

## SIZE OF DIGITAL ECONOMY – GLOBAL AND HUNGARIAN OUTLOOK

**CSABA ROLAND RUZSA**

PhD Student

University of Pécs, Faculty of Business and Economics

Pécs

ruzsa.csaba@pte.hu

### **ABSTRACT**

Digital economy has become the most interesting phenomenon in the last decades. My research has focused on how digital economy has been defined so far and how its performance may be measured if at all. My research has mainly concluded that several statistical and scientific definitions have already been elaborated at US and at EU levels regarding digital economy. However, these definitions may still need further clarification, since no universal definition has not been put together yet. Consequently, only rough estimates may only be determined with respect to the size of Hungarian digital economy.

### **1. Introduction**

The robust expansion of digital economy in the last decades has led to the growing necessity of working out new methods to measure the size of digital economy. Based on international monetary institutions' reports, digital economy is worth almost three trillion dollars today (IMF 2017). To put it in context, this is about 30% of the S&P 500, and six times the U.S.' annual trade deficit (B. Chakravorti, C. Tunnard, R.S. Chaturvedi 2015). To demonstrate the real size of it, we can even mention that it is more than the GDP of the United Kingdom which is the fifth largest economy in the world based on GDP figures (OECD 2014).

The aim of research is to analyze whether a clear definition may be determined for measuring the size of digital economy.

The paper is based on literature survey as research method. From methodological perspective, the international economic organizations, the US governmental institutions, the European Commission have already started to form their own digital economy definitions (European Commission 2018), (IMF 2018), (OECD 2017), (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, R. Omohundro 2018). Theoretical economic studies and analysis on setting standards how to measure digital economy have also been published and these studies provide significant research topics to collect, compare and analyse.

### **2. International literature review regarding digital economy definition and measurement tools**

#### **2.1. Definitions for digital economy**

In the last decade, Thomas Mesenbourg, former director of United States Census Bureau published an early study on how to measure digital economy. Since this method was published in 2001, it may not suit to measure the performance of economy in these new technological platforms. Nevertheless, some basic components are still of importance today.

According to the main principles of Mesenbourg (Mesenbourg 2001), three main elements may be determined with respect to digital economy:

- e- business environment and infrastructure: hardware, software, IT networks, human capital,
- e-business methods: the way business is conducted, any activity or process that a company carries out in computer managed networks, and
- e-commerce transactions: a commercial transaction such as the purchase of any goods online.

Looking at further definitions, it is necessary to refer to the definition of Negroporte who has applied a metaphor for this transitional process. He said that this is a process of transition from atomic processing to bit processing. In his explanation, he also hinted at shortcomings of the past such as weight, raw material and transportation (Negroporte 1995).

Based on the results of my review, these definitions have not been embedded into the statistical approaches of governments and international organizations yet, therefore, no clear measurement method is available with respect to digital economy (Mesenbourg 2001). The main indicator of increase in this economic area may be the growth of e-commerce at international level. The immense upswing in e-commerce is shown in Table 1. below. This table illustrates the main changes in e-commerce sales between 2003-2018 in the main global economic regions.

Table 1. Regional breakdown of e-commerce sales between 2008-2018 (in billions of USD)

<b>Region</b>	<b>2008</b>	<b>2013</b>	<b>2018</b>
North America	58.6	125.8	249.8
Western Europe	57.9	97.7	184.3
Asia & Oceania	20.6	70.4	162.9
Latin America	3.9	9	16.9
Central & Eastern Europe	1.2	5.2	15.2
Middle East & Africa	0.1	0.2	0.3

(Statista 2018)

Looking at Table 1, we may conclude that e-commerce sales figures has nearly quintupled in the North-American region in the last ten years. Furthermore, we can also see a triplication in the European Regional e-commerce sales figures as well. Significant growth can also be seen in the Asian region. In addition, each region has seen an increase in e-commerce sales, however, the pace of change was much slower in the rest of the world.

The latest definitions have already considered these changes as well. As mentioned above, smartphones, mobile apps and solutions as well as social media have also become part of this new business platform (Gole, Kaltenbrunner 2014). Statista, a German market research company compiled a report in 2018 on the latest developments in digital economy and on the future outlook (Statista 2018). The so-called Digital Economy Compass 2018 report has contained eight digital business branches including e-commerce. Besides hardware trends as smartphones, new platforms, and social media data, the following areas were also incorporated: eCommerce, eServices, eTravel, Digital Media, FinTech, Digital Advertising, Smart Home, Connected Car (Statista 2018). As a result, we may realize that the scope of digital economy is already much broader than just e-commerce.

## **2.2. Measuring the size of digital economy**

My research has focused on how digital economy may be measured. It may be seen below that several international organizations have defined digital economy on a broad base and e-commerce is just a part of it already.

### **2.2.1 Global aspects - Review of publications of major international financial organizations**

In the first place, I have reviewed whether any definition regarding measuring digital economy has been introduced by any major global institution. Should there be a globally acceptable framework definition for this reason, this could support to define the principles of measurement at regional and country level. My research has focused on IMF and OECD publications in this regard.

#### **2.2.1.1 IMF Staff Report 2018 on measuring digital economy**

In the first place I found that the International Monetary Fund has released a so-called staff paper on measuring digital economy on 28 February, 2018 (IMF 2018). The staff paper is mainly made for internal purposes, but these type of papers are public and available for research purposes. In this internal paper the IMF summarized, in general, that digitalization has already led to the development of numerous new applications of information technology and in business models (IMF 2018). It is also mentioned that these new types of services and products also have a major impact on the entire economy, a digital transformation process has been elaborated in several branches of the economy.

Nevertheless, there are also comments made in the paper regarding the fact that there is no generally accepted definition with respect to “digital economy”. Furthermore, it is also mentioned that this type of definition does not even exist in case of industries, services, products and IT platforms either (IMF 2018). The parts of digital sector are ICT goods, ICT services and online platforms (IMF 2018). In this respect, the so-called sharing economy is also classified as the part of digital sector. In this paper, IMF experts assess that this sector may not exceed more than 10 % of the entire economy GDP in any country (IMF 2018).

The digital economy definition is based on a much broader basis in this aspect. The size of digital sector may be determined with respect ICT sector, however, the digital economy mostly refers to the digital transformation process (IMF 2018). The digital transformation process, often called digitization, is the key feature in this new definition. It is very difficult to measure this type of economy, since this process has mainly had an impact on each branches of economy, from agriculture to warehousing. Products and services sectors are also affected in this process (IMF 2018).

All in all, IMF paper has highlighted that to define and to measure digital economy in a comparable way is a very complex challenge for any institution and country today. Besides the controversies mentioned above, they are of the opinion that a wide cooperation is necessary to develop calculation methods (IMF 2018). The cooperation should involve national government agencies, representatives of private and the public sectors, including international organizations.

### **2.2.1.2. OECD suggestions for measuring digital economic performance**

The OECD has published two main documents in this regard. The first was published in 2014 as a part of the multilingual series with the title of *Measuring Digital Economy – A New Perspective* (OECD 2014). The second one was published in 2017 with title of *OECD Digital Economy Outlook 2017* (OECD 2017). Both documents describe the main changes in technological sector and the new business models that have been developed due to the appearance of these new digital solutions and platforms. The description of the phenomenon digitalization is similar to that laid down in the IMF report mentioned above. In these papers, the reasons for the main economic changes are also linked to new technological solutions and to the newly developed digital business platforms (OECD 2017). The OECD reports also considered the increase in number of internet users, the increasing penetration of global internet coverage as well as the growing number of patents in the ICT sector. Furthermore, it is also mentioned that the digital economy, which also has a broader definition than ICT sector, was strongly resistant against the economic crisis of 2008 (OECD 2014). It is highlighted that during the crisis between 2008 and 2012, the IT industries has produced nearly 6% of total value added, about 4% of full employment (OECD 2014). Furthermore, it is also mentioned that labor productivity in the information industries are measured at a much higher level than that of the entire economy.

Similarly to the conclusions of IMF report, OECD has also just mentioned that the measurement is clearly definable in case of ICT sector, however, digital economy has to be understood in a much broader area. Therefore, the exact classification of services and products has not been carried out yet as well as additional aspects such as digital skills and impact of new technological solutions on the society should also be considered in this method.

### **2.2.2 Digital economy measurement tools developed at regional and country levels**

As described above, neither the OECD, nor the IMF has managed to construct a new measurement tool for digital economy. In my research, I managed to identify two main tools that have developed at regional and at country level. The first one is developed by the European Commission. This complex index is called digital economic and society index (DESI). The US government agency, US Department of Commerce Bureau of Economic Analysis (US BEA) has developed a definition for digital economy, as well as a classification method for digital economy goods and services and measurement tool. I will summarize the main features of these two tools.

#### **2.2.2.1 US BEA digital economy calculation method**

The BEA has also identified that there major overlaps between digital economy and the ICT sector. BEA has also developed detailed schemes to measure the performance of ICT sector. BEA focused on developing a measurement tool to be able to incorporate properly the economic performance of digital economy into the national GDP calculation method. Practically, this method may be defined as a complementary calculation method. Based on these experiences, BEA has set up a theoretical definition for digital economy in the first place (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, and R. Omohundro 2018). In this conceptual definition, BEA included the digital IT infrastructure necessary to run such a system, the digital transactions that are carried out in and by these IT infrastructure, e.g. e-commerce transactions (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, R. Omohundro 2018). Furthermore, the definition has also included the so-called digital content that is

produced and accessed by the users (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, and R. Omohundro 2018). The third part was also called digital media.

In the second phase, BEA has identified the scope of digital services and goods. In this part, nearly 5000 services and goods were classified into different digital divisions based on supply-use tables (K. Barefoot, D. Curtis, W. Jolliff, J. R. Nicholson, and R. Omohundro 2018). In short, the so-called supply-use tables show which way and to what extent economic activities generate input, and use output from each other to produce GDP.

As a third step, BEA has produced estimates for value added and output of digital economy based on the classification method of services and goods above (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, R. Omohundro 2018). Compensation and employment figures have also been determined in the same way with respect to digital economy.

The results of this method developed by BEA has shown that the inflation adjusted value added of digital economy in the US was \$1,302.2 billion in 2016 (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, and R. Omohundro 2018). Based on comparative calculations, this was 82.2 percent larger than it was in 2005. The resilience of digital economy to economic crisis was also measured (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, R. Omohundro 2018).

#### **2.2.2.2 European Commission's Digital Economy and Society Index**

The European Commission has also built a complex indicator to illustrate digital economic activities. In this case, the index calculation is built on five key features that are measured in each country. Each index is built on the results 6-7 indicators. This index refers only to EU members states (European Commission 2018). The main five dimensions that are included in the reports are:

- infrastructural development focusing on broadband network
- human capital issues, mainly education of digital skills
- changes in number of internet users
- digital business developments, level of integration of new technologies
- area and level of digital public services

The main aim is to measure how countries and the European Union as an entire community performs in these fields. Based on the findings of the report, suggestions are put forward to each country in each field if necessary (European Commission 2018).

In my view, this index calculation method differs from the IMF and OECD approaches. However, it also focuses on main economic areas such as digitization in each economic field, e.g. e-commerce and digital transactions (European Commission 2018) (IMF 2018). This index is different from the previously mentioned ones in a way that this index is not only aiming at measuring clear digital economic aspects, but also considers human capital aspects and digital public services as well (European Commission 2018) (K. Barefoot, D. Curtis, W.Jolliff, J. R. Nicholson, R. Omohundro 2018).

### **3. Size of digital economy in Hungary – EU and national interpretations**

Besides international and EU implications, I have also reviewed whether the Hungarian digital economic performance may be measured (European Commission 2018). In my

research I have found the DESI index which provides a country report each year for each EU member state. I summarize the main results of the latest one below (.

### 3.1. DESI report results on Hungary in 2018

As mentioned above, Hungary receives annual reports on its maturity of digitalization from European Commission each year (European Commission 2018). This index is built on the five main categories mentioned above. I have drawn up a table which shows the rankings of Hungary among 28 countries in the period of 2016 - 2018 based on these five key features.

Table 2. Rankings of Hungary based on DESI country reports 2016-2018.

Category	2016 DESI ranking among 28 countries	2018 DESI ranking among 28 countries
Connectivity: IT Infrastructural Developments	16.	14.
Human Capital	18.	18.
Number of internet users	12.	11.
Integration of Digital solutions in business sector	27.	24.
Digital Public services	24.	27.

(European Commission 2018)

Based on the results illustrated in the table, we may see that Hungary is performing above the average index of Member States in case of number of internet users and in the IT infrastructural developments (European Commission 2017). Analyzing the relatively high number of internet users, we have to mention that the high number of internet users in Hungary is due to the high number of social media platform users (European Commission 2017). In case of the business sector, we may see that the Hungarian companies have a tendency to apply more and more cloud technology solutions, e-invoicing as well as e-commerce solutions, but this result is still very low compared to international standards. Low performance may also be seen in case of public services. Both the number of applied digital services and the number of users is lower than the EU average.

### 3.2. Measuring digital economy at national level in Hungary

I have also reviewed whether the Hungarian governmental agencies or economic institutions have constructed any tool to measure the size of digital economy in Hungary. Most of the governmental agencies refer to the DESI index and to the country report on Hungary of the European Commission (European Commission 2018).

#### 3.2.1. Hungarian survey on digital economy measurement

I have also tried to make a research in order to find measurement tools developed by national institutions or by Hungarian scientific organizations. I have reviewed main economic research periodicals and journals, but no valuable studies were found. Furthermore, I carried out a thorough internet research process in this regard. As a result of my research, I have not found numerous studies published in this regard. There was one survey carried out by the ICT Association of Hungary (IVSZ) and an economic think tank, Századvég Zrt. Their study was based on a survey carried out in 2014 and 2015 (IVSZ, Századvég 2015).

The study addressed the phenomenon that the ICT sector is a smaller part of the entire economy than that of digital economy. The interpretation aspects regarding ICT sector and digital economy were also raised in the study similarly to the reports published by the international and the US governmental agency (IMF 2018) (OECD 2014) (K. Barefoot, D. Curtis, W. Jolliff, J. R. Nicholson, R. Omohundro 2018). The study applies the gross value added definition to measure the size of ICT sector and that of the digital economy as well (IVSZ, Századvég 2015). IVSZ and Századvég Zrt have developed a new methodology combined with surveys to define and measure digital economy. This method was based on four main elements. The elements were as follows:

- to measure and incorporate indirect impacts
- to assess impacts that may not be measured or expressed in financial terms
- to establish a unified measuring approach that may be applied to digital economy in different countries and in different economic branches
- to develop a tool that may be applied in an easy and simple way.

These elements were analyzed with respect to three different methodology such input/output side multiplier method, the productivity and growth contribution method and the consumer surplus method (IVSZ, Századvég 2015). The research partners have decided to apply a method based on balance of inter-sectoral relations combined with the input/output side multiplier method. Based on this new method, the study presented that the size of the digital economy in Hungary nearly adds up to the 20% of the entire national GVA amount. They also published that exports of the digital economy has reached 8.3% of entire export amount of Hungary in 2014 (IVSZ, Századvég 2015).

It has to be mentioned that I have not found any similar study or survey that has been published in Hungary in this regard, therefore, this calculation method may not be compared to different measurement tools and their results.

#### **4. Summary**

There have already been several studies and research works that focused on to measure the size of digital economy. In the first place, we can define that the exact definition of digital economy is difficult to determine. The reason for that is that there are significant overlapping impacts between information and communications technology (ICT) industry and digital economy. Looking at the GDP account calculation methods, ICT industry may be defined based on a clear statistical method. However, we also may determine that the digital economy covers a much wider part of our economy. Therefore, different methods were developed to define the exact size of digital economy. One of the first methods was developed by a US governmental agency. The US Bureau of Economic Analysis has started to introduce a type of classification of services and products relating to digital economy. Similarly, the European Union has also introduced its own measurement method. This is called Digital Economy and Society Index. This tool includes a broader spectrum than that of US BEA, since this index also focuses on societal aspects such as education and skills. Furthermore, we may also try to define digital economy in Hungary by a national think tank and an ICT association.

All in all, it is clear that the digital economy has become a very significant part of our economy and will trigger further major changes in this area. To understand this phenomenon and to be able to prepare for changes to come, exact definition is necessary to be defined in this regard. Today, there are already clear indications that digital economy is a much broader

area than that of ICT industry. However, the exact size of digital economy may only be defined with limitations based on the international and national examples.

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