic et al., 2012; Jeremić, Jovanović-Milenković, Radojičić, & Martić, 2013).

Table 1 – ICT usage pillars and sub-pillars

A	Connection to the internet and computer use
	– Households level of internet access – Household broadband internet connection – Household devices for internet access - desktop or portable computer – Households without access to internet at home - the access costs are too high – Households - availability of computers – Individuals used the internet on a desktop computer, laptop, netbook, or tablet – Individuals used the internet on a mobile device – Individuals used a laptop, notebook, netbook or tablet computer to access the internet away from home or work – Individuals used a mobile phone (or smart phone) to access the internet – Individuals - computer use within last 12 months – Individuals - frequency of computer use daily
B	Internet use
	– Individuals - internet use in the last 12 months – Individuals - frequency of internet use once a week (including every day) – Individuals using internet - sending/receiving e-mails – Individuals using internet - any of the online learning activities – Individuals - use of cloud services; storage space to save documents, pictures, music, video, etc. – Individuals - internet activities using smart TV, watching streamed TV or another video content – Individuals - collaborative economy; any website or app to arrange an accommodation
C	E-commerce
	– Internet purchases by individuals - online purchase in the last 3 months – Individuals who did not encounter problems when buying/ordering goods or services over the internet – Consumers' behavior related to online purchases – gathering information on seller, product, price, customer review – Financial activities over the internet - individuals carried out at least one of the financial activities over the internet
D	E-government
	– E-government activities of individuals via websites - interaction with public authorities (last 12 months) – User satisfaction about use of e-government websites - usefulness of available information mainly satisfied
E	ICT trust, security and privacy
	– Identification procedures - individuals used simple login with username and password – Trust, security and privacy - individuals at least once restricted/refused access to personal data on smartphone – Privacy and protection of personal information - individuals who know that cookies can be used to trace movements on the internet and have ever changed the settings in their internet browser to prevent or limit them – Safety copies and back up files - individuals who make back up files on any external storage device or to internet storage space, automatically or manually
F	ICT usage at work
	– Use of ICT at work - individuals used computers, laptops, smartphones, tablets, other portable devices – Impact of ICT on tasks and skills - individuals' skills correspond well to the duties related to the use of computers, software or applications at work – Work from home, from an external site or on the move - individuals used the internet for job when at home

The methodology is applied in two iterations. The first step is applied on each group of sub-pillars given above, thus creating the specific multivariate measurement for each of the six pillars. The second step is applied on the six newly created pillar measurements (Djurovic et al., 2017). This approach results in the unique multivariate measure (Dobrota & Dobrota, 2016; Dobrota, Martić, Bulajic, & Jeremic, 2015), that allows comparing the capacities and trends in European countries, and creating the specific ranking scheme (Milosavljević, Dobrota, & Milanović, 2019).

3. RESULTS

The results of the Two-step I-distance evaluation are given in Table 2. The column Total I-distance gives the final values of the Two step I-distance methodology, while the column Total rank compares the countries positions regarding the ICT exploitation. The columns Rank A-F give the pillar ranks of all the observed countries according to the I-distance values for each of the six pillars, obtained in the first step.

The top ranked countries are Iceland, Netherlands, Norway, Denmark, and Luxembourg, while the bottom ranked are Italy, Serbia, Romania, Bulgaria, and Turkey. It can be noted that the top ranked are mostly North-Western, while the bottom ranked are mostly South-Eastern countries. Table 2 also shows that not all the pillar ranks are the same as the total rank. Iceland is the 1st/2nd according to almost all sub-pillars, except of the pillar C - E-

commerce, where it is ranked 10th. This leads to the conclusion that people in Iceland are not as highly engaged in purchasing goods online or carrying out financial activities, as they are in other digital activities. For example, people in Switzerland, that is ranked 6th, are more engaged in E-commerce than other countries.

Table 2 – Results of the Two-step I-distance evaluation

Country	Total rank	Total I-distance	Rank A	Rank B	Rank C	Rank D	Rank E	Rank F
Iceland	1	22.149	1	1	10	1	2	2
Netherlands	2	18.118	2	5	5	4	4	3
Norway	3	17.511	3	6	7	5	3	1
Denmark	4	14.804	5	7	4	2	9	6
Luxembourg	5	14.372	4	4	8	8	1	13
Switzerland	6	13.326	9	8	1	6	6	5
Sweden	7	13.045	6	3	6	3	7	4
United Kingdom	8	12.841	7	2	3	17	11	8
Finland	9	9.908	8	11	9	7	12	9
Germany	10	9.615	10	14	2	12	5	7
Estonia	11	4.536	14	15	12	10	13	11
Austria	12	4.323	15	18	14	11	8	10
France	13	4.313	13	16	13	9	10	16
Belgium	14	4.283	11	12	18	18	15	15
Malta	15	3.564	12	10	22	23	21	12
Ireland	16	3.384	16	9	15	14	19	24
Slovakia	17	2.528	17	17	11	25	18	22
Czechia	18	2.280	19	28	17	26	14	14
Spain	19	1.866	21	13	16	15	16	23
Slovenia	20	1.810	20	25	20	13	22	17
Hungary	21	1.575	18	22	24	19	20	27
Latvia	22	1.195	24	24	19	16	23	18
Cyprus	23	1.054	22	21	28	24	17	21
Poland	24	0.862	25	27	21	28	27	25
Croatia	25	0.813	23	34	30	27	28	28
Portugal	26	0.720	27	23	25	20	25	20
Montenegro	27	0.680	26	20	35	30	33	34
Lithuania	28	0.512	29	26	23	22	26	19
North Macedonia	29	0.401	28	30	34	34	30	33
Greece	30	0.290	32	32	26	21	24	29
Italy	31	0.243	31	19	29	33	31	26
Serbia	32	0.232	30	29	27	29	34	30
Romania	33	0.058	33	31	33	35	35	35
Bulgaria	34	0.042	34	33	32	32	32	32
Turkey	35	0.024	35	35	31	31	29	31

4. CONCLUSION

The main idea of this paper was to summarize and compare the ICT exploitation in European countries. The results are given as a sum-up, as well as by each of the defined pillars. The general conclusion is that ICT tools are more commonly used in North and North-West Europe, than in South, East, and South-East Europe, which is similar to previous research (Nevado-Peña, López-Ruiz, & Alfaro-Navarro, 2019).

The special consideration in the paper is given to the analysis of the position of Serbia comparing to the other European countries. Serbia takes the 32nd position among the given 35 countries. According to the listed results, of all the six pillars, Serbia has the highest rank (27th) for the pillar C – E-commerce, followed by the pillar B – Internet use (29th), and pillar D – E-government (also 29th, that is somewhat unexpected). On the other hand, the lowest ranked pillar (34th) is E - ICT trust, security and privacy. This leads to the conclusion that people in Serbia are somewhat careless when it comes to ICT security. In order to improve its position among European countries, Serbia needs to get a bit more informed regarding the issues of ICT security, personal data protection, cookies, and backup issues.

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