

ИКОНОМИЧЕСКОТО ВЪЗДЕЙСТВИЕ НА ИНФОРМАЦИОННИТЕ И КОМУНИКАЦИОННИТЕ ТЕХНОЛОГИИ ВЪРХУ ОБЩЕСТВОТО

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THE ECONOMIC IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON SOCIETY

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Abstract. Current paper explains, firstly, the role ICT plays in society, reporting it's positive and negative aspects. Secondly, this paper analyses how the journal article of Toader et al. (2018) 'Impact of Information and Communication Technology Infrastructure on Economic Growth' complies with the empirical cycle. Finally, it introduces three concepts from Babbie's (2007) and Gravetter & Forzano's (2008) works..

Key Words: ICT in Society, employment changes, empirical cycle, indicators of ICT

INTRODUCTION

ICT, Information and Communications Technology, refers to all the infrastructure and components that enable modern computing. These are for example networking components, applications and systems that, together, allow people, as well as organisations, to interact in the digital world. ICT has improved economic, societal, and interpersonal transactions and interactions. It has changed how people work, communicate, learn. Nowadays, ICT focuses more on the function of the computers, but soon it will spread to robots that will solve many of the tasks once handled by humans. ICT's importance to economic development and business growth has been so monumental, that it has been labeled as the Fourth Industrial Revolution. In fact, more and more people are moving from face-to-face interactions to the ones in digital space, therefore this new era is considered the "Digital Age". Although ICT has a lot of revolutionary aspects, there are also some disadvantages. People with more power have easier access and thus have a greater ability to seize the advantages and opportunities provided by the ICT. This paper analyzes the basic concepts of the empirical cycle within an ICT-related research paper.

Firstly, this paper explains the role ICT plays in society, reporting it's positive and negative aspects. Secondly, this paper analyses how the journal article of Toader et al. (2018) 'Impact of Information and Communication Technology Infrastructure on Economic Growth' complies with the empirical cycle. Finally, it introduces three concepts from Babbie's (2007) and Gravetter & Forzano's (2008) works.

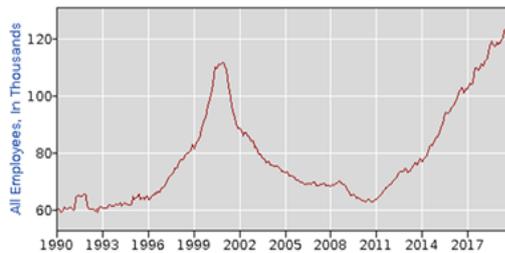
ICT in Society

Information and communication technology (ICT) is constantly changing and evolving even further. This makes the environment in which ICT is used very dynamic. For over two decades now, the Internet has offered various exciting opportunities for communication and business in the most modern way. The Internet has been a cornerstone for the development of information and technology since the middle of the last century and has now become the basis for globalization of human society in all aspects. And especially in society the impact of ICT is very diverse. For this reason, it is interesting to look on both its up and downsides for society.

First, one major benefit of ICT and its related sectors for society is the creation of many new jobs. Not only are skilled and highly educated employees necessary for an always increasing number of companies, but also rather simple jobs are created, which are more concerned with the maintenance, the assembling of hardware, etc. When analysing the employment changes, it is necessary to distinguish between the effects on "emerging digitalised economies [...] and advanced-stage economies" (World Economic Forum, 2013). In this same report by the World Economic Forum it is stated that in 2011 the biggest impact of ICT on employment was realised in these emerging economies like Asia and Latin America (over 4 million jobs were created). Additionally, a smaller, but still positive effect could be seen in the advanced-stage economies. In the latter, an ICT increase results in an improved productivity, which then can likely lead to offshoring

jobs to the emerging countries where new jobs are created. From this point the cycle can start again, in which the newly created jobs in the emerging economies may lead to a better use of technology in the advanced-stage economies and so forth (2013). To further support this argument, Toader et al. (2018) state that "an increase of the digitalization of a country by 10 percent would lead to [...] a 1.02 percent drop in the unemployment rate."

Figure 1. State and Area Employment in the Information



Sector for the Years 1990 till 2019 for San Francisco-Oakland-Hayward, CA. From U.S. Bureau of Labor Statistics. Retrieved from <https://data.bls.gov/pdgs/SurveyOutputServlet/>.

Figure 1 illustrates the employment changes for the information sector in the San Francisco area for the last two decades. Furthermore, as there are many major tech companies located there, this area can be used as a valid example when analysing employment changes for this sector. Since the introduction of the World Wide Web in 1989 (then called Mesh) by Tim Berners-Lee, which made the linking of information possible (Tim Berners-Lee, 1989), the information technology sector changed rapidly (apart from the employment situation around the dot-com bubble in the 2000s also going upward) and reached an all-time high in 2019, having increased steeply for almost 10 years. With this process continuing, as more people get access to the internet and ICT in general, it plays a significant role for economies and society. Not only more people are being employed, but also the connectedness between local companies and the global market is developing further (DeMaagd, K. 2009), so doing business is enabled greatly.

A further economic impact on society arises from an energy perspective. Walker (1985) put forward the viewpoint "that today's new technologies, with their strong energy-saving biases, will propel the next economic upswing", which is easy to say that did not come true. Constant developments of ICT made many industries much more energy efficient. Walker did not foresee in 1985 that the use of ICT would result in such enormous data trafficking that the "hourly Internet traffic will soon exceed the annual traffic of the year 2000" (Mills, 2013). The amount of data mankind uses

has exceeded every imaginable number (being an estimated 44 zettabytes or 44×10^{21}) (IDC & EMC², 2014), those bits, as valuable as some of them are for an entire industry, need an immense infrastructure and the data centres, especially, need a lot of energy (Mills states that each of them needs the amount of electricity of an entire town). Because it is very predictable that the amount of data will continue to increase rapidly, a major economical point of view arises in this energy consumption stage. With CO₂ certificates on the rise in Europe, some energy sources will be more economically efficient than others, specifically the energy captured by renewable power sources. Therefore, the increasing energy consumption of ICT may lead to a growing energy sector, as the energy needs to be captured and distributed. There may also be ways to conduct more research in order to make some processes more efficient. Hence, this whole situation could greatly impact society.

The Empirical cycle in Toader et al. (2018)

The empirical cycle is the research process of putting forward certain hypotheses and testing them against empirical data in a methodical and diligent way. Most scientific papers follow this research process thoroughly. The journal article of Toader et al. (2018) 'Impact of Information and Communication Technology Infrastructure on Economic Growth' adheres to this cycle.

In the part "Review of Empirical Studies" of Toader et al. (2018), they introduce various literature which leads to their topic about ICT infrastructure and its impact on economic growth in countries of the European Union (Toader et al., 2018). The following part combines the next two steps of the empirical cycle by introducing the participants first (EU countries) and then defining the variables measured, both dependent and independent. Moving on to the fourth step, the research strategy and design are introduced in this paper by first explaining and deriving an equation to later using this derived equation to perform some tests. As Toader then states on page 10, all the collected data stems from various countries at their state level, which is summarised in the descriptive statistics part on p. 10. This already contains the next steps in the empirical cycle, collecting and evaluating the data.

The following pages then report and describe the results and then get to the conclusion, where the research idea is confirmed to have "a positive and highly significant impact of ICT infrastructure on GDP per capita" (2018), but as this research was limited to EU countries only, a future research idea for them is to expand this investigation to non-EU countries.

Concepts Used in the Research Process

4.1. Inductive reasoning

The paper written by Toader et al. (2018) starts by reviewing different “empirical studies that have analyzed the effects of ICT on countries’ [...] economic growth”. From these studies, they came to a conclusion that “such situation shows the need for policymakers at both European and national level”. This statement shows that, by reading these studies, they got to a general conclusion which will influence the way they will see the results of their study. As Gravetter & Forzano (2008) say, induction is “reaching a general conclusion based on a few specific examples” which is what is being done in this study.

4.2. Research Hypothesis: logical, testable, refutable, positive

In the chosen literature, several variables were used to answer the research hypothesis: “How various indicators of ICT infrastructure affect growth, proxied in our study by GDP per capita?” (Toader et al., 2018). Firstly, this hypothesis is logical, because they try to find the relationship between different variables. Then, the second condition is also set - it is testable. They use twelve different variables that are all observable and linked with the purpose of their study. It is also refutable since there might or might not be a conclusion saying that “various indicators of ICT affect growth” (2018). It is possible for them to obtain contrary results to the ones they predicted. Finally, the last condition makes the research hypothesis valid because it is a positive statement, they try to find something that exists and not something that doesn’t.

4.3. Quantitative data

In the research made by Toader et al. (2018), all the data used and analyzed were quantitative, taken from different sources: “the database of the International Telecommunications Union (ITU), the OECD database, the World Development Indicators (WDI) database (World Bank), and the European Commission (Eurostat)”. By only using numerical data, it allows the analysis to be more explicit.

Conclusion

Information and communication technology has been of utmost importance to the development of global economy. This new economy is more and more dependent on creative arrangement and distribution of information. The rapid evolution of ICT has vastly increased the employment rate of both developed and developing countries (Toader et al., 2018). ICT has also contributed to the energy sector, since it requires a lot

of electrical power to function properly. The empirical cycle is the most common tool used to carry on research on certain scientific hypotheses regarding topics such as ICT. The 9 steps used in this process combine quantitative and qualitative data to give better understanding to questions that cannot be examined in a laboratory environment.

In conclusion, it can be said that ICT has become a necessity of the present era. It has affected every part of the world and almost every economic sector. Although some negative effects have been observed, they are negligible compared to the benefits.

References

- Berners-Lee, T. (1989). *Information Management: A Proposal*, CERN. Retrieved from <https://www.w3.org/History/1989/proposal.html>
- Bilbao-Osorio, B., Dutta, S., & Lanvin, B. (2013, April). The global information technology report 2013. In *World Economic Forum* (pp. 1-383). Retrieved from http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf
- Gravetter, F. J., & Forzano, L. B. (2008). *Research Methods for the Behavioral Sciences* (3rd ed.). Boston: Cengage Learning.
- DeMaagd, K. (2009). The ICT-Enabled Global Economic Crisis. *Proceedings of the Second Annual SIG GlobDev Workshop 2009*, <https://pdfs.semanticscholar.org/780d/320ffc356af4a6a1eddd58b615e81eb3cbd2.pdf>
- IDC & EMC² (April 2014). *The Digital Universe of Opportunities: Rich Data and the Increasing Value of the Internet of Things*. Retrieved from
- Mills, M. P. (August 2013). *The Cloud Begins with Coal*. Retrieved from https://www.tech-pundit.com/wpcontent/uploads/2013/07/Cloud_Begins_With_Coal.pdf
- Toader, E., Firtescu, B. N., Roman, A. & Anton, S. G. (17.10.2018), Impact of Information and Communication Technology Infrastructure on Economic Growth: An Empirical Assessment for the EU Countries. *Sustainability* 2018, 10. doi:10.3390/su10103750
- Walker, W. (October 1985), Information technology and the use of energy. *Energy Policy*, 13 (5), p. 458-476. doi: 10.1016/0301-4215(85)90102-8