

Chapter 15

Report on ICT in Education in Romania



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15.1 Overview of the Country

15.1.1 Geography

Romania is a country located in Southeastern Central Europe, North of the Balkan Peninsula, on the Lower Danube, within and outside the Carpathian arch, bordering on the Black Sea. The area is about 92,043 miles² (238,391 km²). Almost all of the Danube Delta is located within its territory. It shares a border with Hungary and Serbia to the west, Ukraine and the Republic of Moldova to the northeast, and Bulgaria to the south.

15.1.2 Population

According to NIS (2018) Romania has the ninth largest territory and the seventh largest population (with 19.50 million resident population) among the European Union member states. Its capital and largest city is Bucharest with more than 2 million people. Other large cities are Iasi, Cluj Napoca, Timisoara, or Constanta. Romania's population lives in 320 cities and towns and 12,956 villages.

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Other facts about Romania:

- The main ethnic groups are Romanian 84%, Hungarian 6.1%, Gipsy 3.1%, German 0.2%, Ukrainian 0.2%. As for religions the majority is Christian Orthodox 81%, with a presence of Roman Catholic 4.3%, Reformed 3%, Greek-Catholic 0.7%, Unitarian 0.3%, Jewish, and others.
- Romania's National Day is December 1st.
- Romania's flag is three-colored, the colors being placed vertically in the following order from the flagpole: blue, yellow, red.
- The currency is Leu (plural Lei, abbreviations Lei or RON).

15.1.3 History

The name "Romania" comes from the Latin word "Romanus" which means "citizen of the Roman Empire." Romania history includes periods of rule by Dacians, the Roman Empire, the Kingdom of Hungary, and the Ottoman Empire. As a nation-state, the country was formed by the merging of Moldavia and Wallachia in 1859 and it gained recognition of its independence in 1878. Later, in 1918, they were joined by Transylvania, Bukovina, and Bessarabia. At the end of World War II, parts of its territories were occupied by the USSR and Romania became a member of the Warsaw Pact. With the fall of the Iron Curtain in 1989, Romania started a series of political and economic reforms.

Since December 1989, Romania has pursued a policy of strengthening relations with the West in general, more specifically with the United States and the European Union. It joined the North Atlantic Treaty Organization (NATO) on March 29, 2004, the European Union (EU) on January 1, 2007, while it had joined the International Monetary Fund and the World Bank in 1972, and is a founding member of the World Trade Organization.

15.1.4 The Political System

- The legal system is based on European models and the Constitution of 1991.
- The electoral system is a universal direct suffrage over the age of 18. Parties must win at least five percent of the national vote to gain representation in the Parliament.
- The Head of State is President of the Republic, currently Mr. Klaus Werner Iohannis (elected on November 16, 2014). Romania's president can serve two consecutive five-year terms.
- The National Government is led by the Prime Minister, nominated by the political party—or political alliance—with parliamentary majority, approved by the President of Romania, and confirmed by the Parliament. The present Government has

been nominated by the political alliance formed by the Social Democratic Party (PSD), and the Liberal-Democratic Alliance (ALDE).

- The presidency of the Council of the European Union is currently (as of January 2019) held by Romania (<https://www.romania2019.eu/home/>).

15.1.5 *General Situation of Science and Technology*

Through history, the Romanian researchers and/or inventors have made notable contributions to several scientific fields, such as: aeronautics, medicine, mathematics, computer science/engineering, (bio)physics, (bio)chemistry, biochemistry, and biology. Here are some Romanians that changed the life without even knowing:

- In *Aeronautics*, three names made history: Traian Vuia made the first airplane to take off on its own power, Aurel Vlaicu built and flew some of the earliest successful aircraft, and Henri Coandă discovered the Coandă effect of fluidics.
- In *Biology*: Victor Babes discovered more than 50 germs and a cure for a disease named after him, *babesiosis*; Nicolae Paulescu discovered insulin; Emil Palade received the Nobel Prize for his contributions to cell biology; George Constantinescu created the theory of sonics; Lazăr Edeleanu was the first chemist to synthesize amphetamine and also invented the modern method of refining crude oil; Costin Nenițescu found new methods for the synthesis of pirilium salts, carbenes, tryptamine, serotonin, two new syntheses for the indole nucleus, and a new method of polymerization of ethylene; Emil Racoviță—founder of biospeleology (the study of organisms living in caves).
- In *Mathematics*, there are several scientists that distinguished themselves as well. Among them Stefan Odobleja—the ideological father behind cybernetics. Another important fact, from the recent history, is that Romanian mathematics team is the first in Europe and tenth in the world.
- In *Physics*, as notable inventors we have Mihai Gavrilă, specialized in quantum theory and discoverer of the atomic dichotomy phenomenon; Alexandru Proca, known for the first meson theory of nuclear forces and Proca's equations of the vectorial mesonic field; Stefan Procopiu known for the first theory of the magnetic moment of the electron in 1911 (now known as the Bohr-Procopiu magneton); Theodor V. Ionescu's patent for 3D imaging in cinema and television in 1936; Eugen Pavel is the Romanian scientist who invented the Hyper CD-ROM, a 3D optical data storage medium that has a storage capacity of 1,000,000 GB, equal to 10,000 classic CDs; Ionel Solomon known for the nuclear magnetic resonance theory in solids, Solomon equations and photovoltaic devices.
- In *Engineering* Aurel Perșu contributed to the car's look as we know it today. He was the first to place the wheels inside the body of the car. The parachuted chair, an early form of today's ejector seat, was invented by Anastase Dragomir.
- Petrache Poenaru invented the world's first fountain pen.

- One of the first women to develop anti-ageing products was Ana Aslan, who discovered the anti-ageing effects of procaine, today found in Gerovital H3 and Aslavital products. She also founded the first Geriatric Institute in the world in 1952.
- And recently, a 20 years old Romanian computer scientist designed the cheapest self-driving car. While there are currently about ten self-driving cars in the world, Romanian Ionut Budisteanu's is the least costly, by far, at only USD 4000. Budişteanu won the Gordon E Moore grand prize at the 2013 Intel International Science and Engineering Fair (ISEF) for his low-cost, self-driving car.

Other interesting facts related with science are:

- A Romanian city was the first in Europe to have electric street lighting. It happened in 1889 in the Romanian city of Timișoara (the city was also the first European city to introduce horse-drawn trams in 1869).
- Bitdefender—one of the best antivirus/Internet security software suites—was developed by Romanian company Softwin.
- The nuclear physics facility of the European Union's proposed Extreme Light Infrastructure (ELI) laser will be built in Romania. Romania currently has 1400 MW of nuclear power capacity by means of one active nuclear power plant (Cernavodă) with two reactors, which constitutes around 18% of the national power generation capacity of the country. This makes Romania the 23rd largest user of nuclear power in the world.
- In early 2012, Romania launched its first satellite from the Center Spatial Guyanais in French Guyana.

15.1.6 The Relationship with China Under the “16 + 1” Cooperation Framework

In 2012, the “16 + 1” economic cooperation format was set up as an important part of China's foreign strategy in the context of the Belt and Road Initiative (B&R),¹ between the Central and Eastern European (CEE) countries and China. The “16 + 1” format refers to various mechanisms and collaborations between China and 16 CEE countries, representing a way to strengthen their economic relations. Since its inauguration, the “16 + 1” format has been widely accepted in CEE countries and has witnessed rapid developments. Each year, the China-CEE summit (including meetings of the China-CEE leaders at the level of Prime Ministers), is held along with the China-CEE Economic and Trade Forum. Thus, progress has been made in institutionalizing cooperation mechanisms in various fields, usually taking the form of an association, forum, or collaboration opportunity that facilitates contacts between China and CEE.

¹The State Council. The People's Republic of China. The Belt and Road Initiative. <http://english.gov.cn/beltAndRoad/>.

The international literature already incorporates a significant number of papers about the economic and political aspects related to “16 + 1” framework. Up to date, in Romania there is little in-depth research and there are few relevant papers on this topic and even fewer about education and research. Therefore, writing about this issue is not an easy task and it still is in an exploratory phase.

Talking about the relations between Romania and China, the two countries refer to each other as being “old friends,” invoking a “traditional friendship” that started almost 70 years ago and ties the two nations separated by more than 8000 km.² But when it comes to “16 + 1” format, Romania has an important role. Here are some optimistic milestones worth mentioning (Pantea 2018)³:

- The “16 + 1” 2nd summit was held on Bucharest in October 2013 and issued *The Bucharest Guidelines for Cooperation between China and CEE Countries*. As for Romania, in November 2013 it was the first country among the CEE countries, which Chinese Premier Li Keqiang visited and the meeting concluded with a *Joint Declaration on Deepened Bilateral Cooperation*.⁴ The Chinese Premier said: “I believe that China-Romania cooperation may become a banner for China-CEE countries cooperation and that China-CEE countries cooperation will surely add new impetus to China-Europe relations.”
- In 2013, the first Confucius Institute within the University of Bucharest was inaugurated on the 22nd of November, after the Agreement for cooperation was signed by the University of Bucharest and Hanban—the General Headquarters of the Confucius Institutes. Since then more than 10 institutes were opened in different cities.
- In October 2014, the 9th China-CEE countries Agro-trade and Economic Cooperation Forum was held in Bucharest, Romania. In the same year, China signed with Romania cooperation documents on the peaceful use of nuclear energy. Currently, China is Romania’s main trading partner in Asia, but it is only on the 19th place among foreign investors in our country, with investments value of about USD 440 million in 226. The main Chinese investors in Romania in the last years are: Huawei, China Tobacco International Europe Company, Yuncheng Plate Making, Eurosport DHS, and ZTE. Some of the longer term projects touted by both countries regarding Chinese investment in Romania have yet to come to fruition: the memorandum of cooperation for the Cernavodă Nuclear Power

²Ministry of Foreign Affairs of the RPC (September 27, 2015). Xi Jinping Meets with President Klaus Iohannis of Romania. http://www.fmprc.gov.cn/mfa_eng/topics_665678/xjpdmgjxgswbcxlhgc170znlffh/t1302374.shtml.

³Embassy of the RPC in Romania (November 29, 2017). Five-year Outcome List of Cooperation Between China and Central and Eastern European Countries, <http://ro.chineseembassy.org/rom/xw/t1515015.htm>.

⁴Romanian Government (November 25, 2014). Joint Declaration by the Government of Romania and the Government of the People’s Republic of China on deepening bilateral cooperation in the new circumstances. <http://gov.ro/en/news/joint-declaration-by-the-government-of-romania-and-the-government-of-the-people-s-republic-of-china-on-deepening-bilateral-cooperation-in-the-new-circumstances>.

Plant, the joint venture for the Rovinari Coal-Fired Power plant, as well as other projects including the Tarnița Hydropower Plant.

- In 2015, China signed interdepartmental *Memorandum of Understandings on Jointly Building the Silk Road Economic Belt with Macedonia and Romania*. In May 2015, Chinese Performing Arts delegation visited Hungary, Serbia, and Romania to purchase programs.
- Since 2015 in Beijing there is a Romanian Cultural Institute.
- The Romanian Energy Center (CRE) professional association was named at the Government meeting on September 21, 2016, through a Memorandum, as “pillar of the Centre for Dialogue and Cooperation in Energy (CDCEP) activity - the Romanian initiative within the ‘16 + 1’ format of economic cooperation between Central and Eastern European countries and China.” The Center for Dialogue and Cooperation on Energy Projects “16 + 1” (CDCEP 16 + 1) was established in October 2016, as a Romanian initiative within the “16 + 1” format, to provide a dynamic networking platform for advancing cooperation in the field of energy between the partner countries. The activity of the CDCEP “16 + 1” is coordinated by The Romanian Energy Center (CRE).
- In May 2017, Asian Infrastructure and Investment Bank (AIIB) approved Romania as a new prospective member. The China-CEE countries Political Parties Dialogue and the 3rd China-CEE countries Young Political Leaders’ Forum were held in Bucharest, Romania in July 2017. Later the same year, in November, the China-CEE countries Energy Forum and Expo were held in Bucharest.⁵ The Forum issued a white paper on energy cooperation dialogue and a minister’s statement on conducting joint research for energy cooperation.
- In 2016 and 2017, “Martial Arts on the Silk Road” training sessions were held in Hungary, Romania, and Croatia. As for 2018, martial arts experts will be sent to Poland, Romania, and other CEE countries for “Martial Arts Silk Road” Training Camp.
- The Participants at the 7th Summit of China and CEE countries held in Sofia Bulgaria on July 7, 2018 support Romania in establishing a “16 + 1” Smart City Coordination Center.⁶ Also, the participants support Romania in organizing a conference on the promotion of women entrepreneurship in 2019.
- Memorandum of cooperation in the field of transport and infrastructure between the Ministry of Transport of Romania and the National Development and Reform Commission of the People’s Republic of China was signed in 2018 on the sidelines of the “16 + 1” summit taking place in Sofia. The memorandum reflects the firm common interest of the parties to deepen and diversify bilateral cooperation in two sectors that are key to economic development, such as transport and infrastructure. The document will strengthen the framework and the premises for

⁵China Daily (November 3, 2017). Romania hosts the first Energy Ministerial Conference and Fair within the China—Central and Eastern Europe cooperation format. http://www.chinadaily.com.cn/bizchina/2017-11/03/content_34066287.htm.

⁶Embassy of The RPC of Finland (July 9, 2017). The Sofia Guidelines for Cooperation between China and Central and Eastern European Countries. <http://www.chinaembassy-fi.org/eng/zxxx/t1577455.htm>.

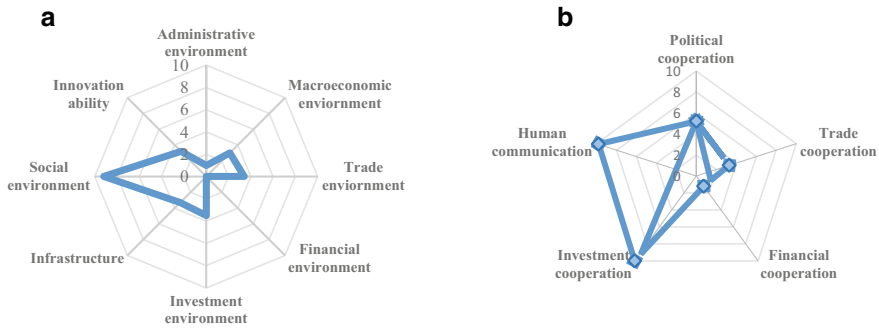


Fig. 15.1 **a** Radar chart of business environment of Romania, **b** radar chart of China–Romania bilateral cooperation. *Source* Xin and Chengyu (2017)

China’s involvement in the materialization of some Romanian projects in these two areas whose development is a priority for the Romanian side.⁷

- China opened at Bucharest in 2018 the first Visa Center for China, the only one of his kind from CEE countries.

As shown in Fig. 15.1a, b, Romania is doing well in 2016 both in the business environment and bilateral cooperation (being outstanding in the field of investment and people-to-people exchange). There are still some modest areas such as the aspects of investment and financing, trade, infrastructure, innovation ability, and macroeconomy. This indicates that Romania should improve the political environment and financial environment. In addition, Romania is doing good in the field of politics and trade and the financial cooperation should be enhanced.

Education is to be found under one of the nine pillars of the “16 + 1” framework, namely, “culture-education-youth-sport-tourism.” The Romanian’s perspective of the cooperation in education between China and Romania, as a UE member, can be followed under the following aspects:

- Since three decades ago, Romania has recognized that there is a significant potential of cooperation with China, being one of the countries with the highest percentages of positive views on China (Oehler-Şincai et al. 2017). According to official declarations, Romanian authorities support bilateral cooperation and “One Belt, One Road” and “16 + 1” (seen as important channels of cooperation and mutual understanding). Nonetheless, this does not translate into practice through a high level of bilateral cooperation intensity. Therefore, at the educational level, Romania is *still low level of cooperation intensity with China* due to several factors, such as cultural differences (for e.g., China sees all countries in the bloc, although there are differences between CEEs countries educational systems), economic,

⁷Romanian Government (July 7, 2018). Prime Minister Viorica Dancila participates in the Summit of the China—Central and Eastern European Countries cooperation format. <http://gov.ro/en/news/prime-minister-viorica-dancila-participates-in-the-summit-of-the-china-central-and-eastern-european-countries-cooperation-format#null>.

regulatory (EU legislation—Romania is still sensitive at any negative signals from Brussels towards China) or lack of general knowledge and understanding of China (for e.g., only several academics know in detail the 16 + 1 mechanisms), etc.

- In spite of that, even if there have been proposed concrete measures of cooperation in the area of education and research, no large-scale project has been implemented until now, *only relative small-scale projects* (see the recent call for bilateral projects Romania–China by UEFISCDI⁸). In our opinion, it is needed a critical level of political will, understanding and trust between China and Romania in order to start significant bilateral projects. Besides, the EU legislation with all its limitations and constraints must be taken into account.
- There is a strong need for increasing awareness of the Chinese initiative in the field of higher education and its potential impact on the Romanian system.
- To focus more on Erasmus + program to facilitate student’s exchanges, to increase teacher’s and researcher’s academic mobility, to create joint masters or research platforms, to held different conferences or other scientific events, etc.
- To *enable increased international collaboration in research and innovation*. Future collaboration between Chinese–Romanian HE institutions to be considered. There is a need to establish collaboration protocols between Romanian universities and prestigious similar institutions from China, to benefit from existing opportunities offered by such partnerships and/or networking.
- To *strengthen dialogue and cooperation* between our countries in the field of higher education/research, to develop/facilitate projects among Chinese and Romania university on key issues of collaboration such as doctoral education and training, university governance and academic leadership.

Although since 2012 all these activities have been integrated under the EU–China High Level People-to-People Dialogue (HPPD), the third pillar of EU–China relations (complementing the other two pillars—the High Level Economic and Trade Dialogue and the High Level Strategic Dialogue) there still is a need to open up space for dialogue and cooperation on a wide range of issues related to doctoral education, bringing real benefits to both Romanian and Chinese higher education institutions, policymakers, students, supervisors, employers, and relevant players.

Romania is a semi-presidential democracy based on a bicameral Parliament: the Chamber of Representatives or “Chamber of Deputies” (<http://www.cameradeputatilor.ro/pls/dic/site2015.home?idl=2>) and the Senate (<http://www.senat.ro/>). All members of the legislature are directly elected from Romania’s 41 counties.

For further general information see:

- Romania in figures (NIS 2018) from National Institute of Statistics <http://www.insse.ro/cms/en/tags/romania-figures>
- Wikipedia: Romania, <http://en.wikipedia.org/wiki/Romania>

⁸Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI) (2018). Mobility projects—Competition Bilateral Cooperation Romania–China. <https://uefiscdi.ro/proiecte-mobilitati-pmroc2018-141>.

- POERUP project country report: Romania, <http://poerup.referata.com/wiki/Romania>
- Eurostat (2018). My country in a bubble, an interactive tool to compare EU countries on several indicators. <https://ec.europa.eu/eurostat/cache/BubbleChart?!g=en#tableCode=tin00073>.

15.2 Overview of the Educational Development⁹

Since the Romanian Revolution of 1989, the Romanian educational system has been in a continuous process of reform that has received mixed criticism. Romania's education system is centralized, both horizontally and vertically. All key responsibilities for education strategy, policy, and delivery are concentrated within the Ministry of National Education.¹⁰ The 2011 Education Law¹¹ defined the current organization and operation of the education system and it consists of:

- The pre-university system that contains the following levels:
 1. early childhood (0–6 years), consisting of the ante-preschool (0–3 years) and preschool (3–6 years);
 2. primary education, including the preparatory class and grades I–IV;
 3. secondary education, including:
 - (a) lower secondary education or secondary education, which includes classes V–IX;
 - (b) secondary education or secondary education?, which includes X–XII/XIII classes with the following channels: general, vocational and technological
 4. vocational education lasting six months to two years;
 5. pre-university tertiary education, including postsecondary education.

The pre-university education system also includes related units: “Houses of the Teaching Staff” (Teacher Training Centers), County Centers for Pedagogical and Psychological Assistance, School Inspectorates.

⁹For further general information see:

Wikipedia: Education in Romania, https://en.wikipedia.org/wiki/Education_in_Romania.

Kitchen et al. (2017), Romania 2017, OECD Publishing, <http://dx.doi.org/10.1787/9789264274051-en>.

MENCs (2015). State school education report in Romania, <https://www.edu.ro/sites/default/files/Raport%20Stare%20invatamant%20preuniversitar%202015.pdf>.

UNICEF Romania, <https://www.unicef.org/romania/overview.html>.

UNESCO Romania, <http://www.ibe.unesco.org/en/country/romania>.

EURYPEDIA Romania, <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/Romania:Overview>.

¹⁰<http://www.edu.ro>.

¹¹http://keszei.chem.elte.hu/bologna/romania_law_of_national_education.pdf.

During 2016–2017 in Romania 3.642 million of the population were enrolled in school and 237.400 teachers (according to National Institute of Statistics), meaning one teacher for 15 pupils/students. Out of these, 95.7% were in public schools and 4.3% in private institutions: 15.2% in kindergarten (3–6 years), 47% in primary, and 18.5% in secondary level and high schools.

Kindergarten is optional between three and six years old. Since 2012, compulsory schooling starts at age six with the “preparatory school year” and is compulsory until tenth grade. Primary and secondary education is divided into 12 or 13 grades. There also exists a semi-legal, informal private tutoring system used mostly during secondary school, which has prospered during the Communist regime.

The results of the PISA assessment study in schools for the year 2012 placed Romania on the 45th rank out of 65 participant countries and in 2016 the Romanian government released statistics showing 42% of 15-year-olds are functionally illiterate in reading, though Romania often wins medals in the mathematical Olympiads and not only.

Higher education is aligned with the European Higher Education Area, the Bologna Agreement. As a result, most Bachelor’s programs take three years to complete. However, some programs last longer—for example, some technical fields, medicine, and architecture. Master’s programs take two years beyond the Bachelor’s degree. Master’s programs are a prerequisite for admission to Ph.D. programs. Ph.D. programs usually take three years to complete. Under special circumstances, the duration of the study may be extended by one or two years. Romania has a large higher education sector with 54 public universities and approximately 40 accredited private universities. Among them Alexandru Ioan Cuza University of Iași, Babeș-Bolyai University of Cluj-Napoca, University of Bucharest, and West University of Timișoara have been included in the QS World University Rankings’ top 800.

According to EC (2017, 2018) Romania is reforming its primary and secondary curriculum for the first time in almost two decades. In a nutshell here are some highlights drawn out from EC (2017, 2018) (Fig. 15.2):

- Plans are underway to train teachers to teach the modernized curriculum. According to the Federation of Education Unions, Romania is the only country

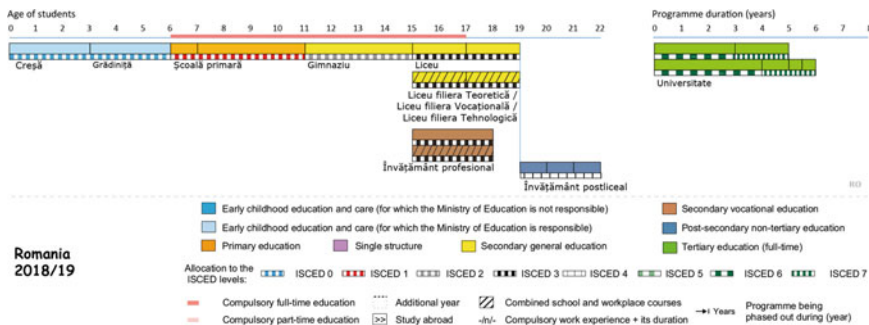


Fig. 15.2 Structure of the education system. Source EC (2018, p. 247)

in the European Union in which unqualified teachers are officially part of the education system—making up numbers 4500 strong in 2017. In this respect the Ministry of Education run between Nov 2017–Nov 2021, the “CRED: Relevant Curriculum, Open Education for all” project, financed by the ESF to support the ongoing curricular reform, with a total budget of EUR 42 million. The aim of the project is to facilitate the understanding of the new competence-based student-centered curriculum and modernize teaching practices. Almost 55 000 teachers and 2500 students in primary and lower secondary education will be trained in how to teach the new curriculum and how to adapt teaching to the specific needs of students, including students at risk of dropping out. The main output is to developed Open Educational Resources for classroom activities.

- Underachievement in basic skills remains one of the highest in the EU. This is due to educational factors and equity challenges. According to OECD today, 40% of Romanian 15-year-olds still lack the foundation skills they need for lifelong learning and productive employment.
- Access to quality mainstream education is particularly a challenge for students in rural areas and for Roma.
- Funding for education is very low. Romania spends the lowest amount on education in the EU at €248 per capita, compared to an EU average of €1400 per capita, which can be seen as a reflection in the funding which in turn creates a new teacher shortage. Furthermore, teachers in Romania on an average earn around €300 per month, which is around 10 times less money than some of their European counterparts.
- Early school leaving risks remaining high, with consequences for the labor market and for economic growth. According to EC (2018) Romania still has among the highest dropout rates in the EU in both primary and lower secondary education. The dropout rate at both levels has increased in the past decade.
- The labor market relevance of higher education is improving, but tertiary educational attainment is the lowest in the EU. Also there is an urgent need to adopt measures that aim to address quality and labor market relevance.
- Efforts to introduce dual vocational education and training are underway. Dual VET was launched in 2017 and it is organized at the initiative of interested companies based on a partnership contract between schools and employers and individual training contracts for students. According to EC (2018), in September 2017, 2412 students (the equivalent of 8% of students in professional schools) were enrolled in the first year of dual VET at European Qualifications Framework (EQF) level three and 106 dual classes in 68 schools were organized, in cooperation with 227 companies. The next step will be to set up the methodology for conducting entrance examinations to dual VET at EQF levels four and five.
- Adult participation in learning remains low despite the need for upskilling.
- Roma inclusion in education remains a major challenge. In this context, the 2018 European Semester country-specific recommendations call on Romania to “improve the provision of quality mainstream education, in particular for Roma and children in rural areas” (EC 2018).

Started with 2018, as mentioned in the EC (2018) Romania is preparing a strategy to modernize the entire educational infrastructure, to guide investment from national and EU funds, and address significant efficiency and equity challenges. This is related especially with the facts that in 2018 there are still huge differences from other EU countries:

- almost 10% of schools are overcrowded (particularly in urban areas), while 60% are underutilized (especially in rural areas);
- school transportation services are overall insufficient and inadequate, while accessibility worsens as student's advance through the school system;
- 38% of schools in rural areas have outside toilets, without running water or sewage (7% in urban areas) and only 20% have a library (60% in urban areas);
- several universities do not possess sufficient accommodation facilities.

Despite recent efforts, quality assurance in school, education remains largely focused on compliance and not on increasing standards (EC 2018). In his respect recent policy developments address some of the challenges around persistent inequality and low levels of acquisition of basic competencies. These include official documents as follows:

- UNESCO (2014). *Romanian Education for all*. Review Report (<http://unesdoc.unesco.org/images/0023/002303/230309e.pdf>).
- *Romania's national strategies developed under the Europe 2020 agenda*, which target some important systemic issues facing the education sector (<https://ec.europa.eu/epale/sites/epale/files/strategia-nationala-agenda-digitala-pentru-romania-20202c-20-feb.2015.pdf>).
- *The National Strategy to Reduce Early School Leaving* (https://www.edu.ro/sites/default/files/_fi%C8%99iere/Minister/2016/strategii/Anexe%20Strategie%20PTS.pdf) plans to improve the government's institutional capacity.¹²
- *The Strategy for Vocational Education and Training for 2016-2020* (https://www.edu.ro/sites/default/files/_fi%C8%99iere/Minister/2016/strategii/Strategia_VET%2027%2004%202016.pdf). The main objective of the strategy is related to contributing to the attractiveness, inclusion, quality, and relevance of vocational and technical education improved proposed measure to enhance the vocational and technical education system through reform curricula, teachers' training and management consolidation through stronger and creative links with the potential employers and the labor market.
- *Romania's Anti-Poverty Package* (https://www.edu.ro/sites/default/files/_fi%C8%99iere/Minister/2016/strategii/Pachet_integrat_pentru_combaterea_sara_ciei.pdf), launched in 2016, includes policies to narrow learning and attainment disparities between rural and urban areas (see *National Strategy on Social*

¹²For further general information see: EACEA (Last Modified On 27/08/2018). Romania. 6.3. Preventing early leaving from education and training (ELET). Available on <https://eacea.ec.europa.eu/national-policies/en/content/youthwiki/63-preventing-early-leaving-education-and-training-elet-romania>.

Inclusion and Poverty Reduction, http://www.mmuncii.ro/j33/images/Documente/Familie/2016/StrategyVolIEN_web.pdf).

- The Initiative of Romania President Klaus Iohannis, the country project “Educated Romania” (<http://www.romaniaeducata.eu/>), as the beginning of resettling Romanian society around values and the development of a culture of success based on performance, merit, work, and professionalism.

15.3 New Progress of ICT in Education

15.3.1 Digital Inclusion¹³

With the information and communications technology (ICT) sector accounting for 6% of the Romanian GDP in 2016, the country ranks fourth among 28 European Union (EU) countries with regard to these criteria, as specified by GISWatch Report (2016).

Also, Romania is ranked 10th in the world and 1st in Europe in terms of average Internet peak connection speed with 85 Mbit/s (Akamai 2016).

There were 12,082,186 internet users in Romania, representing 62.8% of the population, in mid-year 2017, according to Internet World Stats, June 2017 (<http://www.internetworldstats.com/stats4.htm#europe>), while five years before, the percentage was 39.2%. As specified by a study of the Romanian Institute of Statistics, in 2017, 92% of the population of 16–34 years old use computers and Internet, the percentage being 79.2 for those of 35–54 years old, and 44.8 for those over 55 years old.

Digital inclusion has been a high priority on the Romanian ICT Ministry’s agenda since 2004, and is still present in the authorities’ official statements and actions. An important step in facilitating equal access to ICT infrastructure was the 200 Euro Program, launched in 2004 in partnership with the Ministry of Education (<http://www.edu.ro>). By 2011, the program has helped 200 thousand students from low-income families purchase computers (GISWatch 2011).

Tangible results concerning digital inclusion in the country have also been achieved by the Knowledge Economy Project (2006–2013), which helped 255 communities get internet access, and supported small business development and local content creation. This effort was awarded the European Commission’s Inclusion medal in 2008 in the Geographical Inclusion section.

In 2009, the Romanian Ministry of Communications and Information Society (MCSI) (<https://www.comunicatii.gov.ro>) adopted a Strategic Plan for 2010–2013 that set out the actions and programs for developing an efficient information

¹³For further general information see:

Wikipedia: Internet in Romania, http://en.wikipedia.org/wiki/Internet_in_Romania.

Romanian Institute of Statistics, <http://www.insse.ro/cms/en>.

society and knowledge economy, with the following directions of activity: Electronic Communications, Information Society, Structural Funds Management, and MCSI Administrative Capacity.

15.3.2 *Internet and E-Learning*

Developing the ICT infrastructure and internet connection for the Romanian education institutions, training teachers, developing quality online resources, and providing access to online learning spaces were the core goals of the following major programs (Holotescu 2012):

1. *SEI Programme* (System Educational Informatizat, Engl. IT-Based Educational System, <http://portal.edu.ro/index.php/articles/c11/en>: started in 2011, the project was implemented by the Ministry of Education in partnership with Siveco (<http://siveco.ro>), a company specialized in e-Learning, HP Romania, and IBM Romania, under the Romanian Government Strategy in the field of information and computer-aided education. It has equipped all the Romanian schools with 15,000 laboratories with 10–25 computers, with the latest technology and with internet connection, trained teachers and developed digital lessons. In 2012 the number of students per school computer was 4.6, better than the worldwide average value (OECD 2015).

SEI covers the following major activities in the education sector:

- Education. AeL (from Advanced eLearning) is the core of the SEI program, offering support for teaching and learning, testing and evaluation, content management, and training programs for more than 140,000 teachers; the program is meant to integrate the use of ICT in daily school practice, improving the teaching/learning process;
- School management and educational resources management;
- IT support for national exams—admission to colleges and professional schools (ADLIC), Baccalaureate;
- Creating National Education Database;
- Communication and collaboration—national education portal, <http://www.portal.edu.ro>—forums, newsletters, training sessions, educational initiatives.

Users and beneficiaries (four million) are situated at all levels of the education system: local, regional, and national level, being teachers, students, parents, managers, operators, policymakers, and the general public.

2. *RoEduNet* (Romanian National Research and Education Network—<http://www.roedu.net>): was initiated in 1993 and represents the Romania's research and education (R&E) network, that connects universities, schools, research centers, and cultural institutions across the country.

3. *Knowledge Economy Project (KEP)* (<http://www.ecomunitate.ro/en/proiect>): KEP was implemented by the Ministry of Communication and Informational Society between 2005 and 2013, and founded by the World Bank. The Ministry of Education, Research, Youth and Sport was a partner in this program, that has three components:
 - Expanded access to Information and Communication Technologies and improved digital literacy
 - Development and promotion of government e-services
 - Promotion of e-commerce and innovation support for SMEs.
 - During the KEP implementation, the access to knowledge was enabled for 255 rural/disadvantaged communities from 38 counties, addressing to over 1,8 million people (8% of Romania's population). The schools of these communities are the beneficiaries of ICT infrastructure, training of teachers, and inclusion of new technologies in education.
4. *INSAM System* (<http://oldsite.edu.ro/index.php/articles/c924/>): provides digital tools to improve quality assessment in the pre-university system, being a project implemented by the Ministry of Education and its partner Softwin (<http://softwin.ro>), a company specialized in e-Learning.

The system is based on specific digital resources (assessment items, standards, and performance descriptors) needed to improve evaluative processes and self-assessment of high school students, providing an Evaluation Guide for specific curricular area, progress reports and statistics, and discussions forum.

15.3.3 Open Education and Open Educational Resources

Romania is active in the open education movement mainly through the Open Educational Resources (OERs) and Open Educational Practices (OEPs) initiatives carried out by institutions, groups, communities and engaged individuals, and through specific projects or programs, in the following directions (Holotescu 2012; Holotescu and Pepler 2014):

- proposals at government level related to OER and Web2.0, which may become driving forces—but only a few of them appear in formal policies: in 2007, the Knowledge-based Economy Project (KEP) has formulated proposals related to OER (Holotescu 2007);
- the National Strategy on Digital Agenda for Romania 2020 (February 2015) considers the usage of OER and Web 2.0 in a formal and lifelong learning education as strategic lines of development for ICT in education (<https://www.comunicatii.gov.ro/agenda-digitala-pentru-romania-2020/>); the government program mentions the implementation of an e-learning platform and online repositories (<http://gov.ro/ro/obiective/programul-de-guvernare-2017-2020>);

- since the autumn of 2014, digital textbooks for pre-university education are freely available for download from a section of the Ministry of Education site (<http://manuale.edu.ro>); however the e-books are not published under open licenses and do not use open formats; also a project to implement an e-learning platform and online repositories for OERs was launched (<http://edu.ro/rețea-de-resurse-educative-deschise-la-nivelul-inspectoratelor-școlare-judetene>);
- the Romanian Coalition for OER was launched in October 2013, gathering persons and organizations that support and promote the concepts of open access and OER (<http://educatiedeschisa.ro>); the coalition has published guides, has organized workshops and five National Conferences for Open Education, and formulated concrete OE-related proposals for the govern (<http://www.inovarepublica.ro/educatie-deschisa-romania>);
- the Educated Romania (2016–2019) is a project of the Romanian Presidency, conducting a broad public debate on education and research for a set of policies (<http://www.romaniaeducata.eu>);
- Relevant Curriculum and Open Education for All (<http://www.ise.ro/cred>) (2017–2021) is a project of the Ministry of Education and Institute of Education, which will train 18,000 teachers and will produce OERs (<http://digital.educared.ro>);
- open courses and webinars for teacher training in using OER and educational technologies: <http://iteach.ro>, <http://suntprofesor.ro>, <http://oerup.eu>, <http://superteach.ro>;
- directories and projects for open resources—<http://forum.portal.edu.ro>, <http://dascal.ro>, <http://educatie.inmures.ro>, <https://kidibot.ro>, <http://digitaliada.ro>, <https://dacobots.com>, <http://livresq.com>, <http://digitaledu.ro>, <http://scoalainvaliza.ro>, <http://doi.org/indreptardigital>, <https://www.mykoolio.com>, <https://asq.ro>;
- open journals related to open education—<http://iteach.ro/experiencedidactice>, <http://www.elearning.ro>;
- strong communities/events for open source, open access, open data, open licenses (the Creative Commons Romania version was launched on September 2, 2008, with the help of ApTI—Association for Technology and Internet, <http://apti.ro/>).

In the following we mention several ongoing institutional and inter-institutional MOOC initiatives, open for students and teachers training at all levels (Holotescu et al. 2014; Holotescu et al. 2016):

Platforms and MOOCs implemented by academic institutions:

- *UniCampus* (<http://unicampus.ro>): started in April 2014 by University Politehnica of Timisoara and Association of Technical Universities from Romania (rouni.ro), Unicampus offers MOOCs on a version of Moodle platform based on cMOOCs methodology;
- *NOVAMOOC* (<http://novamooc.uvt.ro>): development and innovative implementation of MOOCs in Higher Education, West University of Timisoara, WUT during 2015–2017. WUT offers its first MOOC on the Teachable Platform, Practicing English with Technology, <https://west-university-timisoara.teachable.com/p/pet>.

- *UniBuc Virtual* (<http://www.unibuc-virtual.net>): Credis—Department of Distance Learning from Bucharest University developed and ran three MOOCs for Teachers Training on a Google Apps-based platform;
- *Platforms and MOOCs implemented by companies and NGOs*:
- MOOC.ro (<http://mooc.ro>): developed by Moodle.ro, currently offers two MOOCs about Moodle and Articulate;
- *eStudent* (<http://estudent.ro>): MOOCs on psychology, communication, business, geography, and Romanian language developed by APIO, CTRL-D, and experts;
- *Startarium* (<http://startarium.ro>): platform nurturing an entrepreneurship ecosystem, which was implemented by a group of organizations and experts; the platform offers MOOCs, mentoring and crowdfunding for around 8,000 potential entrepreneurs who design and develop their start-up plans using the platform features;
- *Scientific events related to open education*:
- *Workshops and national conferences* organized by the Romanian Coalition for OER;
- *Workshops* organized by the Politehnica University of Timisoara during the Open Education Week (<http://elearning.upt.ro>);
- Since 2014, the International Conference eLSE has a special section dedicated to OER and MOOCs, co-chaired by the authors, now at 4th edition (http://elseconference.eu/pages/view?page=open_education_open_online_courses);
- The SMART Conference co-organized by the authors since 2013 is focused on open education too (<http://academia.edusoft.ro/category/conferences>);

The number of initiatives is not so large, but one can note the diversity of projects and the involved organizations in open education. MOOCs offered are free, contributing to institutions visibility and learning flexibility, and not yet generating income.

All represent institutional and individual projects, MOOCs not being mentioned yet in governmental documents.

The *drivers* for developing Open Education projects are:

- researchers and teaching staff, seldom the policymakers and managers of the institutions;
- companies and associations.
- The *main barriers* in the Open Education development and adoption could be considered:
- rigid policies in formal education related to curricular systems and assessment practices;
- the lack of possibility to officially accredit online courses, in spite of an impressive number of projects related to online courses over the last 15 years, and of the policy proposals coming from different organizations. Such courses can only be used in a blended approach in formal education;
- the lack of OE/OER/MOOC—related strategies at the national level in formal and continuing education;

- teachers' lack of time and interest to explore, understand, evaluate, and use new technologies, OERs, and MOOCs in the teaching–learning process;
- a reduced number of training programs for adopting open educational practices;
- lack of incentives, official recognition, and promotion for teachers implementing open educational practices.

More insights into e-Learning and Educational informationalization in Romanian could be found in the studies published by Marga (2002), Istrate (2007), Vlada (2009), Vlada et al. (2009), EC (2016), Goldbach and Hamza-Lup (2017) and EC 92017 and EC (2018).

The Romanian achievements related to Open Education were summarized in the EU OpenEdu study of Inamorato dos Santos et al. (2017). Also a recent article found that Romania is the fourth most productive country in OER-related studies, while the authors of this report are ranked to a top of researchers worldwide (Wang et al. 2017).

15.4 Policy and Strategy of ICT

Romanian has a “National Strategy on Digital Agenda for Romania” (2014–2020),¹⁴ directly targets the ICT sector. The document takes over and adapts to the situation of the country and the elements of the Digital Agenda for Europe (Digital Single Market). The National Strategy on Digital Agenda defines the major role that the use of ICT will have to play in meeting the Europe 2020 objectives. The aims are to contribute to economic growth and to increase competitiveness in Romania, both by direct action and support of the development of effective Romanian ICT and through indirect actions such as increasing efficiency and reducing public sector costs in Romania.

Thus, there were set four areas of action, as follows:

- *eGovernment*,¹⁵ *Interoperability, Cyber Security, Cloud Computing, Open Data*,¹⁶ *Big Data and Social Media*—field which aims to increase efficiency and reduce costs in the public sector in Romania by modernizing the administration (an estimated impact on the Romanian economy of about 5% of GDP growth and 1% in terms of jobs);
- *ICT in Education, Health, Culture and eInclusion*—field which aims to support these technologies at the sectoral level (ICT investments to create a positive impact in the social context);

¹⁴Available at: <https://www.trusted.ro/wp-content/uploads/2014/09/Digital-Agenda-Strategy-for-Romania-8-september-2014.pdf>.

¹⁵For further general information see the Report *eGovernment in Romania* (2018). Available at https://joinup.ec.europa.eu/sites/default/files/inline-files/eGovernment_in_Romania_2018_0.pdf.

¹⁶See the National Action Plan 2018–2020, *Open Government Partnership*, available at http://ogp.gov.ro/wp-content/uploads/2018/11/Romania-2018-2020_NAP_EN.pdf.

- *eCommerce, Research and Development and Innovation in ICT*—field which aims at regional comparative advantages of Romania, and backs growth in the private sector (an estimated impact on the Romanian economy of approximately 3% increase at the GDP level and 2% in terms of jobs);
- *Broadband and digital infrastructure services*—field which aims at ensuring social inclusion field (an estimated impact is a GDP growth by 13%, increasing the number of jobs by 11% and reduce administration costs by 12% during 2014–2020).
- The strategy also establishes the following indicators for 2020:
 - At least 35% of people use e-government systems;
 - At least 60% of citizens use the Internet regularly;
 - At least 30% of citizens make purchases online;
 - Coverage with broadband communication networks (over 30 Mbps) of minimum 80%.

In terms of economics, full implementation of the strategic vision of the ICT sector in Romania will result in a total investment of around 2.4 billion euro.

Overall, concrete measures set out in the Strategy will lead to:

- Ensuring access to electronic public services for citizens and organizations;
- Improving access to the Internet by increasing the coverage of high-speed electronic broadband communications networks;
- Increased use of the Internet;
- E-commerce promotion;
- Increasing the number of cross-border electronic public services;
- Enhancing digital content and the development of ICT infrastructure in education, health, and culture;
- Supporting the growth of the ICT sector added value by supporting research, development, and innovation in the field.

At the recent Central and Eastern Europe Innovation Roundtable event (January 21, 2019), organized in Warsaw, the Secretary of the State with the Ministry of Communications and Information Society (MCSI), Mr. Ionut-Valeriu Andrei, said that “the development of the IT sector is one of the Romanian government’s priorities.” The focus will be placed on the implementation of 5G technologies, cloud services, Internet of Things (IoT), and Artificial Intelligence (AI). Moreover, in the context of Romania’s holding the Presidency of the Council of the EU, the Romanian official invited the attendees to participate in the Digital Assembly 2019, an event organized in partnership with the European Commission and MCSI, which will take place in June (13–14) in Bucharest. It is expected to bring together high-level representatives and stakeholders from EU member states to discuss European digital policies and the implications of the latest technological developments.¹⁷

¹⁷ For further general information see: The rise of Digital Challengers—How digitization can become the next growth engine for Central and Eastern Europe—Perspective on Romania. Report available at: https://digitalchallengers.mckinsey.com/files/Rise-of-Digital-Challengers_Perspective-on-Romania.pdf.

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