

ICT SPECIALISTS - A NECESSARY RESOURCE IN ACHIEVING THE OBJECTIVES OF SMART SPECIALIZATION STRATEGIES

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Abstract: *In the current context in which Romania elaborates the National Research and Innovation Strategy for Smart Specialization, based on the Regional Strategies for Smart Specialization, we consider important to highlight the role that ICT specialists can play in developing and ensuring the enterprises competitiveness. In fact, almost all the development regions of Romania (South-Muntenia, South-East, North-West, North-East, Bucharest-Ilfov, South-West Oltenia) have delimited ICT as a distinct field of smart specialization, within their own Regional Strategies. This paper mainly aims a quantitative descriptive research of the Key Indicators regarding the ICT specialists, from Romania and from the European Union, respectively: Enterprises employing ICT specialists, Enterprises reporting hard-to-fill vacancies for jobs requiring ICT specialist skills, Persons Employed with ICT Specialist Skills (broad measure), Enterprises where ICT functions are mainly performed by external suppliers, Enterprises provided training to their personnel to develop/upgrade their ICT skills, Individuals who have obtained ICT skills through formal educational institutions, Individuals who have written a computer program using a specialised programming language. We consider that the comparative analysis of these indicators represents the starting point in establishing the specific measures targeting the ICT field.*

Keywords: *ICT Specialists, smart specialization, key indicators, analysis.*

JEL Classification: *M59, R11.*

1. Introduction

In Romania, in the context in which the elaboration of the The National Research and Innovation Strategy for Smart Specialisation for the period 2021-2027 is in progress, almost all development regions, respectively South-Muntenia Region, South-East Region, North-West Region, North-East Region, Bucharest-Ilfov Region and the South-West Oltenia Region, have delimited ICT as a distinct field of smart specialization, within their own Regional Strategies of Smart Specialization. Smart specialization is the process of economic transformation by identifying areas where the research and innovation for smart specialization can bring benefits for the Region, creating new competitive advantages. The role that ICT specialists can play in achieving the specific objectives of the ICT field is obvious, with direct implications for regional and national competitiveness.

In this context, this paper proposes a quantitative descriptive research of some indicators considered relevant for the ICT specialists, from Romania and the European Union. The comparative analysis of these indicators will reveal the level of Romania compared to the European Union, helping to correctly assess the real possibilities of meeting the objectives assumed by our country, in the context of allocating financial resources from Operational Programs, corresponding to the Policy Objective 1 - A more competitive and smarter Europe.

2. Analysis of key indicators regarding the ICT specialists

We consider the following key indicators relevant for the analysis of ICT specialists: Enterprises employing ICT specialists, Enterprises reporting hard-to-fill vacancies for jobs requiring ICT specialist skills, Persons employed with ICT specialist skills (broad measure), Enterprises where ICT functions are mainly performed by external suppliers, Enterprises provided training to their personnel to develop/upgrade their ICT skills, Individuals who have obtained ICT skills through formal educational institutions,

Individuals who have written a computer program using a specialised programming language.

Enterprises employing ICT specialists are presented in table no.1 and viewed in figure no.1.

ICT specialists are employees for whom ICT is the main job, with the main tasks: developing, operating or maintaining ICT systems or applications.

**Table no.1. Enterprises employing ICT specialists
(unit of mesure: percentage of enterprises)**

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
	All enterprises, without financial sector (10 or more employees and self-employed persons)						
European Union	19	20	20	19	19	19	19
Romania	12	13	11	10	11	10	16
	Large enterprises (250 employees and self-employed persons or more), without financial sector						
European Union	75	77	75	74	75	75	76
Romania	46	45	46	42	43	43	47
	Medium enterprises (50-249 employees and self-employed persons), without financial sector						
European Union	42	43	42	41	41	41	42
Romania	20	19	19	16	16	17	21
	Small enterprises (10-49 employees and self-employed persons), without financial sector						
European Union	14	14	14	13	13	14	14
Romania	9	11	8	7	9	8	13

Source: Eurostat, INS

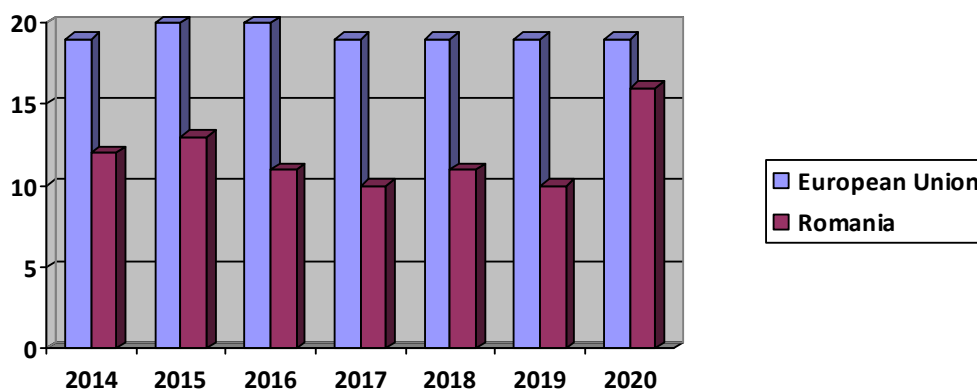


Figure no.1. Enterprises employing ICT specialists (all enterprises, without financial sector, 10 or more employees and self-employed persons)

The table no.1 shows the high values for large enterprises (250 employees and self-employed persons or more), compared to small enterprises (10-49 employees and self-employed persons).

Enterprises reporting hard-to-fill vacancies for jobs requiring ICT specialist skills (reduced comparability with 2007) are presented in table no.2 and viewed in figure no. 2.

Vacancies that are difficult to fill during the previous calendar year refer to a number of situations in which it is difficult for companies to find people with certain skills, ie vacancies that are difficult to fill due to skills shortages.

Table no.2. Enterprises reporting hard-to-fill vacancies for jobs requiring ICT specialist skills, reduced comparability with 2007 (all enterprises, without financial sector, unit of mesure: percentage of enterprises)

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	3	3	3	4	5	5	5
Romania	1	1	1	1	2	3	2

Source: Eurostat, INS

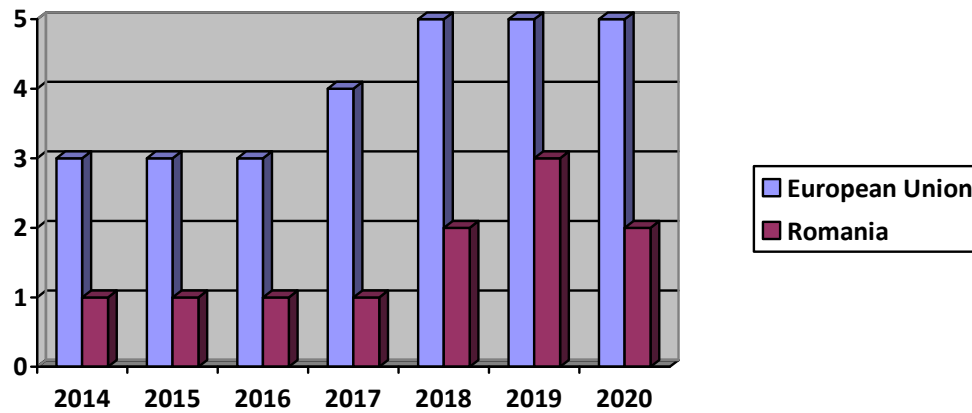


Figure no.2. Enterprises reporting hard-to-fill vacancies for jobs requiring ICT specialist skills, reduced comparability with 2007 (all enterprises, without financial sector)

In comparison and in addition to the previous indicator, we can also analyze the indicator Enterprises recruited/tried to recruit personnel for jobs requiring ICT specialist skills (reduced comparability with 2007), presented in table no.3 and viewed in figure no. 3.

Table no.3. Enterprises recruited/tried to recruit personnel for jobs requiring ICT specialist skills (unit of mesure: percentage of enterprises)

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
	All enterprises, without financial sector, reduced comparability with 2007						
European Union	7	8	8	8	8	9	8
Romania	3	4	4	4	4	3	3
	All enterprises, without financial sector						
European Union	38	43	48	54	58	55	:
Romania	35	36	33	45	90	46	:

Special value (:) not available, Source: Eurostat, INS

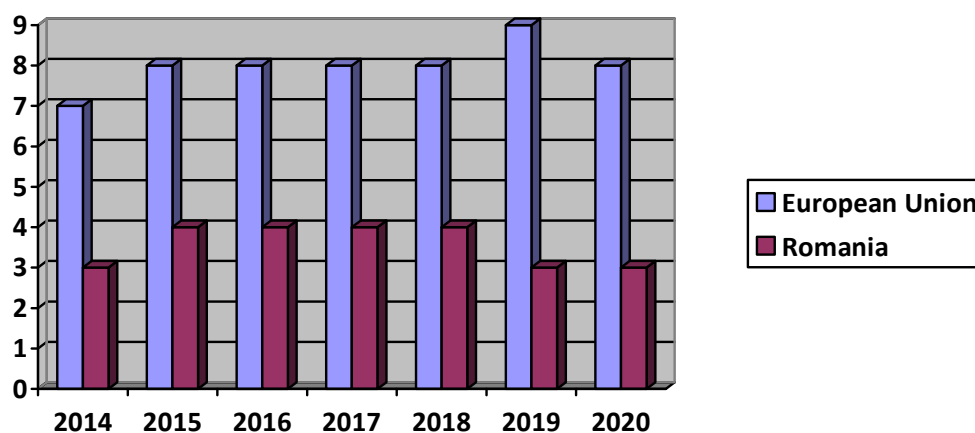


Figure no.3. Enterprises recruited/tried to recruit personnel for jobs requiring ICT specialist skills, reduced comparability with 2007 (all enterprises, without financial sector)

We notice that the share of enterprises that recruited/tried to recruit personnel for jobs requiring ICT specialist skills was in Romania of 35% in 2014 and 46% in 2019. We also note that this share increased greatly in 2018, reaching 90% of enterprises. It is important to note that labor shortages have a significant economic impact.

Persons employed with ICT specialist skills (broad measure) are presented in table no.4 and table no.5 and viewed in figure no. 4 and figure no.5.

The definition of the ICT Specialists' occupations is based on the new ISCO-08 classification. It includes ICT service managers (code 133), ICT professionals (25), ICT technicians (35) and some other groups, from electronic and telecommunications engineers (215) up to ICT installers and servicers (7422).

Table no.4. Persons employed with ICT specialist skills (broad measure) unit of mesure: thousand persons

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	6.302,5	6.540,6	6.908,3	7.173,4	7.570,3	7.846,2	8.431,4
Romania	139,9	160,8	167,7	185,4	190,1	197,2	202,7

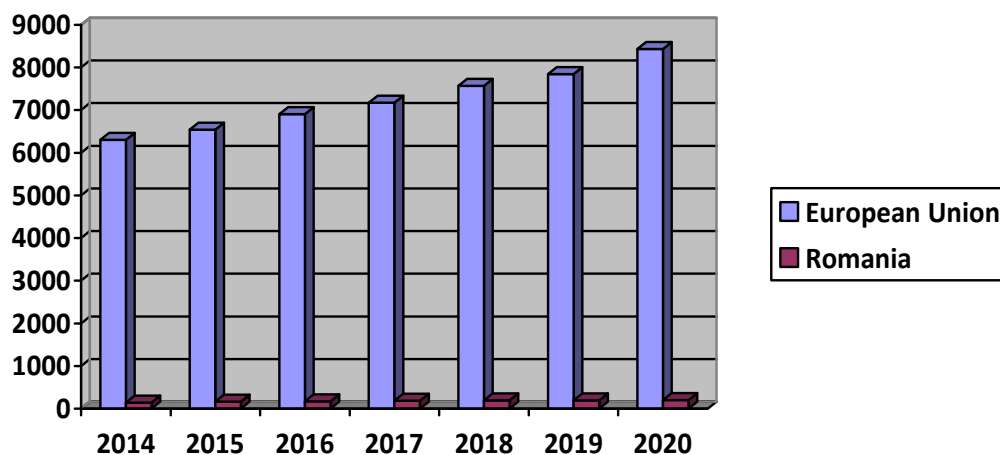
Source: Eurostat, INS

**Table no.5. Persons Employed with ICT specialist skills (broad measure)
unit of mesure: percentage of total employment**

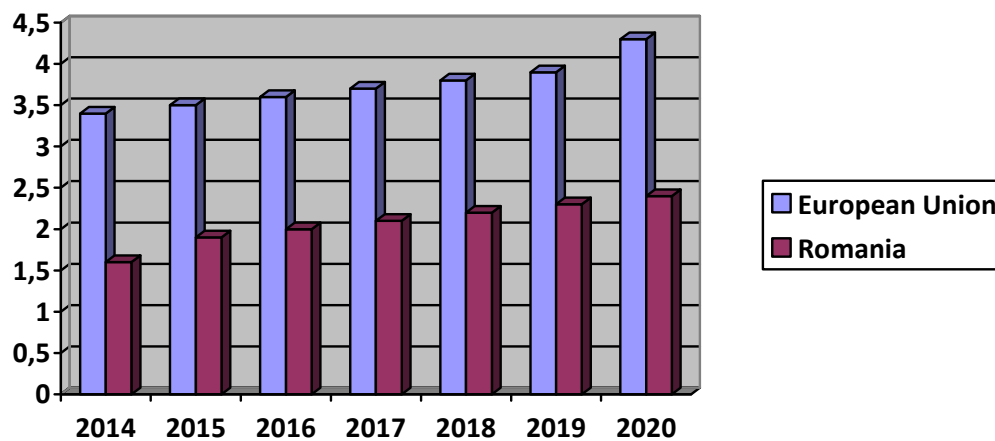
Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	3,4	3,5	3,6	3,7	3,8	3,9	4,3
Romania	1,6	1,9	2,0	2,1	2,2	2,3	2,4

Source: Eurostat, INS

From these tables it is observed that Romania is at a low level compared to European values. However, we note the increasing evolution of the indicator in the analyzed period (2014-2020), which reflects a favorable evolution, both at European level and in our country.



**Figure no.4. Persons employed with ICT specialist skills (broad measure),
thousand persons**



**Figure no.5. Persons employed with ICT specialist skills (broad measure),
percentage of total employment**

Enterprises where ICT functions are mainly performed by external suppliers are presented in table no.6 and viewed in figure no. 6.

The majority of ICT functions are mainly performed by external suppliers and not by own employees. From the point of view of defining this indicator, we specify that the functions include: maintenance of ICT infrastructures, support for office software, development and support for web solutions or business management software/systems, security and data protection.

In comparison and in addition to the previous indicator, we can also analyze the indicator Enterprises where ICT functions are mainly performed by own employees, presented in table no.7 and viewed in figure no. 7.

Table no.6. Enterprises where ICT functions are mainly performed by external suppliers. All enterprises, without financial sector (10 or more employees and self-employed persons), unit of mesure: percentage of enterprises

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	:	51	51	:	53	:	:
Romania	:	36	38	39	44	:	:

Special value (:) not available, Source:Eurostat, INS

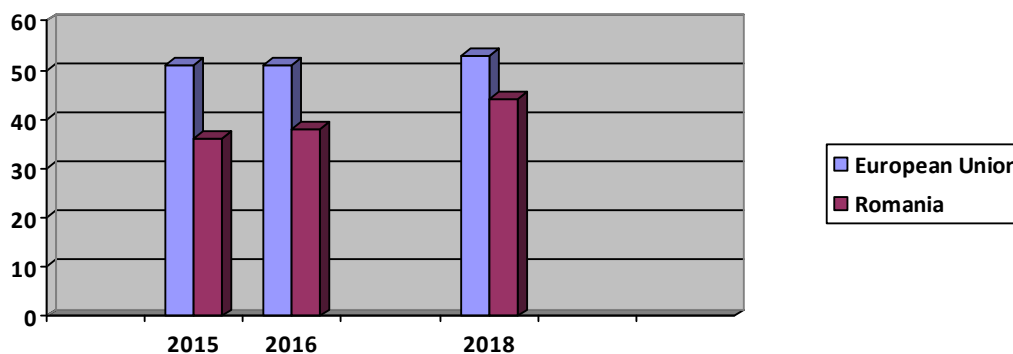


Figure no.6. Enterprises where ICT functions are mainly performed by external suppliers, percentage of enterprises

Table no.7. Enterprises where ICT functions are mainly performed by own employees. All enterprises, without financial sector (10 or more employees and self-employed persons), unit of mesure: percentage of enterprises

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	:	17	18	:	16	:	:
Romania	:	15	14	15	15	:	:

Special value (:) not available, Source:Eurostat, INS

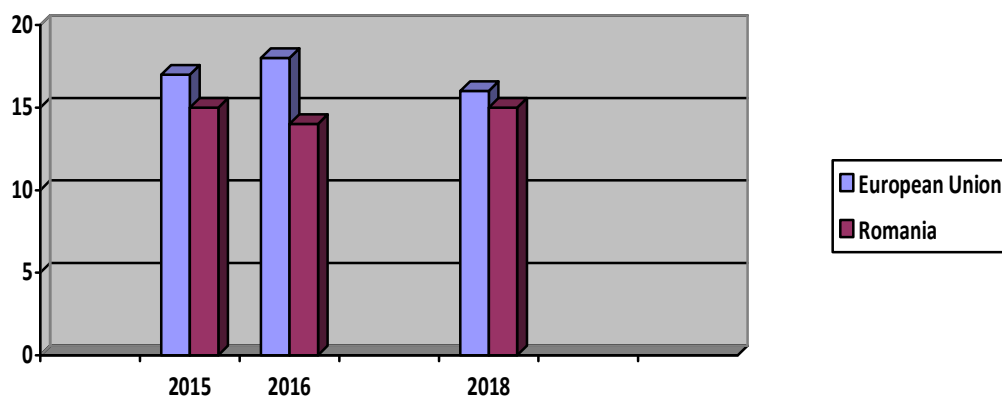


Figure no.7. Enterprises where ICT functions are mainly performed by own employees, percentage of enterprises

Enterprises provided training to their personnel to develop/upgrade their ICT skills are presented in table no.8 and viewed in figure no. 8.

Table no.8. Enterprises provided training to their personnel to develop/upgrade their ICT skills. All enterprises, without financial sector (10 or more employees and self-employed persons), unit of measure: percentage of enterprises

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	20	21	21	21	22	23	20
Romania	5	5	5	4	5	6	6

Source: Eurostat, INS

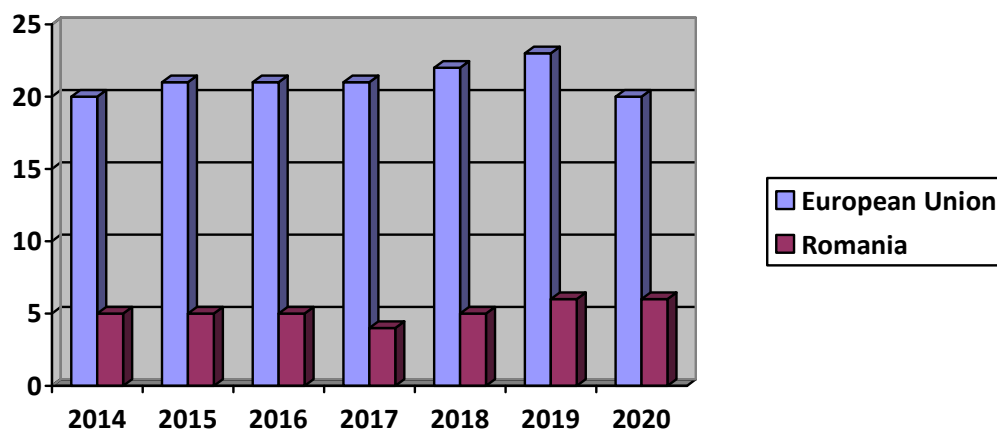


Figure no.8. Enterprises provided training to their personnel to develop/upgrade their ICT skills

In comparison and in addition to the previous indicator, we can also analyze the indicator Enterprise provided training to other persons employed to develop/upgrade their ICT skills, presented in table no.9 and viewed in figure no. 9.

Table no.9. Enterprises provided training to other persons employed to develop/upgrade their ICT skills. All enterprises, without financial sector (10 or more employees and self-employed persons), unit of mesure: percentage of enterprises

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	18	18	18	18	19	21	17
Romania	4	4	4	3	4	5	5

Source: Eurostat, INS

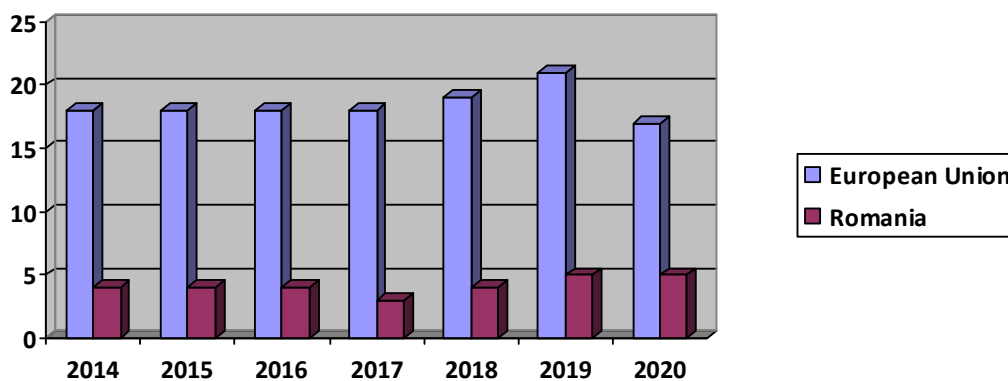


Figure no.9. Enterprises provided training to other persons employed to develop/upgrade their ICT skills

Individuals who have obtained ICT skills through formal educational institutions are presented in table no.10 and viewed in figure no. 10 and figure no.11.

Table no.10. Individuals who have obtained ICT skills through formal educational institutions (school, college, university etc.) unit of mesure: percentage of individuals

Geopolitical entity	2007	2011
Individuals living in cities		
European Union	23	28
Romania	20	23
Individuals living in rural areas		
European Union	19	24
Romania	5	13

Source: Eurostat, INS

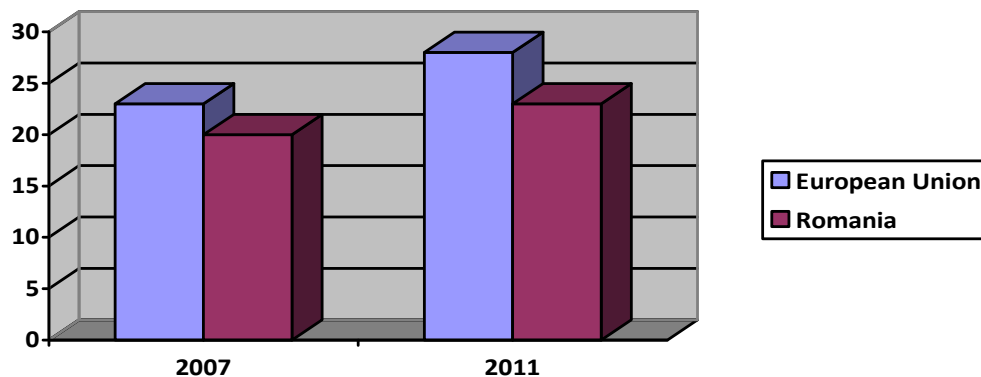


Figure no.10. Individuals (living in cities) who have obtained ICT skills through formal educational institutions

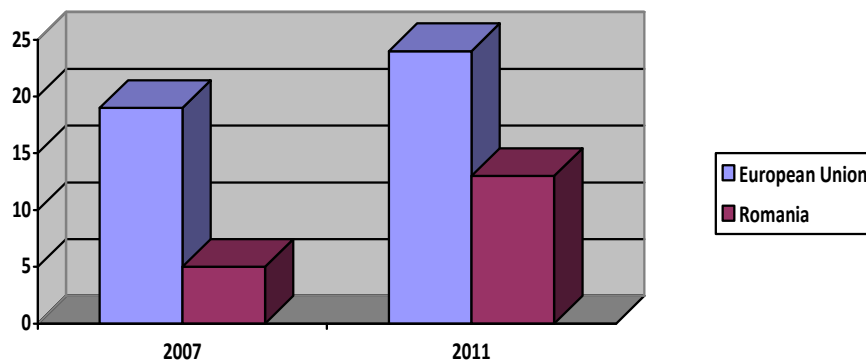


Figure no.11. Individuals (living in rural areas) who have obtained ICT skills through formal educational institutions

Regarding the Individuals who have obtained ICT skills through formal educational institutions indicator, we note that at present there are no recorded and centralized data on the values recorded in recent years, the most recent being the data from 2011. This lack of information is a recognized limitation of the analysis, implicitly an impossibility to correlate with other indicators.

Individuals who have written a computer program using a specialised programming language, more precisely Individuals who have written code in a programming language, are presented in table no.11 and viewed in figure no. 12.

Table no.11. Individuals who have written code in a programming language, unit of mesure: percentage of individuals

Geopolitical entity	2014	2015	2016	2017	2018	2019	2020
European Union	:	5	5	5	6	5	:
Romania	:	1	1	1	1	1	:

Special value (:) not available, Source: Eurostat, INS

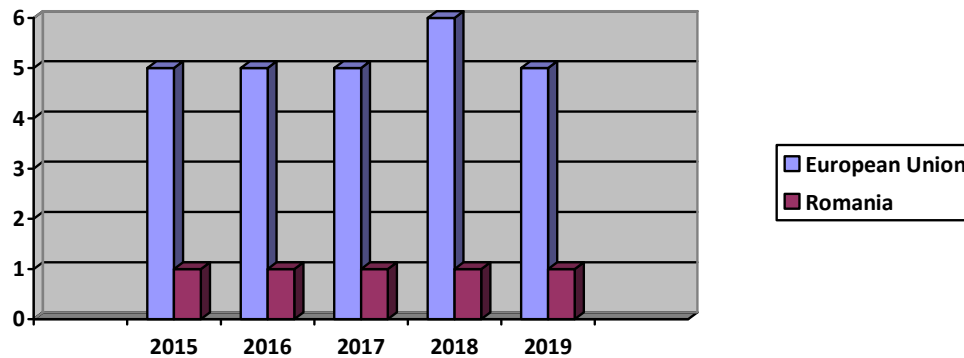


Figure no.12. Individuals who have written code in a programming language, percentage of individuals

3. Conclusions

The segment of ICT specialists has an important impact for building the European and Romanian competitiveness potential, through its contribution to the use of digital technologies. Overall, the dynamics of ICT specialists are characterized by stable and persistent employment, showing resilience to economic recessions.

The comparative analysis of the indicators regarding the ICT specialists, except Individuals living in cities who have obtained ICT skills through formal educational institutions and Enterprises where ICT functions are mainly performed by own employees, reveals the low level at which Romania is in comparison with the average registered at the level of European Union. Thus, in the next period, it will be necessary to approach with caution the objectives assumed by Romania in the context of the allocation of financial resources from the Operational Programs at regional and national level.

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