

INFLUENCE OF THE INFORMATION AND COMMUNICATION TECHNOLOGIES ON ECONOMIC GROWTH

Marcela Hallová¹, Martina Hanová²

Slovak University of Agriculture in Nitra^{1,2}

Faculty of Economics and Management, Department of Informatics¹,

Department of Statistics and Operations Research²

Tr. A. Hlinku 2

Nitra, Slovak Republic

e-mail^{1,2}: marcela.hallova@uniag.sk¹, martina.hanova@uniag.sk²

Abstract

Progress in information and communication technology (ICT) has caused many structural changes such as reorganizing of globalization, economics or trade extension. According some surveys, ICT plays a significant role in development of each economic sector. Personal computers and the Internet provide the equipment and connectivity that allow individuals, households and companies to benefit from ICTs. Employment in the ICT sector has proved resilient to the 2007 crisis and has been growing since 2013. This trend is mainly driven by sustained job creation in information technology (IT) services and software. The aim of the paper is to point out the position of Slovakia within the V4 countries through indexes that provide an overview on economic growth in terms of the use of information and communication technologies.

Keywords: *information and communication technologies, economic growth, Networked Readiness Index, ICT Development Index*

JEL Classification: *L85, O47*

1 Introduction

Information and communication technologies (ICT) play a pivotal role in the world economy. The ICT sector is increasing its trend share of economic activity, and ICTs are important input for economic performance. Information and communications technology refers to all technology used to handle

telecommunications, broadcast media, intelligent building management systems, audiovisual processing and transmission systems, and network-based control and monitoring functions. If the company does not want to be out of step with competition and information progress as well, it must react flexibly to the changes in the IT market (Hennyeyová & Depeš, 2010).

According the Kwochko (2013) from World Economic Forum there are the five common economic effects of ICT. First one is the direct job creation. The ICT sector is, and is expected to remain, one of the largest employers. Second one is the contribution to GDP growth. Findings from various countries confirm the positive effect of ICT on growth – a 10% increase in broadband penetration is associated with a 1.4% increase in GDP growth in emerging markets. The third one is emergence of new services and industries. Numerous public services have become available online and through mobile phones. The transition to cloud computing is one of the key trends for modernization. Next effect is workforce transformation. New “microwork” platforms, developed by companies like oDesk, Amazon and Samasource, help to divide tasks into small components that can then be outsourced to contract workers. The contractors are often based in emerging economies. Microwork platforms allow entrepreneurs to significantly cut costs and get access to qualified workers. Last economic effect of ICT is business innovation. In OECD countries, more than 95% of businesses have an online presence. The Internet provides them with new ways of reaching out to customers and competing for market share. Information and knowledge have gradually become the necessary business resources that influence business management (Šilerová, Hennyeyová, Michálek, Kánská & Jarolímeck, 2017).

Information and communication technology (ICT) is one of the key factors explaining growth differentials across countries. Investment in ICT contributes to overall capital deepening and therefore helps raise economic growth. Rapid technological progress in the production of ICT goods and services may contribute to more rapid growth in the ICT producing sectors. The greater use of ICT may help firms reduce their costs, enhance their productivity and increase their overall efficiency, and thus raise economic growth (Moradi & Kebryae, 2009). The usual objective of an ICT impact analysis is to examine the relationship between ICT and productivity, economic growth or employment. The analysis usually includes other determinants such as labor, non-ICT capital and, for firm-level studies, factors such as firm characteristics, skills and innovation and employee education. There is necessary to focus on increasing of digital skills of employees in context of increasing the economic growth in European Union (Polakovič, Hennyeyová & Slováková, 2016). Included in ICT are the ICT-producing sector, often split into manufacturing and services, and ICT diffusion, measured by ICT investment

and/ or use. Productivity measures relate a measure of output (gross output or value added) to one or more inputs. Economic growth is usually defined in terms of change in gross domestic product (GDP) or value added. Employment refers to jobs generated through the direct and indirect impacts of ICT (Measuring the Impacts of Information and Communication Technology for Development, 2011). The positive effects of ICTs on economic growth have been confirmed by some studies and researches across the OECD and the European Union (Edquist & Henrekson, 2004; Hanclova, Doucek, Fischer & Vltavska, 2015; Falk & Biag, 2015, Tóthová, Országhová & Hornyak Gregáňová, 2017).

2 Data and Methods

There are some methods and indexes how we can measure impact of ICT on economic growth. One of these indexes is Networked readiness index (NRI). Networked readiness is a key indicator of how countries are doing in the digital world. Another definition can be that this index measures the propensity for countries to exploit the opportunities offered by information and communications technology (ICT). The NRI seeks to better comprehend the impact of ICT on the competitiveness of nations. The NRI is a composite of three components: the environment for ICT offered by a given country or community, the readiness of the community's key stakeholders (individuals, businesses, and governments) to use ICT, and finally the usage of ICT among these stakeholders. Also it is a composite indicator made up of four main categories (subindexes), 10 subcategories (pillars), and 53 individual indicators distributed across the different pillars. About half of the 53 individual indicators used in the NRI are sourced from international organizations. The main providers are the International Telecommunication Union (ITU); the World Bank; the United Nations Educational, Scientific and Cultural Organization (UNESCO); and other UN agencies. The hard data are converted into a 1-to-7 scale using linear transformation to be consistent with the data from the Executive Opinion Survey, using the formula:

$$6 * \frac{(\text{Country Value} - \text{Sample Minimum})}{(\text{Sample Maximum} - \text{Sample Minimum})} + 1 \quad (1)$$

The sample minimum and sample maximum are, respectively, the lowest and highest country scores in the sample of economies covered by the GCI (Global Competitiveness Index). The index was developed 2004.

Next index is the ITU ICT Development Index (IDI). The ICT Development Index (IDI) is a composite index that combines 11 indicators into one benchmark measure. It is used to monitor and compare developments in information and

communication technology (ICT) between countries and over time. The main objectives of the IDI are to measure:

- the level and evolution over time of ICT developments within countries and the experience of those countries relative to others;
- progress in ICT development in both developed and developing countries;
- the digital divide, i.e. differences between countries in terms of their levels of ICT development; and
- the development potential of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

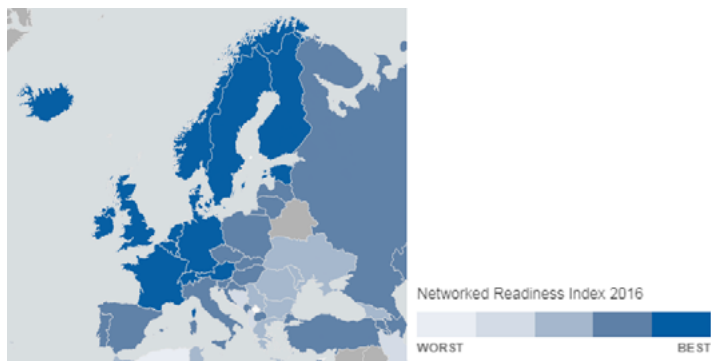
The Index is designed to be global and reflect changes taking place in countries at different levels of ICT development. It therefore relies on a limited set of data which can be established with reasonable confidence in countries at all levels of development. The IDI was developed in 2008 and the scale is from 0 to 10.

Indices bring together different indicators to provide a more comprehensive picture of what's happening than one indicator could do on its own. A good index will even out anomalies between these indicators. It will help us to compare countries with one another, and to understand trends over time.

3 Results and Discussion

According to the World Economic Forum's Global Information Technology Report 2016 Europe is the most technologically-ready region of the world. Seven of the top 10 countries were in Europe, including Switzerland, Scandinavia and most of the United Kingdom. The United States placed fifth, behind Singapore, Finland, Sweden, and Norway. Although Europe had a strong showing at the top of the list, it also has one of the widest disparities, with Greece taking 70th place and Bosnia and Herzegovina coming in 97th. Situation in Europe generally shows Figure 1.

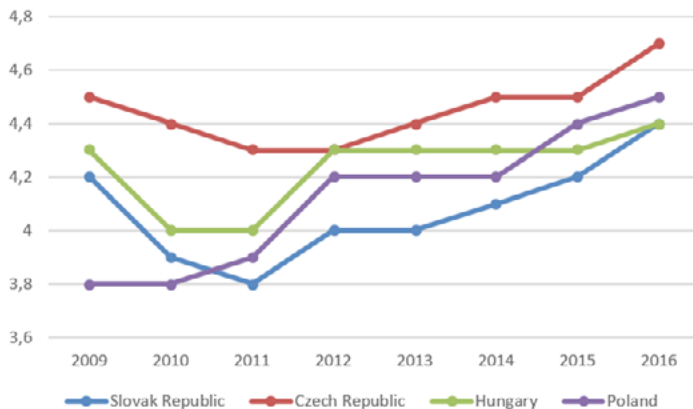
Figure 1 **Networked Readiness Index in Europe countries in 2016**



Source: <https://widgets.weforum.org/gitr2016/>.

Slovakia is usually compared with neighbouring countries like Czech Republic, Poland and Hungary – these countries are members of the Visegrad Group (V4) also. Reason is that these countries have similar economic, political and cultural development. Comparison of these four countries shows Figure 2.

Figure 2 **Networked Readiness Index in V4 countries**



Source: The Global Information Technology Report 2009-2016, own processing.

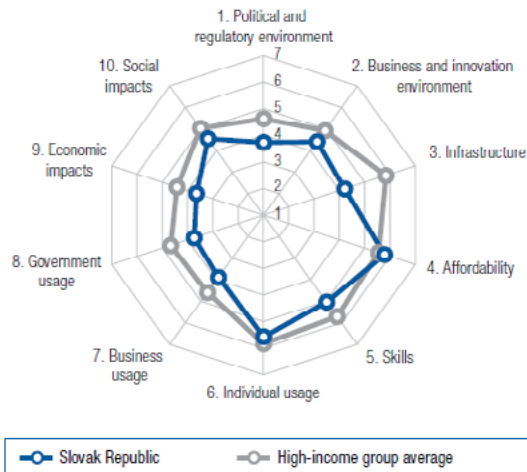
Slovakia is below of the rest three countries. The causes may be several. Although the results of the survey suggest that Slovakia is moving towards to better results, political and regulatory environment is one of the weakest in the long-term. The

problem is mainly the efficiency and independence of courts or the lower quality of ICT-related laws. Weak government support for these technologies, the lack of long-term vision and the inefficiency of government services to citizens can also be the cause of such a placement in the rankings. The weakness is also the procurement of advanced technology, the quality of the education system as a whole, and the schools of management especially.

On the other hand, Slovakia's situation is better in the use of home computers, home access to the Internet and access of schools to the Internet. The strength is the use of the Internet in business towards the consumers. The problem in business is rather low rate of innovation and little impact of ICT on the development of new products and services. The value of individual index components in 2016 in more detail is shown on Figure 3 below.

Generally, in 2016, The Slovak Republic is one of the two biggest movers in this year's NRI, climbing 12 ranks to 47th place, mainly on the back of reinforced effort from the public sector: although the country ranks fairly low in the regulatory environment (its lowest ranks overall are in this category), it is starting to catch up this year in terms of the effectiveness of law-making bodies, laws relating to ICTs, and judicial independence. Furthermore, the government is perceived to have been more active in procuring advanced technologies as well as putting digital technologies to use to increase government efficiency.

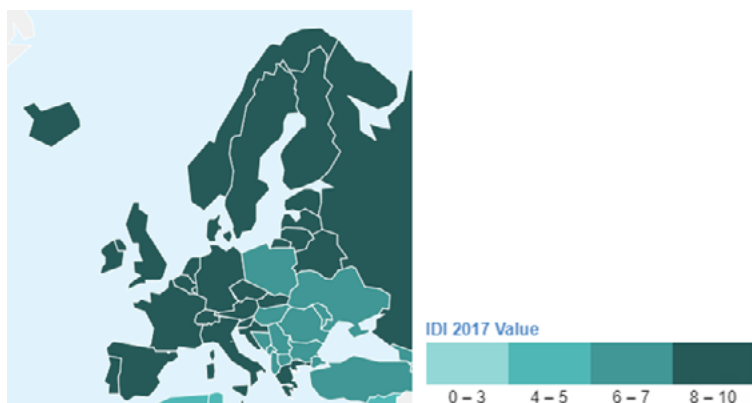
Figure 3 NRI of Slovak Republic in 2016



Source: The Global Information Technology Report 2016.

In case of the ITU ICT Development Index (IDI), which is a powerful tool for monitoring progress towards a global information society, is the ranking of Slovakia very similar as NRI. Generally, the IDI has set a global average value of 5.11 in determining the annual index country rankings in 2017. Most of the European countries have exceeded the global average, placing them on the top half of the rankings. Iceland leads with 8.98, while Switzerland boasts 8.74 points. The United Kingdom is also a top contender for ICT development, having shown the most improvement from 2010 to 2017. In the Middle East, the oil-rich states have achieved significant IDI values. The connection between income and ICT development is one factor that figured in improvement and a reason why African countries have lower IDI numbers. Position of European countries generally shows Figure 4.

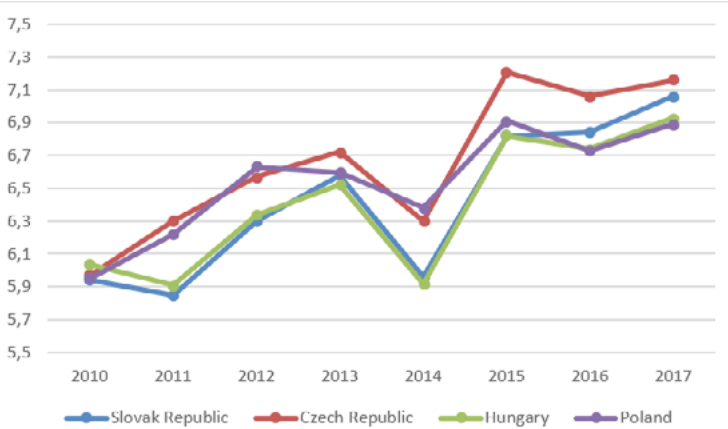
Figure 4 **The ITU ICT Development Index (IDI) in Europe countries in 2017**



Source: <http://www.itu.int/net4/ITU-D/idi/2017/index.html#idi2017map-tab>.

Comparison with the V4 countries is shown on figure 5. From the V4 countries is the Czech Republic above of the rest countries. Slovakia and Hungary has almost the same development line. In 2017, ICT Development Index had all four countries around number 7.

Figure 5 ICT Development Index in V4 countries



Source: Measuring the Information Society Report 2010-2017, own processing.

Slovakia's profile according the Information Society Report in 2017 is evaluated as a country with a highly competitive mobile market, with affordable prices for mobile-cellular and mobile-broadband services. The fixed voice market is still largely dominated by the incumbent operator and penetration rates are comparatively low. Most of the population is using the Internet and policies are in place that aim at further increasing competition in the mobile markets and access to and use of broadband networks.

4 Conclusion

The level of indexes indicates to what extent information and communication technologies affect economic and entire society growth in a particular country and to what extent individual countries can absorb the benefits of using information and communication technologies for economic growth and socio-economic benefits. When comparing various indexes and criteria, the weakest link in the chain appears to be the public sector. Slovakia lags behind in areas like enforcement of the law and public procurement of advanced technologies where it ranks among the least progressive not only in comparison with other European countries but also in global rankings. Slovakia's competitiveness to other countries can be summarized into four problematic areas: inefficiency of the public administration, human capital, market environment and infrastructure. At the end of this paper we can state that, the growth potential of the ICT sector is of the utmost importance for the entire Slovak economy.

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References

1. BARTO, M. Slovensko je na chvoste únie. Vo využívaní internet. *HNONline*. Retrieved from <https://finweb.hnonline.sk/financie-a-burzy/568868-slovensko-je-na-chvoste-unie-vo-vyuzivani-internetu>.
2. EDQUIST, H., HENREKSON, M. (2004). Technological breakthroughs and productivity growth, *SSE/EFI Working Paper Series in Economics and Finance*, No. 562.
3. FALK, M., BIAG, F. (2015). Empirical Studies on the Impacts of ICT Usage in Europe. Institute for Prospective Technological Studies Digital Economy Working Paper 2015/14.
4. HANCILOVA, J., DOUCEK, P., FISCHER, J., VLTAVSKA, K. (2015). Does ICT capital affect economic growth in the EU-15 and EU-12 countries? *Journal of Business Economics and Management*, 16(2), p. 387-406. DOI: 10.3846/16111699.2012.754375
5. HENNYEYOVÁ, K., DEPEŠ, P. (2010). Analysis of the exploitation of information and communication technologies in the agri-food sector companies. *Agricultural Economics-Zemедельска економика*. Volume: 56 Issue: 9 Pages: 403-408. ISSN: 0139-570X.
6. International Telecommunication Union. (2010). *Measuring the Information Society Report 2010*. Geneva. Switzerland. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2010/MIS_2010_without_annex_4-e.pdf.
7. International Telecommunication Union. (2011). *Measuring the Information Society Report 2011*. Geneva. Switzerland. Retrieved from <http://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf>.
8. International Telecommunication Union. (2012). *Measuring the Information Society Report 2012*. Geneva. Switzerland. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2012/MIS2012_without_Annex_4.pdf.
9. International Telecommunication Union. (2013). *Measuring the Information Society Report 2013*. Geneva. Switzerland. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2013/MIS2013_without_Annex_4.pdf.

10. International Telecommunication Union. (2014). *Measuring the Information Society Report 2014*. Geneva. Switzerland. Retrieved from https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2014/MIS2014_without_Annex_4.pdf.
11. International Telecommunication Union. (2015). *Measuring the Information Society Report 2015*. Geneva. Switzerland. Retrieved from <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2015.aspx>.
12. International Telecommunication Union. (2016). *Measuring the Information Society Report 2016*. Geneva. Switzerland. Retrieved from <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2016/MISR2016-w4.pdf>.
13. International Telecommunication Union. (2017). *Measuring the Information Society Report 2017*. Geneva. Switzerland. Retrieved from <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>.
14. KVOCHKO, E. (2013). Five ways technology can help the economy. *World Economic Forum*. Retrieved from <https://www.weforum.org/agenda/2013/04/five-ways-technology-can-help-the-economy/>.
15. Measuring the Impacts of Information and Communication Technology for Development. (2011). United Nations.
16. MORADI, M. A., KEBRYAEE, M. (2009). Impact of Information and Communication Technology on Economic Growth in Selected Islamic Countries. *EconPapers*. Retrieved from <https://econpapers.repec.org/paper/ekd000215/21500068.htm>.
17. POLAKOVIČ, P., HENNYEYOVÁ, K., SLOVÁKOVÁ, I. (2016). E-Government as a reason for increase digital literacy of citizens in the current concept of global e-democracy in the European Union. *Globalizácia a jej sociálno-ekonomické dôsledky 2016*. Rajecké Teplice. 2016. ISBN 978-80-8154-191-9.
18. ŠILEROVÁ, E., HENNYEYOVÁ, K., MICHÁLEK, R., KÁNSKÁ, E., JAROLÍMEK, J. (2017). "Influence of the Correct Management of the IT Department on the Quality of Data And Information Processing", *AGRIS on-line Papers in Economics and Informatics*, Vol. 9, No. 4, pp. 91-98. ISSN 1804-1930. DOI 10.7160/aol.2017.090409.
19. TÓTHOVÁ, D., ORSZÁGOVÁ, D., HORNYÁK GREGÁŇOVÁ, R. (2017). Web content management systems and their use in practice. *Proceedings of the 20th International Conference on Information Technology for Practice*, pp. 103-113, Czech Republic. ISBN 978-80-248-4090-1.
20. World Economic Forum. (2009). *The Global Information Technology Report 2009-2010*. Geneva. Switzerland. Retrieved from <https://www.itu.int/>

- net/wsis/implementation/2010/forum/geneva/docs/ publications/GITR%202009-2010_Full_Report_final.pdf.
21. World Economic Forum. (2011). *The Global Information Technology Report 2010-2011*. Geneva, Switzerland. Retrieved from <http://reports.weforum.org/global-information-technology-2011/>
 22. World Economic Forum. (2012). *The Global Information Technology Report 2012*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/Global_IT_Report_2012.pdf
 23. World Economic Forum. (2013). *The Global Information Technology Report 2013*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf
 24. World Economic Forum. (2014). *The Global Information Technology Report 2014*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf
 25. World Economic Forum. (2015). *The Global Information Technology Report 2015*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf
 26. World Economic Forum. (2016). *The Global Information Technology Report 2016*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf