BARRIERS TO THE USE OF PROFESSIONAL SOFTWARE IN THE MANAGEMENT OF INITIAL TRAINING IN VOCATIONAL AND TECHNICAL EDUCATION

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Abstract

In the last years, in the European Union, initial training has been standardized for the realization of an extended common area of vocational training, in a society based on technology, but in an increasingly competitive economy. From this point of view, the European context offers the possibility of harmonizing the initial vocational training systems in the component countries by introducing learning outcomes adapted to the digitalization era. Romania is in the situation the impossibility of having an initial training in relation to the new requirements for almost all the fields of qualification. This research presents the most important results regarding the barriers that may appear in initial training in accordance with Revolution 4.0. The data were obtained by applying a questionnaire on a representative sample of teachers from pre-university and technical education in Dambovita county. Issues involved are: identification of obstacles, ways to overcome barriers, possible policies to facilitate digitization, future challenges of the professions. In this way, we were able to identify potential barriers. Finally, a matrix of the main barriers and mechanisms emerged from the total responses.

Keywords*: barriers, vocational training, professional software, transversal skills*

JEL classification: I2/O3

1. Introduction

The performance of the education and training system in Romania compared to other systems in Europe remains a challenge in a technology-based society. The new vocational standards and the curriculum for higher secondary education in vocational and technical education are under review. The priorities assumed by Romania in vocational and technical education (VET) are the development and updating of professional qualifications and standards of vocational training in order to increase the quality and relevance for the labour market (*EU, 2018*).

Within the education sector, the intensity of innovation on technological development is the highest in higher education (80%), while secondary and primary education are almost equal (63% and 65% respectively).

Compared to other sectors of activity, on innovation domains, significant differences are observed: innovation in knowledge and methods (60%) is above average (49%), innovation in products and services (38%) is below average (47%), innovation at the technology level (36%) is below the average of the other sectors (42%).

The highest proportions of highly innovative jobs in education (fig. no. 1), with regard to at least one type of innovation or all three types of innovation (products and services; technologies and tools; knowledge and methods), are registered in the United Kingdom (79% and 33%), Slovenia (78% and 23%), Italy (73% and 23%) and Finland (75% and 21%), above the European average (69% and 20%).

In contrast, the least innovative jobs in the education sector are in France (51% and 9%), Hungary (55% and 10%) and Germany (66% and 10%).

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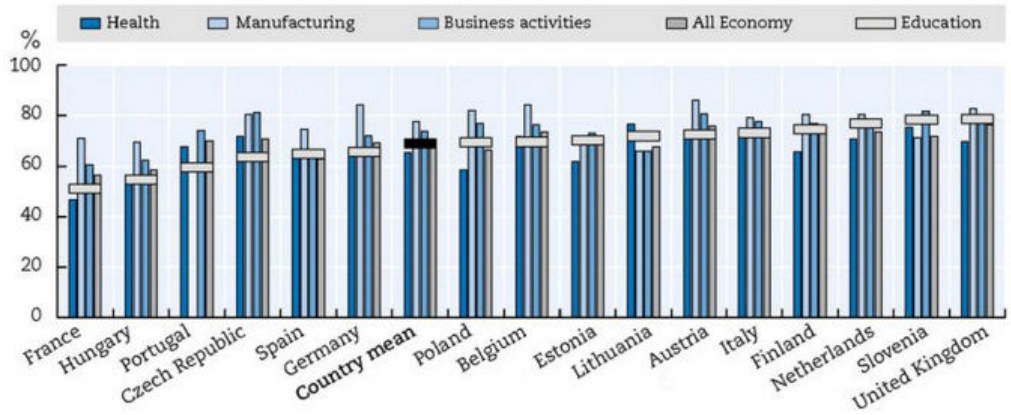

Fig. no. 1. Graduates employed (%) in highly innovative jobs, by sectors of activity
Source: OECD (2014)

In the educational system, with much more than in the other sectors of the economy, the participation of employees in introducing knowledge and innovative methods on technological development in their own institutions (fig. no. 2) exceeds the average of the analysed sectors (71% compared to 61%). The countries with the highest level of involvement of innovation employees in the education sector, regarding at least one type of innovation or all three types of innovation (products and services; technologies and tools; knowledge and methods), are: Czech Republic (87% and 32%), Lithuania (86% and 30%) and Estonia (85% and 36%), above the European average (76% and 23%).

At the opposite end, the lowest participation of employees in the implementation of technological development innovation is in Hungary (69% and 18%), Poland (72% and 11%) and Austria (75% and 15%).

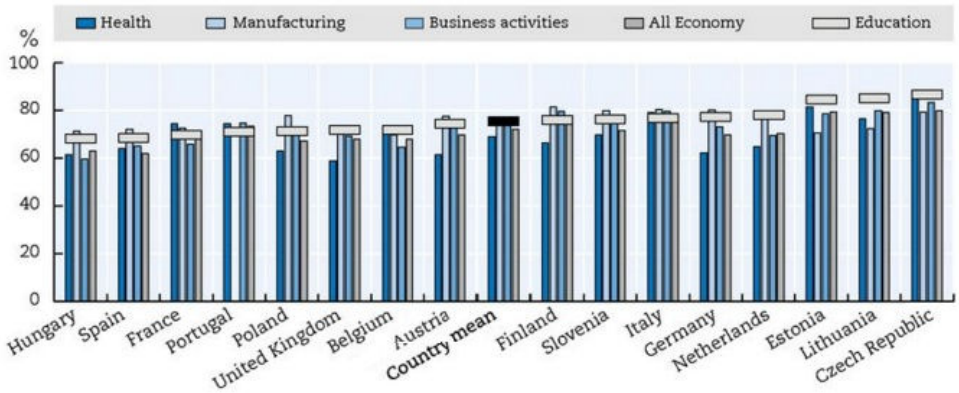

Fig. no. 2. Employed graduates (%) who play a role in introducing innovation, by sectors of activity
Source: OECD (2014)

Regarding the speed of adoption of innovation on technological development (fig. no. 3), education (38% of the graduates mentioned that their educational institutions are in the first wave of those adopting innovations, knowledge or new methods) is close to the average of the economy (41%). The states with the highest rate of adoption of innovations in the education system (the percentage of graduates who consider their job as the leader of innovation adoption) are Austria (82%), the Czech Republic and Estonia (79%). On the other hand, France (60%), Lithuania (64%) and Portugal (65%) have a relatively slow level of adopting innovations in new knowledge and methods.

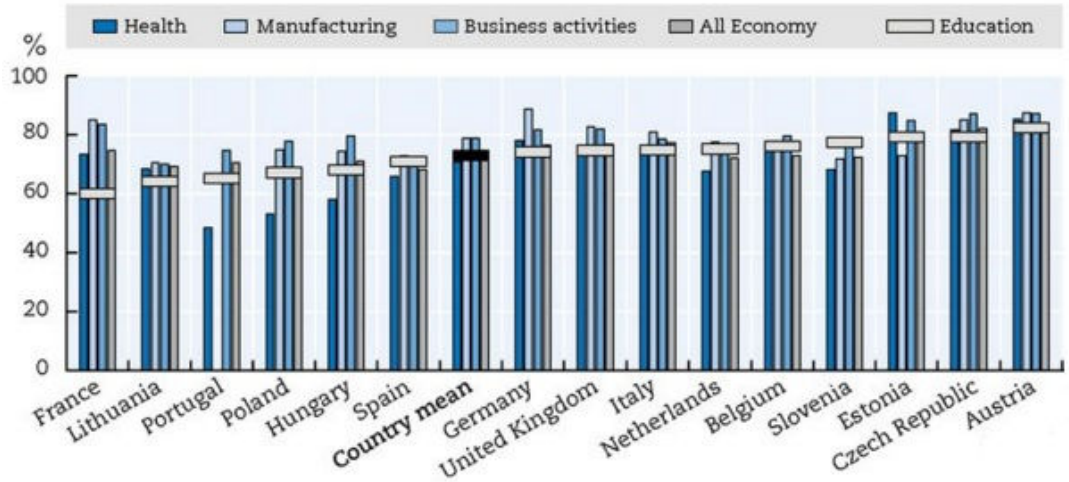

Fig. no. 3. Employed graduates (%) involved in the first wave of innovation adoption, by activity sectors
Source: OECD (2014)

An important dimension of digital innovation is represented by innovative workplaces (in which employees play an important role in introducing new knowledge, methods, technologies, products and services). In the European states, 58% of the graduates with university studies mentioned that they have innovative jobs (fig. no. 4), compared to 55% as an average of all economic sectors. In Europe, higher education holds the most innovative jobs (68%), compared to primary education (55%) and secondary education (53%), provided that the number of graduates is twice as high in higher education.

The Netherlands (65%), Lithuania and Slovenia (64%) are the countries with the most innovative jobs, while France (43%), Portugal (46%) and Hungary (48%) have the fewest innovative jobs in the education sector.

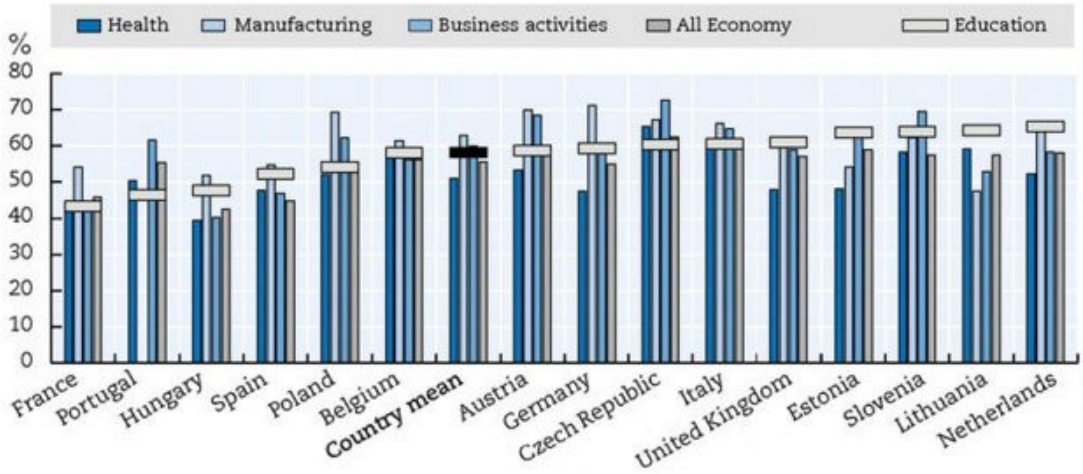

Fig. no. 4. Employed graduates (%) who work in innovative jobs, by sectors of activity
Source: OECD (2014)

2. Relevance and importance of study

In Europe there is a deficit of upstream investments, which is felt by the mismatch between the increasing demand and the supply of the latest technologies. The Digital Single Market (DSM) strategy has established a robust framework, which must now be doubled by a

solid investment program. It was approved at the highest political level. In Tallinn, Heads of State and Government identified the main pillars of a strong digital economy: cyber security, artificial intelligence, a world-class infrastructure that includes high-performance computing technology, digital skills and digital transformation of the public sector.

Therefore, the program will focus on strengthening Europe's capabilities in high-performance computing, artificial intelligence, cyber security and advanced digital skills for young people entering the labour market. Promoted at the same time, these issues will contribute to the creation of a prosperous data-based economy, which will promote inclusion and ensure value creation.

The European Credit System for Vocational Training (ECSVT) and other European and national instruments have developed a framework that allows confidence in the results of the national training system at European level. In Romania, professional training standards described by learning outcomes have been created, validated by the social partners, including evaluation standards, modular curriculum, student-centred learning methods, workplace learning, quality standards for the teaching-learning-evaluation process / certification.

According to the European Skills Index (ESI) of CEDEFOP, a composite indicator that measures the performance of a national education and training system, performance is not only measured by the intrinsic elements of the system, but also in relation to employment and economic growth. From this perspective, countries must equip their workforce with all the necessary skills in the labour markets.

To this end, adequate policies are needed regarding the correlation of new changes in the labour market and the training in VET.

According to CEDEFOP (2018) and Eu (2018), it is estimated that 9.8 billion euros have been allocated to projects in the digital economy. According to the same report, the analysis of vocational training on digitization was based on three pillars:

- Developing skills - efficiency of compulsory and post-compulsory education and training;
- Activating skills - the transition from education to the labour market;
- Adequacy of competences - the extent to which competencies respond to a job.

VET systems are an important component of national competitiveness. The European pillar of social rights, built around a functional and inclusive labour market, refers to training through vocational and technical education and lifelong learning. The indicator is relevant at political level and relates to policy issues at European level (EU 2020 strategic framework targets).

According to ESI (fig. no. 5), there are 3 performance groups:

- score over 67 - top group: Czech Republic (75), Estonia, Luxembourg, Slovenia, Finland;
- score 45-62, middle performers group, 14 countries;
- score 23-35, low performing group, Romania (31).

Although they have low performance in skills development and activation, Bulgaria, Hungary and Romania have above average performance in competences adequacy.

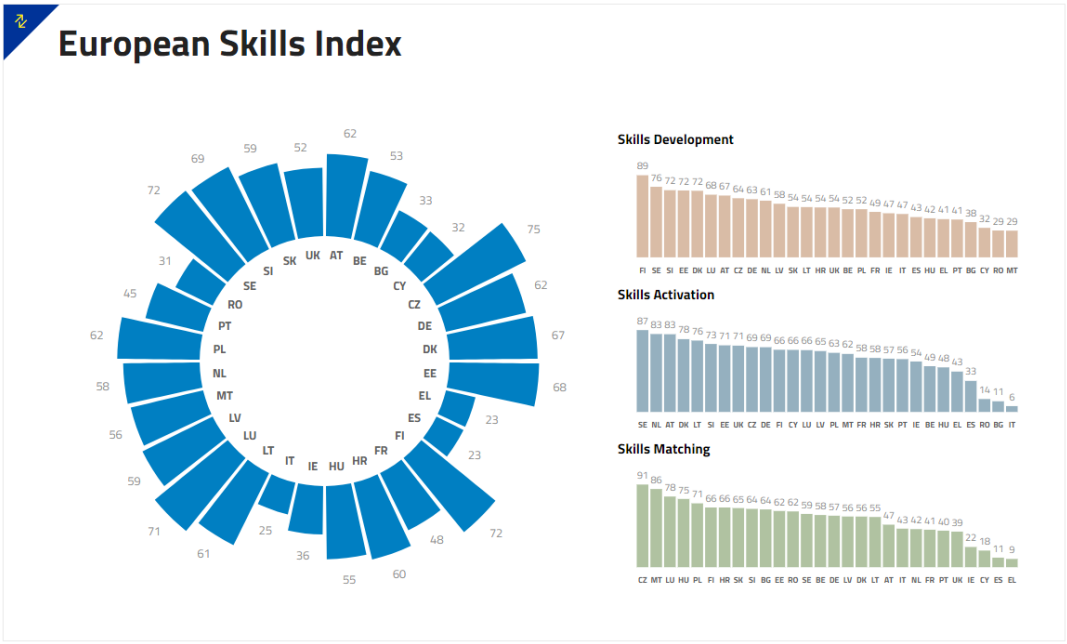

Fig. no. 5. European Skills Index
Source: *ESI (2018)*

2.1. Materials and methods

The investigative approach regarding the barriers to the use of professional software in the management of initial training in vocational and technical education, consisted of an analysis of the answers to the questionnaire offered by the teachers from the 17 technological high schools in Dambovita county.

At the basis of the sample calculation, the criteria related to sex and residence environment were established (table no. 1).

Table no. 1

Teaching staff in high school education in professional and technical education 2017/2018

County environment	Teaching staff number				Qualified teacher staff average	
	Total	of which: female	From col. 1 and col. 2, qualified			
			Total	of which: female	Total	Female
Dâmbovița	1161	809	1152	806	99,22%	99,63%
Urban	1060	741	1051	738	99,15%	99,60%
Rural	101	68	101	68	100,00%	100,00%

Source: *ISJ Dambovita*

The sample was calculated on a 95% confidence interval, with a margin of error of 5% (table no. 2). ***Information processing methods were performed by Pearson-type correlations and principal component analysis***, using the Kaiser normalized Varimax (3 iterations) rotation method.

Table no. 2

Margin of error	5%
Level of trust	95%
N	**289**

The investigative approach regarding the barriers encountered in the initial training process in vocational and technical education on training domains used a complex research strategy, which combines both quantitative and qualitative methods, aiming at obtaining valid and reliable results regarding the opinion of teachers in vocational and technical education.

2.2. The objectives of the study

The present research aims to analyse the perceptions of the teachers, from the technological high school education in Dâmboviţa county, regarding the barriers of using professional software in the management of the initial training in the professional and technical education.

Research objective: Analysis of barriers in the use of professional software in school units in vocational and technical education

Qualitative and quantitative research on barriers to the use of professional software in the management of initial training in vocational and technical education is based on the following **hypothesis**: there is a direct link between the barriers on the use of professional software in the initial training in vocational and technical education and the insertion of young graduates in the labour market.

2.3. Documentary Analysis

Starting with 2010, through the Bruges Press Statement, at the EU progress has been made in making initial vocational education more relevant to labour market needs. However, quality and participation in VET systems vary from one Member State to another. CEDEFOP shows that (European Commission, 2018), with the increasing share of VET-specific content, in parallel with key competencies, it is expected that the provision of learning will become more hybrid - in terms of blurring the boundaries of the institutional profile, target group, curriculum and learning environment between vocational education and general education. According to the Institute for the Future for the University of Phoenix Research Institute (Davies A., Fidler D., Gorbis M., 2011), there are six trends in future vocational training:

- exlongevity: Increasing global lifespans change the nature of careers and learning;
- rise of smart machines and systems: Workplace automation nudges human workers out of rote, repetitive tasks;
- computational world: Massive increases in sensors and processing power make the world a programmable system – “everything is programmable” - an era of thinking about the world in terms of computation;
- new media ecology: New communication tools require new media literacies beyond text;
- superstructed organizations: Social technologies drive new forms of production and value creation.

All these tendencies can have the following implications at the level of initial vocational training: emphasis will be placed on developing skills in critical thinking, intuition and analysis, literacy and integrating experiential learning through soft skills.

3. Result of research

O1 - Which facts do you attribute as barriers in the use of professional software in your institution? [Insufficient coordination and planning;]

O2 – Which facts do you attribute as barriers in the use of professional software in your institution? (It does not exist in the curriculum and professional standard]

O3 - Which facts do you attribute as barriers to the use of professional software in your institution? [Lack of digital tools (computers, software);]

O4 - Which facts do you attribute as barriers to the use of professional software in your institution? [Lack of teacher training in the use of professional software;]

O5 - Which facts do you attribute as barriers to the use of professional software in your institution? [Lack of correlation of the national curriculum with the needs of the current labour market]

O6 - Which facts do you attribute as barriers to the use of professional software in your institution? [Lack of infrastructure]

O7 - Which facts do you attribute as barriers to the use of professional software in your institution? (Pedagogical hesitations of the teachers)

O8 - Which facts do you attribute as barriers to the use of professional software in your institution? (Lack of interest from students]

O9 - Which facts do you attribute as barriers to the use of professional software in your institution? (Lack of ICT skills)

O10 - Which facts do you attribute as barriers in the use of professional software in your institution? (Lack of school partnerships - economic agent)

Table no. 3

Pearson correlation between O1, O2, O3, O4, O5, O6, O7, O8, O9, O10.

	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10
O1	1	0,212**	0,052	0,064	-0,057	0,017	0,040	0,051	0,047	-0,033
O2	0,212**	1	**0,561****	0,340**	0,342**	0,300**	0,267**	0,260**	0,222**	0,250**
O3	0,052	**0,561****	1	**0,582****	0,473**	0,310**	0,342**	0,322**	0,215**	0,435**
O4	0,064	0,340**	**0,582****	1	**0,526****	0,212**	0,406**	0,341**	0,301**	0,341**
O5	-0,069	0,341**	0,463**	**0,526****	1	0,171*	0,237**	0,232**	0,249**	0,202**
O6	0,115	0,351**	0,513**	0,281**	0,268**	0,416**	0,426**	0,320**	0,405**	**0,625****
O7	0,032	0,375**	0,312**	0,333**	0,283**	0,416**	0,386**	0,342**	0,468**	0,413**
O8	-0,037	0,217**	0,397**	0,371**	0,332**	0,459**	0,448**	0,354**	0,443**	0,292**
O9	0,019	0,300**	0,320**	0,212**	0,171*	1	**0,639****	0,316**	0,419**	0,395**
O10	0,040	0,267**	0,342**	0,406**	0,237**	**0,639****	1	0,344**	0,367**	0,471**
****. p < 0,01 (N=289).**										
***. p < 0,05 (N=289).**										

From the table no. 3, you can see the following strong Pearson-type correlations:

- Due to the lack of infrastructure in schools (O6) it is necessary to encourage school partnership - economic agent (O10) - strong correlation 0.625; p <0.01; **N = 289.**
- The lack of ICT skills of the students (O9) is determined by the pedagogical hesitations of the teachers (O7) - strong correlation - 0.639; p <0.01; **N = 289.**
- The lack of teacher training in the use of professional software (O4) is influenced by the lack of digital tools (O3) - strong correlation - 0.582; p <0.01; **N = 289.**
- The lack of teacher training in the use of professional software (O4) is influenced by the lack of correlation of the national curriculum with the needs of the current labour market (O5) - strong correlation - 0.526; p <0.01; **N = 289.**

Table no. 4

Principal components analysing applied to arguments O1, O2, O3, O4, O5, O6, O7, O8, O9, O10

	Component						
	1	2	3	4	5	6	7
O1	0,091	0,053	-0,010	0,053	0,047	-0,080	**0,806**
O2	0,229	**0,589**	-0,260	0,209	**0,461**	-0,103	0,153
O3	**0,359**	**0,725**	0,032	0,154	0,033	-0,253	0,017
O4	0,222	**0,750**	0,105	0,073	-0,076	0,082	0,095
O5	0,083	**0,788**	0,175	-0,111	-0,009	0,106	-0,033
O6	**0,646**	0,305	0,166	0,229	0,057	-0,146	-0,009
O7	**0,397**	0,351	0,083	0,255	0,234	0,240	-0,093
O8	0,373	0,374	0,182	0,171	-0,022	**0,395**	-0,210
O9	0,361	0,268	0,108	**0,490**	0,026	0,175	-0,258
O10	**0,388**	0,408	0,291	0,343	-0,012	0,106	-0,209

By analysing the principal components (PCA), using the Varimax rotation method with Kaiser normalization (20 iterations), the following main components were obtained (table no. 4):

- **Component 1** is characterized by the following arguments: **due to the lack of infrastructure** (O6, **0.646**) and the lack of digital tools (computers, software) (O3, **0.359**), the pedagogical hesitations of the teachers in the use of technology have appeared (O7, **0.397**), and school-economic partnerships (O10, **0.388**) do not exist.
- **Component 2** is characterized by the following arguments: **the lack of correlation of the national curriculum with the needs of the current labour market** (O5, **0.788**) has led to a lack of teacher training in the use of professional software (O4, **0.750**) and a lack of digital tools (computers, software- hours) (O3, **0.725**), starting from the fact that there are no specifications in the curriculum and professional standards (O2, **0.589**), as well as by the lack of school-economic partnerships (O10, **0.374**), generating the lack of interest from the students (O8, **0.408**).
- **Component 3** is very poorly represented.
- **Component 4** is characterized only by the **lack of ICT skills** (O9, **0.490**).
- **Component 5** is characterized only by the fact that **it does not exist in the professional curriculum and standards** (O2, **0.461**)
- **Component 6** is characterized by a **lack of interest from students** (O8, **0.395**).
- **Component 7** is strongly represented by the **lack of coordination and planning** (O1).

4. Conclusions

In this context, the barriers encountered in the initial training process in vocational and technical education in training areas, highlight the following aspects: the main barrier identified is determined by the lack of infrastructure at the school unit level, as well as the lack of correlation of the national curriculum with the labour market needs. current. Also, a major importance represents the lack of digital tools, a barrier that could be counteracted by strengthening school-business partnerships. Digital competence in vocational and technical education, which encompasses digital knowledge, attitudes and skills, has become a key competence in vocational education in most developed countries. Currently, Romania is one of the least digitized countries in the European area, especially in vocational and technical education.

Therefore, it is necessary to take serious digital leadership in the next ten years. The young people who are currently undergoing training do not have any guarantee of the profession, because a major cause is the rapid development of technologies.

In a volatile, uncertain, complex, ambiguous world, education can make a difference, if the new generation will face the challenges by:

- emphasis on informal learning and recognition of learning outcomes;

- collaboration within and between education institutions and the world of work, strong partnerships;
- the international perspective on education and training should be in line with new technologies;
- the use of ICT and professional digital networks;
- the need for autonomy of the learner.

Highlighting the need to permanently research the perceptions of the actors involved in the vocational training process in accordance with the new qualifications and competences required in a globalized and digitalized labour market, the whole scientific approach leads to underlining the major importance in adapting the vocational education system to the needs of educators and to the technical and scientific progress.

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References

CEDEFOP (2018), *European Skills Index* (https://skillspanorama.cedefop.europa.eu/en/indicators/european-skills-index)

Davies A., Fidler D., Gorbis M. (2011), *Future Work Skills 2020* (http://www.iftf.org/uploads/media/SR-1382A_UPRI_future_work_skills_sm.pdf)

European Commission (2018), *Opinion on The Future of Vocational Education and Training Post 2020* (https://smeunited.eu/news/opinion-of-future-of-vocational-education-and-training-post-2020-adopted)

EU (2018), *Education and Training Monitor 2018. Education and Training in Romania* (https://ec.europa.eu/education/policy/strategic-framework/et-monitor_ro)

EU (2018), *Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions* (https://ec.europa.eu/chafea/agri/content/report-commission-european-parliament-council-european-economic-and-social-committee-and)

OECD (2014), *Measuring Innovation in Education. A New Perspective*.Educational Research and Innovation, OECD Publishing, 335 p.