

MEASURING THE DIGITAL ECONOMY: EUROPEAN UNION COUNTRIES IN GLOBAL RANKINGS

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Abstract

The paper presents different measures of digitalization provided by international organizations. Their annual reports are important tools for national specific policies and the countries try to improve their position in the rankings. The study emphasizes that even if the measures and indices structure are different, the relative position of the countries is almost the same. This conclusion is the result of a short analyse of the European Union countries digital performance in five rankings in 2017.

Keywords: digitalization, indices, European Union countries

JEL classification: C43, L86, O3

1. Introduction

Over recent years, the issue of evaluating digital development of different countries became more important, due to the relevance of ICT technologies for businesses, individuals and national economies. In this context, European Union's Digital Single Market Strategy aims to enhance the EU position as a global leader in the digital economy. Global competitiveness of European Union could be evaluated at EU level, but also based on the individual performance of the member countries and their ability to improve the position in different rankings related to the digital economy.

The paper shows the structure of different indices of digitalization and summarizes the main findings for 2017 of the European Union countries digital performance in five rankings: Digital Economy and Society Index (DESI) created in the framework of Europe's Digital Agenda; Networked Readiness Index (NRI) of the World Economic Forum; ICT Development

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Index (IDI) created by the International Telecommunication Union; IMD World Digital Competitiveness Ranking published by IMD World Competitiveness Center; Digital Evolution Index (DEI) presented by the Fletcher School at Tufts University and Mastercard.

2. Indices of digitalization – different approaches

At international level, different institutions and organizations have conceived and published various indices of digitalization. It has not been created an uniform and internationally accepted methodology for measuring digitalization of countries.

Most indices have focused on metrics such as infrastructure and access indicators but the most complex ones are starting to consider other components and dimensions regarding the use of digital technologies and digital skills.

The United Nations specialized agency for ICTs - International Telecommunication Union (ITU) created the **Digital Opportunity Index (DOI)**, an index based on 11 internationally-agreed ICT indicators grouped in 3 clusters: opportunity, infrastructure and utilization. The DOI has been compiled for 62 economies for the period 2000-2006 and 181 economies for the period 2004-2006.

Starting with 2008, ITU developed the **ICT Development Index (IDI)** to monitor developments in information and communication technology. It is a composite index that combines 11 indicators divided into 3 sub-indices with different weights:

- *Access*: reflects ICT readiness and includes five infrastructure and access indicators (fixed telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, households with a computer, and households with Internet access) - 40%;
- *Use*: captures ICT intensity and includes three intensity and usage indicators (individuals using the Internet, fixed broadband subscriptions, and mobile-broadband subscriptions) - 40%;
- *Skills*: captures ICTs capabilities or skills and includes three proxy indicators (adult literacy, gross secondary enrolment, and gross tertiary enrolment) - 20%.

IDI is presented in the Measuring the Information Society Report that it has been published annually by ITU since 2009. The 2015 edition (ITU, 2015) analyses ICT developments in 167 economies for the period 2010-2015 while the 2017 edition (ITU, 2017) presents the ICT country profiles (mobile services, fixed services, and government policy) for 192 economies and highlights new trends.

To track the progress of EU Member States in digital competitiveness, in the framework of the Europe's Digital Agenda (EC, 2015) was created a composite index - **Digital Economy and Society Index (DESI)**. It includes 30 indicators on Europe's digital performance grouped in 5 dimensions having different weights and covers the period 2014-2017:

- *Connectivity*: measures the deployment of broadband infrastructure and its quality and contains 4 sub-dimensions (fixed broadband, mobile broadband, broadband speed and affordability) - 25%;
- *Human capital/digital skills*: measures the skills needed to take advantage of the digital society and contains 4 sub-dimensions (basic skills and usage, advanced skills and development) - 25%;
- *Use of internet*: accounts for the variety of activities performed by citizens already online and includes 3 sub-dimensions (citizens' use of content, communication and online transactions) - 15%;
- *Integration of digital technology*: measures the digitalization of businesses and contains 2 sub-dimensions (business digitalization and eCommerce) - 20%;
- *Digital public services*: measures the digitalization of public services, focusing on 1 sub-dimension (eGovernment) - 15%.

The Fletcher School at Tufts University and Mastercard presented in their Digital Planet Report for 2014 and 2017 the **Digital Evolution Index (DEI)**. The DEI 2017 evaluates the progress of the digital economy in 60 countries, using 100 different indicators across 4 key drivers: supply conditions, demand conditions, institutional environment, and innovation and change.

The **Networked Readiness Index (NRI)** created by the World Economic Forum and published in the Global Information Technology Report is an indicator of how countries are doing in the digital world. It measures for the period 2001-2017 the performance of 139 economies and currently assesses the state of networked readiness using 53 individual indicators.

To analyze the digital evolution of different economies, IMD World Competitiveness Center published the **IMD World Digital Competitiveness Ranking**. The rankings are calculated on the basis of the 50 criteria (30 Hard and 20 Survey data), covering 63 economies in 2017 on 3 digital competitiveness factors: knowledge, technology and future readiness.

The Information Economy Report published by UNCTAD (2017) examines the evolution of the digital economy and its potential consequences for trade and development.

OECD Report (2017) provides an assessment of G20 economies' digital performance using a set of indicators on digital infrastructure, access to and use of digital technologies, innovation and the skills needed in the digital economy.

Based on these indices, there are some researchers that aimed to develop an index for measuring the degree of digitalization at country level and to compare countries' performance (Camara and Tuesta, 2017; Friedrich et al., 2011; Holbling et al., 2011; Katz and Koutroumpis, 2013; Katz et al., 2014; Vidruska, 2016).

Another papers study the digital evolutions in different economies (UK, Poland, Denmark, Sweden or Norway), analyzing the digitalization of their industries.

Since 2014, the Lloyds Bank has provided the UK Business Digital Index for small businesses and charities to understand their digital behaviors (Lloyds Bank, 2017).

Gruda et al. (2016) have studied the digital transformation within the Polish economy, for 500 companies operating in various industries: energy and mining; fuels and chemicals; retail and wholesale; consumer goods; industrial goods; TMT; finance and insurance.

In 2017, Microsoft and Quartz developed for Denmark, Norway and Sweden the Digital Transformation Report to see how the largest national enterprises address digital transformation. For this, they interviewed corporate executives from 20 of the largest companies from 7 major industries: finance, services, medtech & pharma, industry & manufacturing, telco & media, consumer products, transport & energy.

3. Figures for European Union countries in 2017

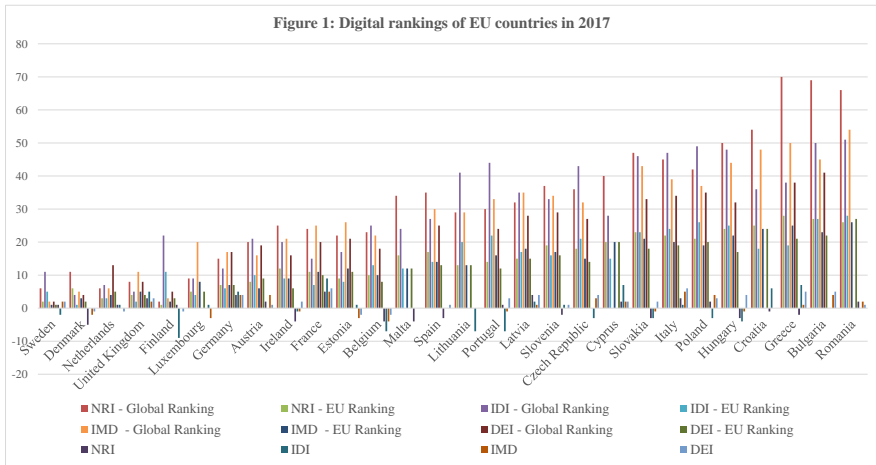
The latest reports on digitalization (2017) are more comprehensive than the previous editions, and the number of countries included is between 192 (IDI - ICT Development Index) and 28 (DESI - Digital Economy and Society Index). Table 1 presents the position of each member state of European Union in five different rankings. According to this results, it is obvious that even the five indexes measure different components of the digital economy, the differences between countries' position are limited. For example, Denmark, Sweden, Finland and Netherlands are in top 5 in all rankings (one exception, Finland is in 22nd position related to IDI). The same coherence of the results could be identified for the bottom of the ranking, with Bulgaria, Romania, Greece, Italy and Croatia registering the poorest results relative to the other European Union members.

Table 1: Digital Global Rankings of the EU countries in 2017

Country	DESI - EU Ranking	Network Readiness Index (NRI) - Global Ranking (139 countries)	ICT Development Index (IDI) - Global Ranking (192 countries)	IMD World Digital Competitiveness ranking (IMD) - Global Ranking (63 countries)	Digital Evolution Index (DEI) - Global Ranking (60 countries)
Austria	10	20	21	16	19
Belgium	6	23	25	22	18
Bulgaria	27	69	50	45	41
Croatia	24	54	36	48	na
Cyprus	22	40	28	na	na
Czech Republic	18	36	43	32	27
Denmark	1	11	4	5	4
Estonia	9	22	17	26	21
Finland	2	2	22	3	5
France	16	24	15	25	20
Germany	11	15	12	17	17
Greece	26	70	38	50	38
Hungary	21	50	48	44	32
Ireland	8	25	20	21	16
Italy	25	45	47	39	34
Latvia	19	32	35	35	28
Lithuania	13	29	41	29	na
Luxembourg	5	9	9	20	na

Malta	12	34	24	na	na
Netherlands	4	6	7	6	13
Poland	23	42	49	37	35
Portugal	15	30	44	33	24
Romania	28	66	51	54	na
Slovakia	20	47	46	43	33
Slovenia	17	37	33	34	29
Spain	14	35	27	30	25
Sweden	3	6	11	2	2
United Kingdom	7	8	5	11	8

Nevertheless, the different approaches of digitalization could lead to different results for some countries. Figure 1 presents the performance of European Union countries in the above mentioned rankings, compared to DESI, considered the most relevant measurement of digitalization for EU member states.



The methodological approach used for this analyze was to order the EU countries based on their rank value for NRI, IDI, IMD and DEI lists and to represent the relative position of each country inside European Union. The results show that different approaches of digitalization and different values of global rankings, have no consequences on the relative position inside EU.

4. Conclusions

The scientific literature on measuring the impact and the development of digital economy is very diverse and the academic and business community are far from a general accepted approach. Using the European Union countries as benchmark, this paper emphasizes that the best known reports on digitalization generate almost the same relative rankings, even the variables and datasets are different.

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