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Innovation and its impact on economic development in EU countries: A comparative analysis

Helgi Llozana *

Department of Computer Engineering, Faculty of Information Technology, Polytechnic University of Tirana, Albania.

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Abstract

The idea of creating the European Union came as a need for economic cooperation between European states. The first countries that made this idea a reality were countries with a more developed and stable economy, such as Italy, Luxembourg, etc. The goal was to create a space of economic cooperation, where the states in agreement between them, avoid obstacles and difficulties. The occasional enlargement of the EU required that the new member states have similar rules for economic development, the legal system and then other policies, which transformed this reality into today's profile. Economic cooperation culminated in the establishment of the common European currency.

Keywords: Innovation; Technology; Information Systems; Economic Development; European Union (EU)

1. Introduction

Technology can be described as the use of scientific knowledge for practical purposes, especially in industry. It involves the creation and use of tools, techniques and systems to solve problems and improve human life.

The technology and information systems revolution has had a rapid spread across countries, industries, and socio-economic activity in recent decades, having substantial transformative consequences. Every day new technologies and applications are developed in order to promote better communication with citizens, facilitate the introduction of innovations in various organizations and create competitive advantages for individuals, businesses and countries.

The first part of this assignment will describe the importance of innovation in economic development. The second part will give a presentation of EU member and non-member countries depending on the level of innovation that each of them has. While the third part will focus on exploring the level of presence of technology and information systems in EU member and candidate countries. economic growth and structural change of human societies. The task is focused on the countries of the European Union, not only to recognize this very important dimension of economic and social development, but also so that Albania, as an aspiring country in this institution, can recognize in an effort to become part of this development.

The purpose of this paper is to analyze the relationship between the use of technology in EU countries and their positioning as innovative countries. Specifically, this task aims to investigate whether countries that are considered leaders in innovation are those countries where the presence of technology and information systems is high. The importance of this task lies in the opportunity to understand the impact of technology on economic development and innovation, as well as in determining whether their presence is a contributing factor to the level of innovation of a country.

* Corresponding author: Helgi Llozana

Through a comparative analysis, in the task we will examine the level of use of technology and information systems in EU member states.

Using the Innovation Table for EU countries, the topic will analyze how the level of use of technology and information systems varies between countries considered as (1) innovation leaders, (2) countries considered as innovation followers, (3) countries considered as moderate innovators and (4) countries considered as small innovators.

The question this topic seeks to answer is: Does the use of technology and information systems have an impact on ranking countries as innovative?

The objectives of the work are

- To analyze if there is a relationship between the use of technology and information systems and the evaluation of a country as an innovative country.
- To examine the level of presence of technology and information systems in EU member and candidate countries.
- Help in understanding the impact of technology on economic development and innovation.

2. Overview of the literature

Technology is 'neither good, nor bad, nor neutral' (Kranzberg, 1986). This means that technology can have both positive and negative impacts depending on how it is used and who benefits from it. In addition, technology is always evolving and changing, while its consequences in society are complex and manifold. In today's society, the widespread presence of technology and information systems has revolutionized various areas of life, such as education, science, medicine, economy, communication, etc., and has had a significant impact on the way business is done. With the advent of computers and other technological devices, many individuals became disillusioned with technology and its impact. However, over time, our approach to technology has changed radically, and more and more we have accepted it, changing our lives little by little. Technology has made it possible to automate processes, reduce costs and increase efficiency. Increased use of the Internet has enabled innovation, leading to increased productivity and economic growth (Oliner, 2002).

Technology has had a radical impact on economic growth, comparable to the impact of education a century ago (Sianesi, 2000). The importance of innovation as a source of growth for enterprises is also a known fact and the direct impact of technology on them has been investigated by many researchers (Milana, 2002). Technology plays a crucial role in innovation, as it provides tools and platforms that enable the creation and implementation of new ideas and solutions. They also provide new channels for communication, collaboration and information sharing.

This paper is important because it provides insight into whether the use of technology can lead to the birth and development of innovative ideas (Bach, 2014), a fact which can bring economic benefit and influence governments seeking to invest in this area.

3. The importance of innovation in economic development

Innovation plays a crucial role in economic development. It can have a significant impact on various sectors of the economy, such as energy, transport and industry. Innovation can lead to the development of new technologies, tools and processes that can improve productivity. This means that workers can produce more goods and services in less time, leading to increased economic output.

Innovation can lead to the development of new industries and businesses, which can create new countries. work. For example, the development of the Internet and various technologies has led to the creation of many companies and jobs in the technology sector.

Businesses can become more competitive through innovation. They may offer new products or services, or they may make existing products and services more efficient or less expensive. This can help businesses expand their market share and increase their profits. Innovation can also lead to the development of new products and services that can improve social welfare or people's quality of life. For example, medical innovations have led to the development of new treatments and cures that have improved the health and well-being of many people. Similarly, innovations in renewable energy have made it possible to reduce pollution and improve the environment (Gust, 2002).

Governments and businesses are increasingly realizing the importance of innovation for economic development. They invest heavily in research and development to promote innovation and create an environment that fosters creativity and entrepreneurship.

Innovation is a critical driver of economic growth and development. By creating new products and services, improving existing ones and improving production processes, innovation can lead to increased competition, the creation of new jobs and improved social welfare.

To measure how innovative a country is, the innovation index is used, which is a tool used by the European Commission to evaluate and compare the innovation performance of European Union member countries, candidate countries and other countries that are part of Europe.

This index is constructed as a weighted average of 27 indicators such as investments in research and development, patent applications, the number of companies with high economic growth, the availability of companies for financing capital for start-ups and ventures.

3.1. Innovation is assessed in five key areas

- Framework conditions for innovation,
- Investments in research and development,
- Innovative activities by companies,
- Enterprises,
- Intellectual assets.

The evaluation and use of this index has started since 2003. It is realized every year and is used by policy makers, academics and businesses to identify areas where innovation can be improved and to evaluate the performance of different countries. Its maximum value is 1 and its minimum value is 0.

Most of the data for these indicators are taken from Eurostat, but some of them come from other data sources.

Table 1 Tabular Presentation of the Innovation Index

Country	**2015**	**2016**	**2017**	**2018**	**2019**
Belgium	0.615231	0.620375	0.63153	0.640727	0.627174
Bulgaria	0.237791	0.244211	0.238542	0.240564	0.239365
Czech Republic	0.404268	0.408845	0.411798	0.415889	0.428194
Danmark	0.67486	0.677602	0.687058	0.678934	0.682971
Germany	0.600574	0.59685	0.601102	0.606841	0.607909
Estonia	0.421505	0.3912	0.405423	0.474388	0.488249
Ireland	0.609577	0.618783	0.627284	0.622187	0.619649
Greece	0.31598	0.318521	0.333457	0.362667	0.368258
Spain	0.438705	0.443374	0.452003	0.463628	0.471056
Franeë	0.576273	0.577432	0.582918	0.579709	0.577717
Croatia	0.283761	0.290715	0.290547	0.300029	0.306199
Italy	0.41058	0.412679	0.419906	0.442679	0.448484
Cyprus	0.392156	0.394523	0.411194	0.430174	0.414902
Latvia	0.25217	0.268088	0.272135	0.274916	0.267463
Lithuania	0.355619	0.370002	0.375622	0.414837	0.414499
Luxemburg	0.635906	0.642767	0.654637	0.654141	0.655948

Hungary	0.343183	0.344931	0.344453	0.353569	0.339969
Malta	0.425992	0.43355	0.446746	0.470685	0.486734
Hetherlands	0.652062	0.662808	0.667072	0.682121	0.692511
Austria	0.618603	0.614147	0.618734	0.63574	0.632423
Polond	0.272041	0.280127	0.290445	0.288443	0.293688
Portugal	0.433873	0.433427	0.432133	0.469588	0.479467
Romani	0.17597	0.174911	0.169721	0.158747	0.165844
Slovenia	0.497037	0.492343	0.49483	0.476473	0.460812
Slovakia	0.326079	0.318743	0.335973	0.332064	0.333255
Finland	0.638462	0.644132	0.640425	0.667257	0.672029
Swedi	0.683427	0.689914	0.699177	0.699165	0.700038
Iceland	0.525404	0.540406	0.533828	0.526435	0.537132
Norway	0.558037	0.557928	0.563853	0.611152	0.617292
Montenegro	0.225024	0.241621	0.245814	0.21926	0.233802
North Macedonia	0.187579	0.184546	0.190854	0.209232	0.209458
Albania	0.201176	0.213931	0.19426	0.199886	0.236736
Serbia	0.258044	0.250757	0.271165	0.290566	0.311018
Turkey	0.261196	0.262018	0.270161	0.299485	0.302309
Bosnia and Herzegovina	0.184769	0.184538	0.181187	0.157594	0.155152

Source – European Innovation Scoreboard (own processing); Source - European Innovation Scoreboard (edited by the author)

The table above present the innovation index for 33 countries, members and non-members of the EU, during the period 2015-2019.

3.2. Depending on the scoring, we have four groups of innovation

3.2.1. Innovation leaders

Innovation leader states are those that are considered to be at the forefront of innovation and have a good track record in developing and implementing new technologies, products and processes. These countries tend to have strong research and development ecosystems, strong intellectual property protection, and government-backed policies that foster innovation and entrepreneurship. Countries considered innovation leaders include Belgium, Denmark, the Netherlands, Finland and Sweden.

3.2.2. Strong innovators

Strong innovators are those countries that have a high level of innovation activity and performance, but are not necessarily considered at the forefront of innovation. These countries have made significant investments in research and development, as well as policies that support innovation and entrepreneurship. Countries considered to be strong innovators include Germany, Ireland, France, Cyprus, Luxembourg, Austria, Iceland and Norway.

3.2.3. Moderate innovators

Countries considered as moderate innovators are those countries that have an average level of innovative activity and performance, with some strengths in some areas, but also room for improvement in other areas. These countries have made progress in developing their innovation ecosystems, but may still face challenges in areas such as investment in research and development, intellectual property protection, and government support for innovation. Moderate innovators include the Czech Republic, Estonia, Greece, Spain, Italy, Lithuania, Malta, Portugal and Slovenia.

3.2.4. Emerging innovators

Emerging innovators are those countries that have just begun to develop their innovation ecosystems and are showing signs of progress in innovation activity and performance. These countries may have a lower level of investment in scientific research and development, and less supportive policies from governments compared to the countries above. They have the potential for significant growth in the area of innovation, but they also face challenges, such as limited resources and infrastructure, as well as political and economic instability. States considered as emerging innovators include Bulgaria, Croatia, Latvia, Hungary, Poland, Romania, Slovakia, Montenegro, North Macedonia, Albania, Serbia, Turkey and Bosnia-Herzegovina. It is noted that these countries are also the new member countries in the EU (Bulgaria, Romania and Croatia) and the aspirant countries (North Macedonia, Albania, Serbia, etc.)

4. Statistical measurement of the index of the level of technology use in the GDP of EU member and non-member countries: A comparative analysis

To measure the level of use of technology and information systems, 3 indices have been selected, which are presented in tabular and graphical form.

The first index is the percentage of enterprises that had access to the Internet. As in the case of the innovation index, 31 countries were examined for a period of 5 years. The data presented are in percentage. So, if we analyze Belgium, we see that there was an increase in the percentage of enterprises that have access to the Internet from 2015 to 2017, and then a slight decrease in 2018 and 2019.

Table 2 Percentage of enterprises that had access to the Internet

Country	**2015**	**2016**	**2017**	**2018**	**2019**
Belgium	98.3	99.1	99.6	99.4	99.1
Bulgaria	91.3	91.3	94.6	94.6	93.7
Czech Republic	97.8	97.7	97.6	97.9	97.1
Denmark	99.0	98.9	98.3	99.7	99.9
Germany	97.9	97.9	97.4	98.5	98.7
Estonia	97.0	95.6	95.3	98.6	98.3
Ireland	97.0	98.4	96.2	96.9	95.8
Greece	87.4	85.9	85.5	85.7	84.8
Spain	98.0	97.9	98.4	98.4	97.9
France	99.1	98.4	99.5	99.1	99.8
Croatia	89.5	91.3	95.8	96.7	98.0
Italy	97.7	98.2	98.2	96.9	98.3
Cyprus	95.3	96.5	95.8	95.6	96.5
Latvia	N/A	96.7	98.2	99.5	98.7
Lithuania	100.0	100.0	100.0	100.0	100.0
Luxemburg	98.2	98.3	98.0	98.9	98.8
Hungary	88.6	90.1	93.2	91.2	92.8
Malta	96.9	95.8	95.7	96.5	97.2
Netherlands	100.0	100.0	100.0	100.0	100.0
Austria	98.6	99.0	99.7	99.6	99.6
Polaand	92.7	93.7	94.8	95.6	96.3

Portugal	98.1	98.0	97.8	98.4	98.0
Romania	85.4	81.7	85.0	85.5	81.8
Slovenia	98.6	99.2	98.9	98.8	98.9
Slovakia	97.3	96.9	97.6	96.3	95.5
Finland	100.0	100.0	100.0	100.0	100.0
Sweden	97.6	98.1	96.1	96.6	99.4
Iceland	N/A	N/A	N/A	N/A	N/A
Norway	97.5	97.7	98.5	97.9	97.5
Montenegro	N/A	94.1	97.5	97.7	97.9
North Macedonia	93.5	93.8	N/A	N/A	N/A
Albania	N/A	N/A	N/A	N/A	N/A
Serbia	N/A	N/A	99.7	99.1	99.8
Turkey	92.5	93.7	95.9	95.3	94.3
Bosnia and Herzegovina	N/A	N/A	N/A	98.8	99.0

Source – Eurostat (edited by the author)

TOverall, most countries saw an increase in internet use by businesses from 2015 to 2019, although some saw more year-on-year change. High levels of internet usage in 2019 were found in Lithuania, the Netherlands and Finland, where 100% of businesses had access. Several other countries had very high levels of internet usage by businesses in 2019, including Denmark, Sweden and Germany, where more than 98% of businesses had internet access. We note that the Netherlands, Finland, Denmark and Sweden are also four of the five countries considered as innovation leaders.

Other countries had lower levels of use, ranging from around 95% of enterprises (Austria, Czech Republic and Estonia), to 85% of enterprises (Greece and Romania). Some countries saw significant improvement in internet usage over the years, such as Croatia, where the percentage of businesses increased from 89.5% in 2015 to 98% in 2019; and North Macedonia, from 93.5% in 2015 to 93.8% in 2016.

The countries that had the least improvement or even a decrease in the percentage of Internet use by enterprises were Bulgaria, about 93-95%; and Hungary, which saw a rise in numbers from 88.6% in 2015 to a peak of 93.2% in 2017, before declining to 92.8% in 2019. that the countries considered as innovation leaders and powerful innovators are exactly the same countries that have a higher percentage of enterprises that use the Internet. This percentage ranges from the lowest 95% to 100%. While the countries considered as moderate innovators and emergent innovators have a lower percentage of use by enterprises, or the data for some of these countries do not exist at all. So, a positive relationship between the percentage of use of of the Internet from enterprises and the degree of innovation of countries.

The second index that has been selected to measure the level of use of technology and information systems is the percentage of high-speed Internet coverage for the countries surveyed. This index is presented in tabular and graphical form.

Table 3 Tabular presentation of % of high-speed internet coverage

Country	**2015**	**2016**	**2017**	**2018**	**2019**
Belgium	96.6	95.9	96.3	95.8	96.6
Bulgaria	71.3	72.2	80.7	83.9	80.5
Czech Republic	97.5	97.2	97.4	96.8	96.2
Denmark	98.8	98.5	100.0	100.0	100.0
Germany	93.7	92.8	92.8	92.6	91.5

Estonia	95.5	93.3	91.4	98.1	96.3
Ireland	96.9	96.0	96.0	92.9	90.6
Greece	84.4	84.2	84.8	84.2	80.3
Spain	93.8	92.9	93.4	91.3	91.7
France	94.4	93.4	97.2	93.8	93.9
Croatia	86.6	86.0	92.0	92.2	96.8
Italy	91.8	92.4	93.6	91.5	91.1
Cyprus	95.0	96.1	94.6	94.4	93.4
Latvia	87.6	85.0	85.1	81.5	79.3
Lithuania	97.4	94.5	94.0	96.1	96.7
Luxemburg	95.6	95.5	95.1	96.8	96.4
Hungry	87.4	88.0	87.2	82.8	78.5
Malta	95.5	93.0	92.1	94.3	94.5
Netherlands	98.5	97.2	98.4	99.0	97.3
Austria	90.7	92.0	91.4	90.4	89.6
Polond	86.7	86.9	83.3	87.0	85.7
Portugal	93.9	93.1	96.8	96.5	95.8
Romania	83.0	77.5	80.0	82.3	82.6
Slovenia	98.4	99.2	98.9	98.8	98.7
Slovakia	87.9	85.6	88.0	88.7	85.4
Finland	99.2	97.3	98.3	96.6	97.4
Sweden	92.9	92.5	92.5	93.4	93.9
Iceland	N/A	N/A	N/A	N/A	N/A
Norway	87.7	86.8	85.2	89.1	90.1
Montenegro	N/A	91.8	95.8	96.0	96.4
North Macedonia	91.5	92.9	N/A	N/A	N/A
Albania	N/A	N/A	N/A	N/A	N/A
Serbia	N/A	N/A	98.3	97.9	96.9
Turkey	91.4	91.6	94.2	93.7	93.3
Bosnia and Herzegovina	N/A	N/A	N/A	98.4	98.9

Source – Euro Stat (own processing)

Based on the information above, we note that Denmark, Slovenia and the Netherlands have respectively achieved high-speed internet coverage of 100%, 98.7% and 97.3% over the five-year period from 2015 to 2019. These countries are the top performers in terms of high-speed internet coverage.

Most countries have shown an overall improvement in internet coverage from 2015 to 2019, with the exception of a few countries, such as Greece, Latvia and Romania, which experienced a decline over this period.

Bulgaria is the country with the least favorable situation regarding the percentage of internet coverage. Its coverage rates range from 71.3% in 2015 to 80.5% in 2019. The situation in Germany and France has remained essentially unchanged over the years under study, with only a few minor movements.

Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia are countries with incomplete data, given that for some years Eurostat has not been able to provide data for these countries. However, the situation in these countries is moderately good in terms of the percentage of high-speed Internet coverage.

Estonia and Croatia have also experienced significant changes in recent years, with Estonia experiencing a deep decline in 2016 and 2017, followed by an increase in 2018 and 2019, and Croatia which had an increase in 2018 and 2019, then a decrease in 2017.

Eurostat data shows that most European countries have made progress in terms of coverage high-speed internet in the years under analysis. However, there is still room for improvement in some countries, especially in those with lower coverage rates.

Regarding the correlation of the index measuring the percentage of high-speed Internet coverage with the index measuring innovation, it is noted that there is a strong statistical relationship between these indices. Countries considered innovation leaders have Internet coverage rates above 95%, with Denmark having 100% coverage.

4.1. Percentage of the technology and information systems sector in GDP

The last index that was taken into consideration in relation to the level of technology use, is the percentage of this sector in the GDP of each of the analyzed countries. This index is a strategic indicator of the competitiveness of economic systems as it enables the incorporation of important elements in the recognition of the production of goods and services in the sector of technology and information systems with a positive impact on the totality of economic results.

Information on the sector of technology use and the percentage that this sector occupies in GDP of the European Union (EU) are key components of statistical indicators on research and innovation that are used in the European field to evaluate policies supporting research and improving innovative capacity and competitiveness in the EU.

In particular, the impact it has on a country's GDP is an indicator defined by the EU to monitor public and private investments in the technology sector.

The statistical measurement of this index has been consolidated by the EU with the growing harmonization of statistics on research and technological innovation at the European level until the entry into force, in 2004, of Decision no. 1608/2003 of the European Parliament and the European Statistics Council in the field of science and technology. This development of European law is complemented by the entry into force of implementing Regulations that determine the obligation for implementation for member countries (Regulation 995/2012/EU has been replaced by Regulation 2152/2019/EU and Executive Regulation 1197/2020/EU).

Table 4 Tabular presentation of the % of the technology and information systems sector in GDP

Country	2015	2016	2017	2018	2019
Belgium	3.79	3.78	3.75	3.97	4.21
Bulgaria	5.02	5.36	5.72	6.07	6.62
Czech Republik	4.24	4.27	4.36	4.56	4.71
Denmark	N/A	N/A	N/A	4.56	4.48
Germany	4.23	4.13	4.18	4.39	4.38
Estonia	4.74	4.9	5.12	5.39	5.95
Ireland	N/A	N/A	N/A	N/A	N/A
Greece	2.18	2.16	1.96	2.49	2.27
Spain	N/A	N/A	N/A	3.29	N/A
France	3.89	4	4.33	4.31	4.41
Croatia	4.14	4.16	4.31	4.38	4.48
Italy	3.22	3.27	3.33	3.29	3.35

Cyprus	N/A	N/A	N/A	N/A	N/A
Latvia	4.15	4.53	4.69	4.92	5.41
Lithuania	2.93	2.95	3.01	3.13	3.5
Luxemburg	N/A	N/A	N/A	N/A	N/A
Hungary	5.71	5.62	5.96	5.95	6.13
Malta	6.86	6.61	8.2	7.73	7.66
Hetherlands	N/A	N/A	N/A	N/A	N/A
Austria	3.37	3.46	3.49	3.58	3.67
Polond	3.14	3.21	3.33	3.59	3.62
Portugal	N/A	N/A	N/A	N/A	N/A
Romania	3.36	3.56	3.53	3.74	3.74
Slovenia	3.6	3.59	3.67	3.59	3.71
Slovakia	4.35	4.01	4.3	4.13	4.31
Finland	4.54		5.42	4.85	4.91
Sweden	N/A	N/A	N/A	5.94	6.48
Iceland	N/A	N/A	N/A	N/A	N/A
Norway	3.41		3.43	3.37	3.77
Montenegro	N/A	N/A	N/A	N/A	N/A
North Macedonia	3.26	3.4	N/A	N/A	4.18
Albania	N/A	N/A	N/A	N/A	N/A
Serbia	N/A	N/A	4.42	4.51	4.92
Turkey	N/A	N/A	N/A	N/A	N/A
Bosnia and Herzegovina	4.75	4.54	N/A	N/A	N/A

Source – Eurostat (edited by the author)

Based on the data in the table, it is noted that the country with the highest percentage of the technology and information systems sector in GDP is Malta, followed by Bulgaria and Sweden (only the latter is part of the leading innovation countries).

For some countries such as Denmark, Spain, Cyprus, Luxembourg, the Netherlands, Ireland, Portugal, Iceland, Norway, Montenegro, North Macedonia, Albania, Serbia and Bosnia Herzegovina, the data is missing or incomplete, which which limits our analysis.

From the available data, it can be seen that the percentage of the technology sector in GDP goes from 1.96% to 6.86%.

Greece, Italy and Lithuania have the lowest percentage of this sector in GDP, with Greece going from 2.18% in 2015 to 2.27% in 2019; Italy from 3.22% in 2015 to 3.35% in 2019 and Lithuania from 2.93% to 3.5%.

Other countries, such as Belgium, Czech Republic, Germany, France, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia have moderate percentages of the technology and information systems sector in GDP, with small changes over the years.

Starting from the main goal of our analysis, we can affirm that in this case there is no strong visible relationship between the sector of technology in GDP and innovation index of these countries. It was noticed that countries like Bulgaria (which is in the group of emergent innovators) or Malta (which is in the group of moderate innovators) had higher percentages of this sector in the gross domestic product.

The conclusions reached in the above matter are placed in relation to another finding resulting from our research: the EU strategy, with a multi-year dimension, for a digital single market in Europe. Announced by the European Commission on May 6, 2015 with the communication COM (2015) 192 addressed to the European Parliament, this strategy emphasizes that the research and innovation sector of European enterprises now represents the only foundation on which all modern innovative economic systems of the EU member state.

Europe has the necessary capacities to lead the digital economy, but the European Commission in the 2015 communication evidences that the EU does not potentially use the capacities it has.

To unlock the blockage of the EU, due to fragmentation and barriers that in the European geographic market do not exist, it is necessary, according to the European Commission, to break down these barriers inside the EU to enrich its GDP by 415 billion euros. We think that this increase in EU GDP is explained by the fact that the digital economy enables not only the expansion of markets and the promotion of better-quality services at better prices, but also the provision of more choices and the creation of new sources of employment with the creation of new ventures and the growth of existing ventures.

Starting from 2015, the communication of the European Commission determines that the EU must dedicate to the research and innovation sector of European enterprises an increasing investment value for each subsequent year.

From the study of the data within the EU industrial research and development investment evaluation, it results that the field of research and innovation of enterprises in the EU consists of three main units: 1. automotive industry; 2. producers and services of European enterprises related to the sector of technology and information systems; 3. health sector.

Let's stop at the study of the unit of manufacturers and services of European enterprises related to the sector of technology and information systems and the impact that this unit has on the GDP of the EU, for the time period 2015-2019, given that this is the focus of our task.

According to EUROSTAT data, it results that the value of investment in the field of research and innovation of European enterprises related to the technology and information systems sector in the EU, for the time period 2015-2019, marks an increase in progressively compared to 2014.

From the interpretative analysis of the EUROSTAT chart on the percentage of the EU GDP, the values invested by the EU in the field of research and innovation of European enterprises related to the technology and information systems sector in the EU, for the years 2015-2019, are as follows:

- For the year 2015, the value of the investment corresponds to the value in percentage of 2.12% of the GDP of the EU, marking an increase of 0.1% from the year 2014 to which the value of 2.11% of the GDP belongs.
- For the year in 2016, the value of the investment did not increase, but remained the same as the value of 2015, that is, it corresponds to the percentage value of 2.12% of GDP. For 2017, the value of the investment increased compared to 2016 and corresponds to percentage value of 2.15% of GDP.
- For the year 2018, the investment value undergoes a further increase compared to 2017 and marks the percentage value of 2.19% of GDP.
- For the year 2019, the investment value increases by 0.3% compared to year 2018 and corresponds to the percentage value of 2.22% of GDP.

In a comparative analysis of the value of investment in 2019 in EU GDP with the value of investment in 2019 in US GDP and China's GDP, in terms of investment values in research and innovation of enterprises of related to the technology and information systems sector, we find that: The value invested by the EU in research and innovation for European enterprises related to the technology and information systems sector is inferior to the value invested by China and the USA. In fact, the USA leads the classification at the world level, while China has quadrupled in its GDP the value of the investment thus exceeding the value invested by the EU. In conclusion, the conclusion is reached that, digital enterprises in the European market represent only 58% of enterprises as a whole, compared to 69% of those in the US. This difference is particularly important for the digital services sector in which 40% of digital services are identified in the EU compared to 61% of digital services found in the US.

5. Conclusion and recommendations

From the analysis that was made for each of the indicators considered for measuring the use of technology and information systems, it was observed that there was a strong relationship between the percentage of access of enterprises to the Internet and the degree of innovation of countries. The same positive correlation was evident in the case of the percentage of high-speed Internet coverage with the innovation index. Meanwhile, a strong positive relationship between the percentage of the technology sector in GDP and the innovation index was not distinguished in the analysis carried out above. One of the and quot; causes and quot; of this and quot; missing link and quot; may be precisely the lack of data from Eurostat for some of the countries, which is also considered as one of the shortcomings of our analysis.

To conclude, we can affirm that two of the three indicators considered to measure the use of technology and information systems justify a positive relationship between being an innovation leader country and the intensive presence of technology and information systems. This means that countries with high levels of innovation tend to have more advanced technological infrastructure compared to countries with moderate innovation or emergent innovative countries.

However, a more scientific study would be needed to determine the type and weight of the connection. between technology and innovation.

If the EU states are clear about the importance of this connection, they can develop numerous policies in aid of technological progress, with the aim of economic growth of the old, new and aspiring member countries of this institution, which is the main objective of creation had the economy.

Regarding the results brought for the statistical measurement of the index of the level of technology use in the EU GDP, we think that: The conclusions reached are explained by the fact that, until 2019, the research and innovation of European enterprises related to the sector of technology and information systems is still immature in this transitional phase of the European digital market that points to an increased risk for the competitiveness of the European continent. Also, it turns out that the adoption of digital technology in the EU until 2019 is slow, while the innovative differentiation between enterprises is increasing, given that digital enterprises aim in this period to make significant investments to become more innovative and to grow faster (advantage pioneers).

Finally, in order to increase investments in the field of research and innovation related to the technology and information systems sector, we think that the encouragement of the European Commission for the countries is very useful members to provide fiscal incentives of general character for research and innovation activities. In the context of important projects of general European interest, public-private partnerships and support measures for research and development and innovation are essential to reduce innovation risks.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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