Improving digital competence in Romania: learning from the best

Mihaela BUICA [*], Gabriela DRAGAN [**]

Abstract

The main objective of this paper is to analyse and understand the factors which constantly position Romania on the last places of the European digital rankings, especially at the Human Capital/Digital skills indicators and, secondary, to raise awareness concerning the necessity of increasing digital competences in Romania. The paper provides a comparison among Romania and other three European countries, better positioned on the European ranking, namely Germany, Poland and Denmark. The paper concludes that the level of preparedness of the human capital with digital competence has played a crucial role in assuring the success of the European industry. Learning from the better positioned countries on the European digital ranking can be a solution for Romania in increasing its performance and maintaining a valuable role in the European industry framework.

Keywords: Digitising European industry, comparative analysis, human capital, digital competence, Romania

Introduction

Industry is one of the main 'pillars' of the European economy and taking into consideration its importance in the global macro-economic context, a new industrial strategy was launched in 2010, proposing "a fresh approach to industrial policy" and an "integrated" approach for the new "Globalisation Era" (European Commission, 2010c, p. 4).

Since April 2016, European industry strategists have become even more daring in approaching the future in this field and started an official process of digitisation of industry as "…a unique opportunity for attracting further investments into innovative and high growth digital and digitised industries in Europe" (European Commission, 2016b, p. 6). The decision has come due to the spectacular development of digital technologies and after less than a year, when a "strategy for a

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Digital Single Market proposed transformational actions for the European economy and society" (European Commission, 2016b, p. 15).

In recent times, many of the Member States have identified an opportunity to increase their competitiveness through integrating digital technologies in the industry by adopting several national initiatives, variously labelled such as Platform Industrie 4.0 in Germany, Industrie du Futur in France, Smart Industry in Netherlands and so on.

Due to the major transformational changes created through digitisation processes and according to the classification for industrial technology development, experts in the field considered this stage of industry development as 'The New Industrial Revolution', 'The Fourth Industrial Revolution' or, for short 'Industry 4.0' (Davies, R., 2015; Schwab, 2015; Schwab, 2016).

> *The First Industrial Revolution used water and steam power to mechanize production. The Second used electronic power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century (Schwab, 2015, p. 3).*

About the changes that the new industrial revolution is supposed to bring, Klaus Schwab in his article 'The Fourth Industrial Revolution: What It Means and How to Respond' (2015, p.3) notes "We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before".

Therefore, these daring initiatives which are supposed to be the best solution for economy are coming together with major changes and challenges for the evolution of humankind. As can be easily inferred, these changes need adequate skills. Modernising Europe's skills base has become a major priority since 2010, when European Commission launched the 'Europe 2020' strategy (European Commission, 2010d).

To support EU member states in implementation of digital policy, a Digital Scoreboard was created at the European level, as an instrument designed to measure the progress of the European digital economy. The annual EU Report of Europe's Digital Progress presents an objective image of the current situation.

Since the progress of the European digital economy has started to be monitored, Romania constantly occupies the last places of the ranking in many monitored aspects.

Analysing and understanding the factors which cause this reality is a necessary step in order to promote changes and also respond to the research question of this paper, namely how to raise the digital competence level compared to European average.

Thus, having regard that all statistics confirm Romania's poor ranking and considering this position as a management deficiency, the methodology of this study will have a different approach. Through a comparative analysis between Romania and some of the better positioned countries on the European ranking, we have set out to identify their strengths. Analysing the state of digital transformation in these countries, combined with management and leadership techniques, should be a useful resource for improving Romania's potential weaknesses, through adopting adequate and appropriate digital policies and strategies.

For the comparative analysis we chose the following countries: Romania, Denmark, Germany and Poland. The analysis will be based on the digital requirements for digitisation process of the European Industry. According to the Digital Economy and Society Index (DESI) 2017, Romania occupies last place, the 28th, Denmark 1st place, Germany, a country well known as a digital industry promoter, the 11th place, and Poland, an Eastern European country with strong involvement in addressing new technological trends, the 23rd place.

The paper is structured in two main parts. First part is dedicated to clarifying the two key concepts: 'digital skills' and 'digital competence' and to highlight their importance for the digital progress of a country. Also in this part, the necessity of new managerial strategies adapted for the new challenges related to Industry 4.0, long-term tendencies affecting the growth and to 2030 global trends, will be approached. The second part of the paper assesses the results of the comparative analysis.

1. The importance of having digital skills

Even for those who are not specialists in digitisation area, one can feel and see every day the need to have some skills in handling the different things connected with technologies as ordinary as the television set or the phone. But when we talk about the digital economy and society, the importance of digital skills exceeds the limit of our daily life and becomes a major priority in strategic

documents, with 'crucial role' in the development of the modern life as a whole (European Commission, 2010a, 2010b, 2010d).

Due the fact there are various definitions and terms for digital skills and digital competences, a clarifying definition for the two terms is very welcomed in the context of this analysis.

1.1. What are the digital skills and what are the digital competences.

According with the European Parliamentary Research Service (EPRS) (Kiss, 2017, p.4), digital skills are defined as:

> *a range of basic to highly advanced skills that enable the use of digital technologies (digital knowledge) on the one hand, and basic cognitive, emotional or social skills necessary for the use of digital technologies, on the other hand.*

The Organisation for Economic Co-operation and Development (OECD) (OECD, 2016a) identified four types of Information and Communication Technologies (ICT)-related skills necessary at the workplace. These are: ICT generic skills, ICT specialist skills, ICT complementary skills and foundation skills. "People need a minimum level of basic skills, including numeracy, literacy and basic digital skills, to access good jobs and participate fully in society" (European Commission, 2016a, p4).

Having regard that education and training in Europe is the competence of Member States, European Commission through The Directorate-General for Employment, Social Affairs and Inclusion launched a series of European initiatives for skills whose target is the mobilisation of all interested European stakeholders along the three lines of action: Understanding Skills, Developing skills and Showing skills.

In June 2016, a new Communication was adopted, called 'The new Skills Agenda for Europe' in order to "…better assist Member States in their national reforms as well as to trigger a change of mindsets in both individuals and organisations" (European Commission, 2016a, p. 3).

Digital competence is one of the eight key competences established in the Reference Framework (European Parliament, 2006), the other seven being: 'Communication in the mother tongue', 'Communication in foreign languages', 'Mathematical competence and basic competences

in science and technology', 'Learning to learn', 'Social and civic competences', 'Sense of initiative and entrepreneurship' and 'Cultural awareness and expression'.

> *Digital competence includes not just digital skills, but a set of skills, knowledge and attitudes concerning the nature and role of information technologies and the opportunities they offer in everyday contexts, as well as the related legal and ethical principles. It also includes critical and reflective attitudes towards the information available and its responsible use (Kiss, 2017, p 4).*

In order to produce a set of digital competence descriptors for all levels, in 2013 was published the European Digital Competence Framework for Citizens also known as DigComp (Ferrari, 2013). The competences were grouped in five areas: 'Information and data literacy', 'Communication and collaboration', 'Digital content creation', 'Safety' and 'Problem solving'. To be considered digitally competent it is necessary to have competences in each of these five areas.

In 2016 DigComp 2.0 (Vuorikari *et al*., 2016) was introduced with the second Phase of the update. Phase 1 of the update, whose central theme is the conceptual reference model, was launched in 2016 followed by the second Phase which is planned in 2017.

1.2. The need for digital skills

Why is so important for everybody to have digital skills? A likely answer was provided by Klaus Schwab (2016, Introduction), that noticed: "In its scale, scope and complexity, …the fourth industrial revolution is unlike anything humankind has experienced before" and "The change are historic in terms of their size, speed and scope". Fortunately for this question there are many well justified works that answered it, in many forms like legal framework, scientific studies, papers and etcetera. The principal need of having digital competence was strongly derived from the real benefits of digital technologies, both for national level and individual level.

Since 2010, with the adoption of the 'Europe 2020' strategy, Europe has entered a new era, an era with ambitious plans for changing. 'Europe 2020' is, in essence, the strategy of the EU response to globalization, focusing both on the immediate challenge of the recovery and the long-term challenges specifically of remaining competitive at the global level.

To ensure the core priorities on smart, sustainable and inclusive growth, the 'Europe 2020' strategy proposes seven flagship initiatives, four of which are particularly important for industry competitiveness: 'Innovation Union', 'A Digital Agenda for Europe', 'An industrial policy for the globalisation era', 'New Skills for New Jobs'. The other three flagships refer to the 'Youth on the move', 'Resource efficient Europe' and 'European platform against poverty'.

The flagship initiative 'An Industrial Policy for the Globalisation Era' (European Commission, 2010c) focuses on the central objective of this policy, namely promoting the competitiveness of European industry. Following this Communication, in support of increasing the competitiveness of industry, the European Commission intervened through a series of other Communications. In 2016, an important step in this direction was officially taken by the European Commission, through the Communication 'Digitising European Industry. Reaping the full benefits of a Digital Single Market' (European Commission, 2016b).

Thus, all these ambitious strategies need a certain level of preparedness of the human capital with adequate skills. This task of modernising Europe's skills base became one of the main aims of the flagship initiative 'An Agenda for new skills and jobs' (European Commission, 2010b).

Starting in 2013, the European Commission initiated the 'Grand Coalition for digital jobs' as a cross-European, multi-stakeholder initiative, in order "to increase the provision of digital skills through stakeholder pledges" (European Commission, 2016b, p.14). In June 2016 'A New Skills Agenda for Europe' (European Commission, 2016a) was adopted, in order to support the framework for employability, including the need for digital and complementary skills.

On the other hand many Think Tanks, NGO's, private research and consultancy firms offer various studies approaching the different aspects of the process of digitising industry. Some of them developed valuable initiatives of research in the area, such as: World Economic Forum 'Shaping the Future of Digital Economy and Society', McKinsey Global Institute 'Digital Disruption - Understanding how technology is transforming industries and how leaders and organizations can respond' , 'Employment and Growth -How to drive economic growth and create jobs', ManPower Group 'World of Work-The skills revolution', Boston Consulting Group 'Mastering the Digital Imperative', Empirica 'eSkills & Work', European Parliament Think Tank (European Parliamentary Research Service) and so on.

The same, we have to mention here the research in the area of the important international institution as UNESCO, UNICEF, OECD.

Among the authors which recently approached the subject of the Fourth Industrial Revolution, the future of jobs and professions we can mention: Klaus Schwab (2016), Eric Schmidt and Jared Cohen (2013), Chris Anderson (2013), Franco Mosconi (2015), Alec Ross (2016), Kevin Kelly (2016), Erik Brynjolfsson and Andrew McAfee (2014), Richard Susskind and Daniel Susskind (2015).

Until now, there were no relevant studies which demonstrate or tried to demonstrate the economical disadvantages of digital technologies. Some of the studies approach the threats of the 'New Industry' especially the ones related with the future of jobs. Another interesting approach of the studies is the one related to the speed of development of digital technologies and the risk of automation for jobs (Arntz *et al*., 2016; Chui *et al*., 2016; Manyika 2016; Manyika *et al*., 2017a, 2017b). And last but not least we have to mention here the importance of education and the risk of non-education or low education (OECD, 2010; Costache (coord), 2014; World Economic Forum, 2017).

2. New managerial strategies for new challenges

Nowadays "The European social partners have recognised that digitisation is not just a technological issue, but it has wider social, work and economic implications. It is also a question of economic development and social cohesion" (European Commission, 2016b, p14).

Talking about the challenges that digitisation will bring, besides "...many potential benefits for industrial development…", "There will be winners and losers, and adjustments to make" (Smit *et al.*, 2016, p 72).

The strategic analysis of the main strengths, weaknesses, opportunities and threats (SWOT) of the Industry 4.0 is presented in Figure 1.

Figure 1. Industry 4.0 – SWOT analysis

STRENGHTS	WEAKNESSES
• Increased productivity, (resource) efficiency, (global)competitiveness, revenue • Growth in high-skilled and well-paid jobs • Improved customer satisfaction –new markets: increased product customisation and product variety • Production flexibility and control	•High dependence on resilience of technology and networks: small disruptions can have major impacts •Dependence on a range of success factors including standards, coherent framework, labour supply with appropriate skills, investment and R&D •Costs of development and implementation •Potential loss of control over enterprise •Semi-skilled unemployment •Need to import skilled labour and integrate immigrant communities
OPPORTUNITIES	**THREATS**
• Strengthen Europe's position as a global leader in manufacturing (and other industries) • Develop new lead markets for products and services • Counteracting negative EU demographics • Lower entry barriers for some SMEs to participate in new markets, links to new supply chains	• Cybersecurity, intellectual property, data privacy • Workers, SMEs, industries, and national economies lacking the awareness and/or means to adapt to Industry 4.0 and who will consequently fall behind • Vulnerability to and volatility of global value chains • Adoption of Industry 4.0 by foreign competitors neutralising EU initiatives

Source: Smit *et al*., 2016, "Industry 4.0", p. 72

Other challenges may be related to the long-term tendencies affecting the growth (European Commission, 2014) and with the global trends (ESPAS, 2016). In Table 1 there is a parallel view between long-term tendencies affecting the growth and global trends previously specified. As we can easily notice, in both documents, there are the same long-term tendencies which can affect the growth.

Table 1. Parallel view between long-term tendencies affecting the growth (European Commission, 2014) and Global trends to 2030 (ESPAS, 2016)

Long-term tendencies affecting the growth	Global Trends to 2030
-Social change	-Widening inequalities
-Globalisation and trade	-Vulnerability of the sustained development of the world economy in front of challenges and weaknesses in the globalisation process
-Productivity developments and the use of information and communications technology (ICT)	-Revolution in technologies involving digitization
-The pressure on resources and environmental concerns	-Managing scarcity of resources -The interdependence of countries and global governance.

Source: Authors own representation based on data from European Commission (2014) and ESPAS (2016)

Taking into consideration the importance and complexity of the subjects, the correct preparedness of the human capital is essential. According to a recent study there is a need for "…the emergence of a Skills Revolution -where helping people upskill and adapt to a fast-changing world of work will be the defining challenge of our time" In the same study it is also highlighted the fact that "Now is the time for leaders to be responsive and responsible…" (ManpowerGroup, 2016, p.2).

In the opinion of the McKinsey Global Institute (Manyika, 2017b, p.112) there are two broad categories of issues for policy-makers to consider. First, increasing the productivity by "accelerating development and deployment of automation" and second, "managing the redeployment to other productive activities of workers whose activities are automated".

Ultimately, the ability of government systems and public authorities to adapt will determine their survival. If they prove capable of embracing a world of disruptive change, subjecting their structures to the levels of transparency and efficiency that will enable them to maintain their competitive edge, they will endure. If they cannot evolve, they will face increasing trouble (Schwab, 2015, p. 8).

Experts in the management field offered for these new challenges various solutions, strategies, models and ideas of new management, leadership, innovation and creativity.

Some of the ideas for new managerial strategies adapted for the new challenges are presented below.

The recommendation offered by Schwab (Schwab, 2015, p. 9) to decision-makers is to embrace "… 'agile' governance, just as the private sector …".

The same solution, but for both the private and public sectors, is agreed by Isaksen and Tidd (Isaksen and Tidd, 2006, Preface) "Under these conditions, managers must learn how to become more flexible and agile in order to respond successfully". In their opinion "successful organizational transformation and managing change demand both leadership and management as well as creativity and innovation".

Roland Bel in his work 'Leadership and Innovation: Learning from the Best' (Bel, 2010, p.47) proposes as a new managerial strategies, learning from the experience of some of the most innovative companies. In the same time, Bel highlights the importance of having good leaders "And without great innovation leaders, there is no innovation".

3. Comparative analysis between Romanian, Germany, Poland and Denmark based by Digital Economy and Society Index 2017

Digital competitiveness is one of the new and very used terms when we talk about today's economy, along the classic term of competitiveness which is well known as a key determinant for growth and jobs.

At the European level, the evolution of the Member States in digital competitiveness is measured and tracked by The Digital Economy and Society Index (DESI) and the results are annually made public in the Europe's Digital Progress Report.

According with the definitions of DESI from the Digital Agenda website, it is an overall index, calculated as the weighted average of the five main DESI dimensions: 'Connectivity', 'Human Capital', 'Use of Internet', 'Integration of Digital Technology' and 'Digital Public Services'. Each one of the five main DESI dimensions is calculated as the weighted average of the DESI Sub-dimensions which in turn are calculated as the weighted average of the DESI Individual Indicators.

The DESI 2017 ranking is presented in Figure 2.

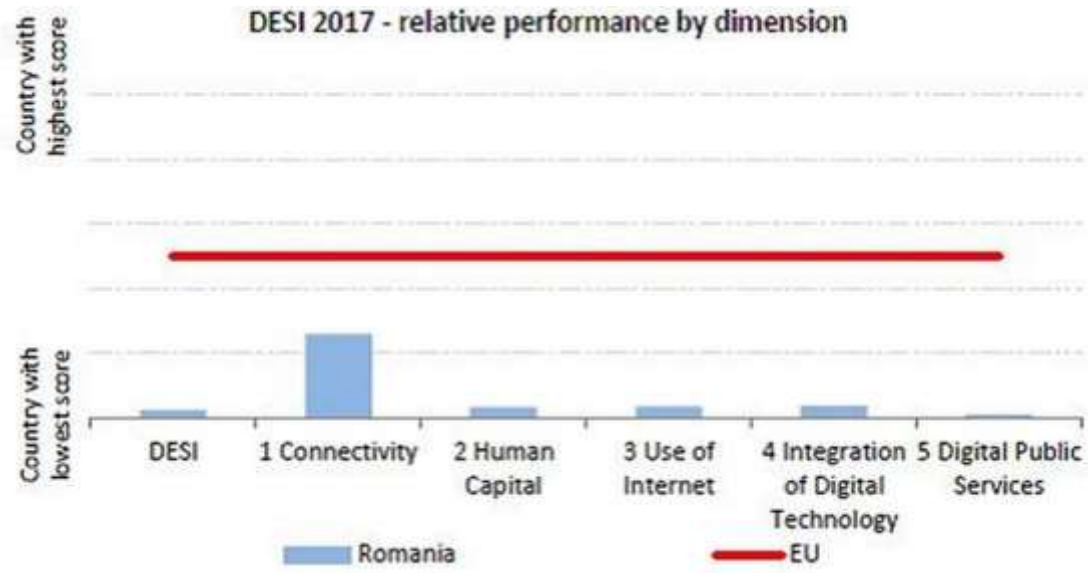
Figure 2. Digital Economy and Society Index (DESI) 2017 ranking

Source: European Commission, https://ec.europa.eu/digital-single-market/en/desi

As can be seen Romania occupies the last place in the ranking but the real problem consists in the fact that this happens despite the generous European framework dedicated to help Member States. In order to properly explain these results, we need to look at the evolution of the Member States since the democratization of the Eastern Europe. While several of Romania's neighbours moved quickly at governmental level towards the core functioning principles of the European Union, Romania's policy makers lagged behind. Therefore, crucial decisions like the liberalization of the economy, pragmatic public policies that answer real needs and using the technical know-how of experts in various fields, were postponed time and again. 2007, the year of Romania's accession to the EU was met with a level of unpreparedness which caused the slow and inefficient implementation of European policies.

In this chapter, through the comparative analysis between Romania and some of the better positioned countries on the European ranking, namely Denmark, Germany and Poland, we set to identify their digital strengths according to the five DESI dimensions. As was presented in the Introduction part of this paper, in the Digital Economy and Society Index (DESI) 2017 Romania occupies last place 28th, Denmark 1st place, Germany 11th place but well known as a digital industry promoter and Poland 23rd place, an Eastern European country with strong involvement in addressing new technological trends. Romania's place in the European rankings on digitisation by dimensions is presented as follow (Figure 3):

Figure 3. DESI 2017 –relative performance of Romania by dimension

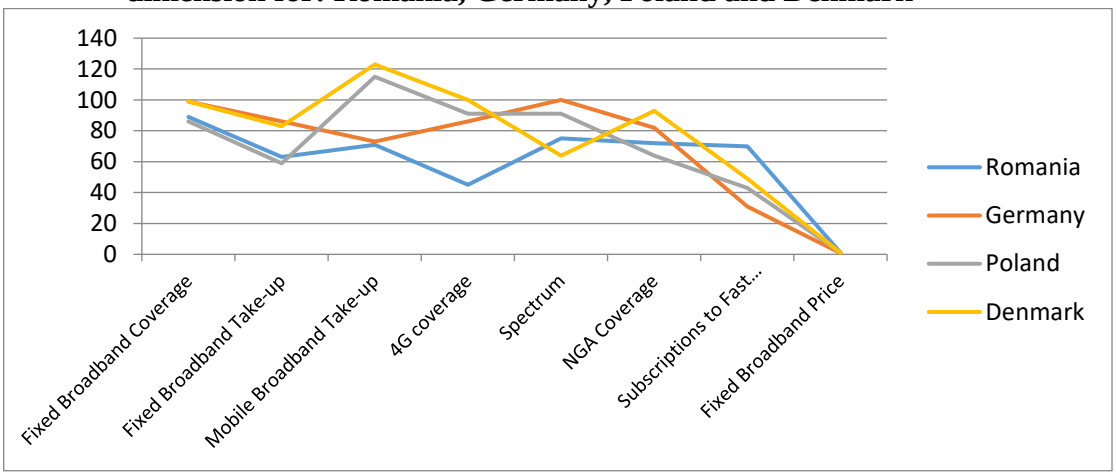


Source: European Commission, https://ec.europa.eu/digital-single-market/en/scoreboard/romania

For each dimension of the comparison, the values obtained by each country chosen for analysis, in DESI 2017 ranking, were used. The results of comparison for each dimension are the following:

a) Connectivity dimension. In the ranking of this dimension, Romania occupies rank 22, Germany rank 7, Poland rank 25, Denmark rank 4. The image of the Connectivity dimension in comparison between the four selected countries is presented in Figure 4.

Figure 4. The comparison between the value of the indicators included in the 'Connectivity' dimension for: Romania, Germany, Poland and Denmark



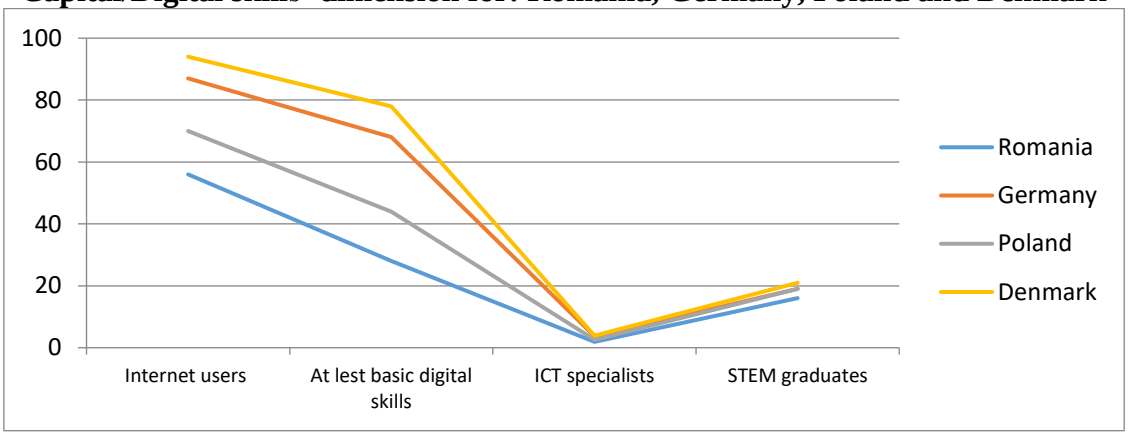
Source: Authors' own representation

Connectivity is the dimension for which Romania has the best ranking among all five occupying the 22nd place. This position is due to Romanian consumer preference for high-speed broadband, mobile and fixed point connections. Despite this position, the coverage of fixed and mobile (4G) broadband networks remains one of the lowest in the EU: coverage 45%, rank 28.

It should be mentioned here that connectivity is one of the indicators that mostly depends on the private areas of economy not the state public policies. Cable and internet companies have quickly covered the empty place left by the government, facilitating the urban sprawl of networks that soon offered a high standard of broadband connectivity. At the same time, it should be noticed that the rural area is woefully under covered at this time, though there are some initiatives to improve this aspect.

b) Human Capital/Digital skills dimension. In the ranking of this dimension, Romania occupies rank 28, Germany rank 8, Poland rank 21, Denmark rank 5. The image of the Human Capital/Digital skills dimension in comparison between the four selected countries is presented in Figure 5.

Figure 5. The comparison between the value of the indicators included the 'Human Capital/Digital skills' dimension for: Romania, Germany, Poland and Denmark



Source: Authors' own representation

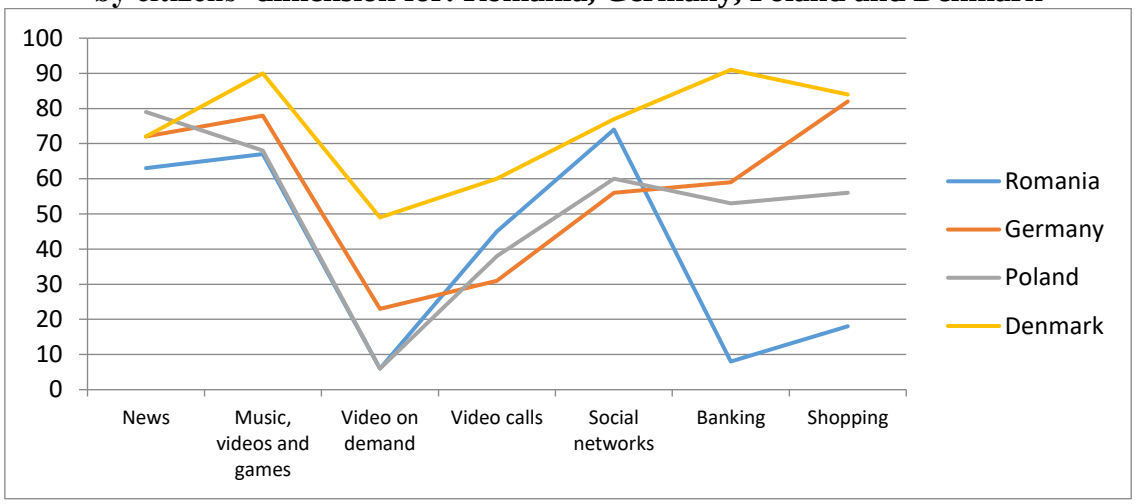
The ICT specialists and STEM graduates is a common problem. Romania has a 56% percent of 'Internet users' from the total population with a 28% percent with at 'At least basic digital skills'. There is an obvious difference between Romania and Denmark which has a 94% percent of 'Internet users' with 78% percent with 'At least basic digital skills'.

The small percentages obtained by Romania for this dimension reveal major weaknesses in the preparedness of human capital in the digitisation field, both in education and training. The responsibility for creating the framework for improving this aspect lies with the government. Taking into consideration the importance of this subject, a deeper analysis will be made in the results chapter.

c) Use of Internet by citizens dimension. In the ranking of this dimension, Romania occupies rank 28, Germany rank 18, Poland rank 24, Denmark rank 1. The image of the Use of Internet by citizens dimension in comparison between the four selected countries is presented in Figure 6.

Romanian citizens use the Internet in general for 'News' (63%), 'Music, videos and games' (67%) and 'Social networks' (74%). As we can see, these interests are common for all countries but the big difference consist in the interest of the three other countries in 'Online banking' and 'Online shopping', which also support the general economy. It is especially noticeable the high percent of Romanian citizens which use the Internet for 'Social networks' (74%), almost equal with Denmark (77%). At the same time we can observe the data about Poland which has almost the equal scores as Romania for the indicators 'News' (79%), 'Music, videos and games' (68%) and 'Social networks' (60%) but has a good score for online 'Banking' (53%) and 'Shopping' (56%) considerably higher than Romanian scores for Banking (8%) and Shopping (18%).

Figure 6. The comparison between the value of the indicators included in the 'Use of Internet by citizens' dimension for: Romania, Germany, Poland and Denmark



Source: Authors' own representation

The problems identified when analysing the third dimension 'Use of Internet by citizens', are mainly derived from the second one. The majority of people are unprepared for using digital tools in their own benefit. It looks like the only digital technologies which are actually used are those for entertainment, the other being reserved for 'specialists'.

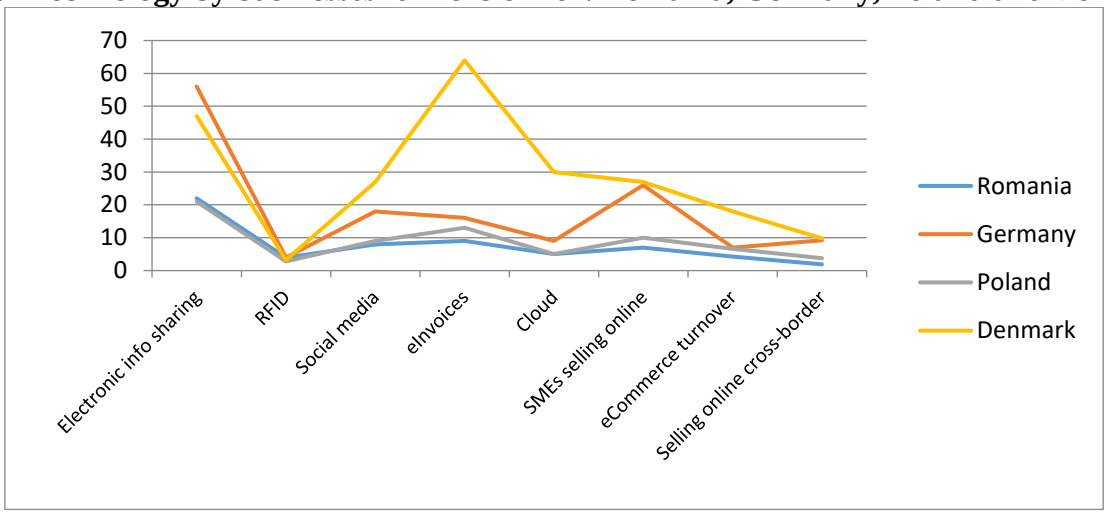
d) Integration of Digital Technology by businesses dimension. In the ranking of this dimension, Romania occupies rank 28, Germany rank 18, Poland rank 24, Denmark rank 1. The image of the Integration of Digital Technology by businesses dimension in comparison between the four selected countries is presented in Figure 7.

As we can see, the 'Electronic informatics sharing' is the only indicator where Romania has some progress in 'Integration of Digital Technology by businesses' dimension. The overall evaluation for this dimension is very low for Romania, the percent of 'SMEs selling online' or 'Selling online cross-border' positioned Romania at the last places in the ranking for these indicators, respectively rank 27 and rank 28.

Selling online is a new trend on boosting the growth of the European digital economy. This is supported by the Commission through the Digital Single Market Strategy (European Commission, 2015). At the Romania level, in supporting implementation of this strategy, there is 'National Strategy on the Digital Agenda for Romania 2020' (NSDAR) (Guvernul Romaniei, 2016b) approved by Government Decision no. 245/ 2015. The aim of the strategy is to ensure Romania's information and

communication technology (ICT) development at the level of the countries in the region and to establish the prerequisites of Romania's integration into the digital single market of Europe.

Figure 7. The comparison between the value of the indicators included in the 'Integration of Digital Technology by businesses' dimension for: Romania, Germany, Poland and Denmark



Source: Authors' own representation

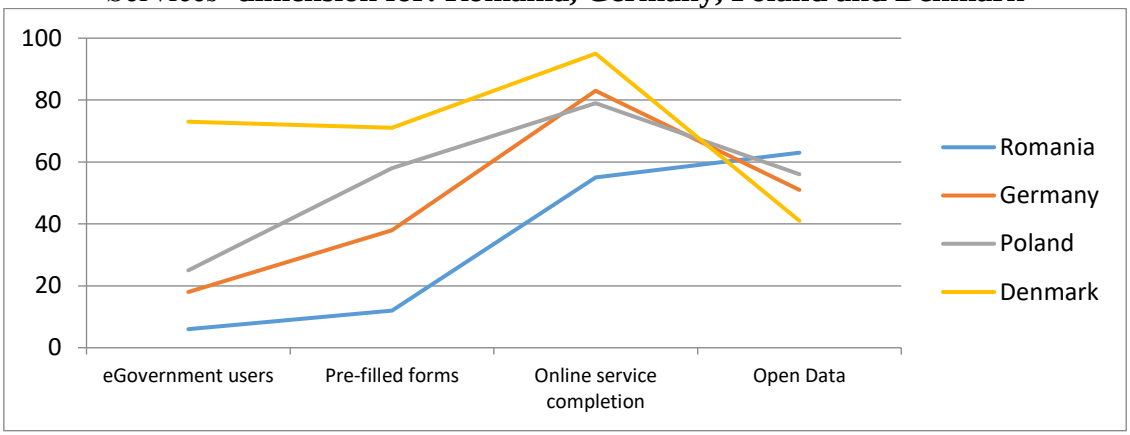
The reason for the small percentages obtained by Romania for this dimension is, on one hand the low level of preparedness of human capital with digital skills and, on the other hand, due to a lack of trust of Romanian consumers towards the digital market.

e) Digital Public Services dimension. In the ranking of this dimension, Romania occupies rank 28, Germany rank 20, Poland rank 14, Denmark rank 4. The image of the Digital Public Services dimension in comparison between the four selected countries is presented in Figure 8.

Except Denmark which has a high percent of 'eGovernment users' (73%), all three other countries have a low level of use of eGovernment services (Romania 6%, Germany 18%, Poland 25%). Romania continues to occupy the last place in the ranking for this indicator and even more worrying is the fact that internet users percent which use this service decreased by 2 p.p. in 2017 compared with 2016 (from 8% to 6%).

The same last place in the ranking is occupied by Romania at the 'Online Service Completion' indicator. A little bit of progress was made for 'Pre-filled forms' indicator, placing Romania on the 27th place compared with 28th place in 2016. The surprise at this dimension is coming from Poland which almost surpasses Germany in all aspects.

Figure 8. The comparison between the value of the indicators included in the 'Digital Public Services' dimension for: Romania, Germany, Poland and Denmark



Source: Authors own representation

The main reasons for Romania's position are the low level of preparedness of human capital with digital skills, the lack of strategic foresight and the lack of trust of Romanian consumers. This lack of trust was strengthened, for example, by the lack of competence by the government in the domain of online tax payments and issue of various certificates by the public authorities. Though promoted for years there still is a distinct lack of possibilities for Romanian citizens to pay their taxes online, to obtain various papers like records, certificates and such which are usually requested by public authorities from other authorities and instead of using digital means to transfer them, they impose on the citizen to basically take it from one place to another in printed form.

4. Comments of results

The 22th place occupied by Romania for Connectivity dimension concludes that Romania has a good base for digital development, but this is not enough to compensate the gaps for the others four dimensions.

Analysing the result of the comparison for all five dimensions, as it can be easily seen, it shows that the main problem is coming from the second dimension 'Human Capital/Digital skills'. The strengths and weaknesses identified in this dimension have a decisive influence on the performances recorded in the other four dimensions.

The analysis of the second dimension reveals major weaknesses in the preparedness of human capital with digital skills, aspect reflected by the 56% percentage of 'Internet users' and by the 28% percentage at users with at 'At least basic digital skills'.

Also, after the analysis of the digital skills indicator (all individuals) and compare countries, available at the digital-agenda-data.eu/charts, the results for Romania, in percentages, are: 40.5% 'No digital skills', 31,8% 'Low digital skills', 19,1% 'Basic digital skills', and only 8,59% 'Above basic digital skills'.

According with the Digital Agenda Scoreboard, the definition for 'Digital Skills Indicator (all individuals)' is:

> *Persons that have been using internet during last 3 months are attributed a score on four digital competence domains: information, communication, content-creation and problem-solving, depending the activities they have been able to do. The scores are basic, above basic and below basic. Individuals not using internet are classified without digital skills. The four digital competence domains are aggregated in four logical groups.*

The level 'Basic' is defining as "Individual having at least "basic" skills in ALL the four Digital Competence domains included in the index: information, communication, content-creation and problem-solving, but no more than three above basic". Unit of measure: percentage of individuals

This opinion about the very low level in preparedness of human capital with digital skills is also verified by comparison with the data about the education and training in Romania (European Commission, 2016c) (Table 2).

Table 2. Education and training Monitor 2016 -Key indicators Romania

ET 2020 benchmarks		Romania		EU average	
		2012	2015	2012	2015
Early leavers from education and training (age 18-24)		17.8%	19.1%	12.7%	11.0%
Tertiary education attainment (age 30-34)		21.7%	25.6%	36.0%	38.7%
Early childhood education and care (ECEC) (from age 4 to starting age of compulsory education) Data refer to 2011 and 2014		86.4%	86.4%	93.2%	94.3%
Proportion of 15 year-olds with underachievement in:	Reading	37.3%	38.7%	17.8%	19.7%
	Maths	40.8%	39.9%	22.1%	22.2%
	Science	37.3%	38.5%	16.6%	20.6%
Employment rate of recent graduates by education attainment (age 20-34 having left education 1-3 years before reference year)		70.2%	68.1%	75.1%	76.9%
Adult participation in lifelong learning (age 25-64)		1.4%	1.3%	9.2%	10.7%

Source: Authors' own representation based on dates from European Commission, 2016c

The 'European Innovation Scoreboard' (European Commission, 2016d) and the OECD 'Programme for International Student Assessment' (PISA) (OECD, 2016b) are reflecting the same weaknesses. The PISA is testing the skills and knowledge of 15 year-old students, measuring their reading, math and science literacy. The highest performance in PISA tests was obtained by Romania in 2012 with 445 score in Maths, 439 in Science and 438 in Reading. The scores obtained in 2015 are: 444 (Maths), 435 (Science) and 434 (Reading). Romania has been participating in PISA tests since 2006. The OECD 2015 averages are: 490 (Maths), 493 (Science) and 493 (Reading).

As the Government is responsible for education and training, the main cause for this issue is represented by the lack of a coherent and sustainable strategy in these fields. Private initiative should be encouraged to improve this aspect, taking into consideration that until now, the digital transformation was promoted by private sector rather than by public policies.

The main recommendation of OECD (Kitchen *et al*., 2017) for Romania after 'Reviews of Evaluation and Assessment in Education –Romania 2017' is referring to the strengthening of strategic planning through developing a long-term national strategy for education. Also the education strategy mirrored in a new legislative approach has to be linked to the wider national development objectives.

The 2016 'Competitive Romania' strategy, in the Education chapter, states that "The identified problems arise from the lack of a clear methodological framework for the implementation of the principles …" (Guvernul Romaniei, 2016a, p. 16). The 'Competitive Romania' is a project for sustainable economic development which imposes the need for "… demonstrating political and societal consensus on the main areas for action in 2016-2020 that are necessary to put Romania on the path of sustainable economic development" (European Commission, 2017, p.14).

The consequences which derive from the low level of preparedness of human capital with digital skills can be severe, both at the individual and the national level. The main consequence can be seen in the Figure 1, the strategic analysis of strengths, weaknesses, opportunities and threats (SWOT) of the Industry 4.0, and concerns the possibility of falling behind this new industry. Also, in the first chapter 'The need for digital skills' are presented several resources which analyse the subject. We can mention here, as an example, the 2014 final report for UNICEF: 'Cost of non-investment in education in Romania' (Costache (coord), 2014) or 'The High Cost of Low Educational Performance. The long-run economic impact of improving PISA outcomes' (OECD, 2010).

Analysing the efforts Romania undertakes in this direction, we can notice one possible solution in the 'Europe's Digital Progress Report' *(*EDPR) 2017 (European Commission, 2016e, p.5). It mentions that the Romanian Ministry of Education and Research is preparing "some initiatives to

tackle this issue" in order to "increase the digital skills of the new generation". At this time, there is a 'Strategy of Education and Professional Training in Romania for the period 2016-2020' (Guvernul Romaniei, 2015) approved by Government Decision no. 317/2016. The overall objective of the strategy is to develop a system of education and training adapted to the requirements of the labour market and the needs of the direct beneficiaries.

The current scientific studies offer many solutions and strategies in order to increase the level of digitisation in Romania but it success mostly depends on the policy makers. In the second chapter 'New managerial strategies for new challenges' we presented the new manager's profile, "more flexible and agile", applicable for both the private and public sectors.

The gap between digital competence and digital incompetence will probably be the main indicator of class divide in the present century. Only pragmatic and applied strategies can reverse this trend and these can only be directed by the government.

Conclusions

The main reason which motivated us to elaborate this study was the constantly low Romanian position in the DESI ranking in the context of global transformation through digitisation.

As we can see, the society and the economy are under major transformation due to the process of digitisation. Through SWOT analysis, we saw which are the benefits and which are the challenges of this process and we also saw the global risks it poses.

Thus, having regard the Romanian score reported to the digitisation risk and the global context mentioned above, we can easily conclude that Romania risks being left behind by this new revolution.

After completing the comparative analysis between Romania and some of the better positioned countries on the European ranking, we concluded that the main weakness of Romania, which prevents its climb in the rankings, is the low level of preparedness of the human capital with digital skills. This supposition was verified and confirmed by the actual status of the key indicators about the education and training in Romania and by the other evaluation reports in the field. For this issue we have identified the necessity of a new strategy, a long-term one linked to the wider national development objectives.

Also, we saw there are several studies and examples of strategies in the management field and the same about the digitisation process, on which can be built a successful development model. We have chosen for our subject of study, as a theoretical strategy, learning from the experience of the

better positioned countries on the European ranking. Identifying their strengths by approaching their strategies and policies and adapting them, can be a solution to address Romanian's weaknesses.

One of the common ideas in most governmental strategies involves the financing, through national and European funds, of requalifying workers in various outdated economic fields. Unfortunately this approach proved to be little bit more than wishful thinking in some areas. While the education system provides a relatively adequate framework for children and young adults to develop the needed digital competencies, the reality of the adult workforce make it a far more difficult proposition to basically change the fundamental approach to working in the modern economy.

Any state must encourage such strategies and measures that try to help adult workers to adapt to the new realities of the digital world. It is to be expected however that such changes will be slow and with a significant degree of failure. There are significant differences between member states in this regard, between various regions and also between urban and rural areas. Therefore, any economic measures taken in support of digitising industrial branches need to be supported by social measures that take into account the differences mentioned above.

However, until digital skills are a 'major priority' for Europe it is of vital importance that the policy makers from Romania adopt such a strategy that really responds to the identified needs and, at the same time, is in correlation with European framework. The future of the Romania economy and not only that will depend on this strategy.

This paper focuses only on identification, by comparison with the better positioned countries on the European ranking, of the main aspects which 'keep' Romania at the end of the European ranking regarding digitisation. The results can be used both by academics and by policy makers in order to find an appropriate solution for the identified issues. The causes and the optimal solutions regarding the future of the digitisation in Romania will be the subject of a new paper. Also, building on the foundation of this paper, an in-depth comparative analysis of the public policies from the countries chosen above, will constitute the object of the new study.

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