IMPACT OF DIGITALIZATION ON THE NEW COMPETENCES FOR ACCESS TO THE LABOR MARKET – POINT OF VIEW FOR VOCATIONAL AND TECHNICAL EDUCATION

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Abstract

Digitalization opens up a new field in recruitment and workforce composition. Cooperation between internal and external staff, staff in mixed teams and additional providers of highly qualified service for specific activities is already a reality today. Digital competence in vocational and technical education, which includes digital knowledge, attitudes and skills, has become a key competence in vocational education in most developed countries. Currently, Romania is one of the least digitalized countries in the European space, especially in professional and technical education. The present research presents the most important results regarding the impact of digitalization on the new skills in professional and technical education, necessary for access to the labor market in Dâmbovița county, the performance been analyzed simultaneously with the results obtained at the organizational level. The data were obtained by applying a questionnaire to a representative sample of teachers from professional and technical education in Dambovița county. They served to create an overview of training in professional and technical education, background on the current labor market integration.

Keywords: digitalization, vocational training, professional training, transversal skills

JEL classification: I2/O3

1. INTRODUCTION

Along with technological progress, the **process of automation and robotization** has accelerated, with a continuous and unprecedented impact on the way companies operate. First, digitization has caused a radical change in the workplace and the way work is done. But at the same time, digitalization benefits all the actors involved: **the client, the company, the employee**[2].

In general, questions arise regarding **current and future patterns of employment, including future forms of employment, the notion of „employee", as well as the role of the social partners**. Moreover, there is a need for an adaptation of the current labour legislation in correlation with the digital future. Differentiations may occur according to the size of enterprises (there will be comparable situations between large and small ones), in their attempt to remain competitive in the market.

From the employer's perspective, qualification is a key challenge and one that needs decisive action. The skills challenge in the manufacturing sector is becoming more pronounced as the industry becomes more digitized.

The accelerating digital transformation of the economy means that almost all jobs now require some level of digital skills, as does participation in society in general. The collaborative economy is changing business models, opening up new opportunities and new pathways to jobs, requiring different skill sets and bringing challenges such as accessing upskilling opportunities. Robotization and artificial intelligence are replacing routine work, not only in the production department, but also in the office[3]. Access to services, including e-services, is changing and requires both users, providers and public administrations to have sufficient digital skills. E-health, for example, is changing the way people access and receive health care.

The demand for digital technology specialists has grown by 4% annually over the past ten years. However, digital skills are in short supply in Europe at all levels: there are a large number of vacancies for ICT specialists; almost half of the EU population lacks basic digital

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[3] COM(2016) 381 final: A new skills Agenda for Europe.

skills; about 20% of people do not have these skills at all. Member States, businesses and citizens must rise to the challenge and invest more in digital skills training (including programming/IT) across the spectrum of education and training.

It is estimated that 65% of children entering primary school today will likely end up in jobs that do not yet exist[1]. Therefore, it is quite complicated to predict exact skill requirements. However, we can identify a number of skills to cope with new occupations and tasks:

• ***generic technical skills***, ***software and hardware integration.*** This needs to be addressed through an increased focus on specific STEM (Science, Technology, Engineering and Mathematics) skills and enhanced cooperation between companies and education providers (particularly from higher education).

• ***electronics and software engineers*** in product and process development. The increasing digitization of manufacturing means a growing need for ***robotics and automation engineers with programming and coding skills.***

• ***analytical skills***. The huge amount of data provided by various sensors, involves a number of data understanding skills.

• ***cyber security skills***. Increasing amounts of software and Internet services across the industry mean an increase in cyber threats.

But, in addition, to technical skills, working with a more complex productive activity will also continue to require ***soft skills*** in the industry:

• the ability to cooperate;
• the ability to assume responsibility;
• ability to solve problems;
• the ability to communicate.

2. RELEVANCE AND IMPORTANCE OF STUDY

Starting from the premise that education (through the skills it develops) represents the best tool in combating social inequalities, a more accurate correlation is required between the development of the industry (by including the latest technological discoveries) and the labour market, in other words, an accurate anticipation of skills needs by analysing supply and demand data.

Policymakers need to ensure that *digital literacy and STEM fields* are prioritized in children's early education, both in mainstream and higher education. In some European countries, the school curriculum in primary education has notions of simple coding in computer science.

Digital learning environments are also being developed, integrated into all school curricula. The goal is not only to learn to use new equipment and programs (software), but also to be able to understand and control their operation and to create new ones.

Cooperation with the business environment (employers) should come first, because they play an important role in the demand for jobs, which is the basis for the design and development of some courses (at school, high school or university).

In particular, within *vocational and technical education* (IPT or VET), IT and digital literacy skills should be taught for all professions and education levels. This would, moreover, be a form of responsibility for the industry and the social partners, involved in the governance and definition of study programs.

Digitization opens up a new field in recruitment and workforce composition. *Cooperation between internal and external staff*, the staff in mixed teams and additional highly qualified service providers for specific activities is already a reality today. However, visions of global cooperation in virtual teams across borders and across companies raise

[1] WEF, „The future of Jobs and Skills", 2016.

questions about integration, leadership and supervision, in addition to necessary adjustments in skills, working hours and workplace.

Also, at this time, a complex analysis is not yet done regarding the *clear demarcation between professional and private life*. Furthermore, as technologies become more and more advanced, the consequences of their use on personal health and safety become less and less certain, or anyway somewhat unknown. It is important for policy makers to recognize that employers cannot be solely responsible for health and safety issues that may arise through the use of technology, both in a person's working life and in their private life.

2.1. Materials and methods

The investigative approach regarding the impact of digitalization on the new competencies for access to the labour market – point of view for vocational and technical education, consisted of an analysis of the answers to the questionnaire provided by the teachers who carry out the practical courses in the 17 technological high schools in Dambovita County.

The basis of the sample calculation were the criteria related to gender and place of residence.

Table no. 1

TEACHING STAFF IN HIGH SCHOOL EDUCATION FROM PROFESSIONAL AND TECHNICAL EDUCATION

COUNTY ENVIRONMENT	TEACHING STAFF NUMBER	QUALIFIED TEACHING STAFF PERCENTS	
	TOTAL	TOTAL	FEMALE
Dâmbovița	1320	99,22%	99,63%
URBAN	1160	99,15%	99,60%
RURAL	160	100,00%	100,00%

Sursa: ISJ DAMBOVITA

The sample was calculated on a 95% confidence interval with a margin of error of 5% (tab. 2). ***The information processing methods were carried out through Pearson correlations and principal components analysis***, using the Varimax rotation method (3 iterations) with Kaiser normalization.

Table no. 2

Error Margin	5%
Confidence Level	95%
N	**289**

The investigative approach regarding the impact of digitalization on the new competencies for access to the labour market – point of view for vocational and technical education used a complex research strategy, which combines both quantitative and qualitative methods, with the aim of obtaining results valid and faithful regarding the opinion of teachers in professional and technical education.

The analysis of the sample according to the ***variable field of activity for the internship teachers***, the largest number of teaching staff is observed in the field of *Mechanics* (22.6%), followed by the fields of *Commerce* (14.2%) and *Tourism and Food* (10, 6%), while the lowest share can be seen in the areas of *Manufacture of Wood Products* (0.6%), *Agriculture* (1.4%) and *Media Production* (1.7%).

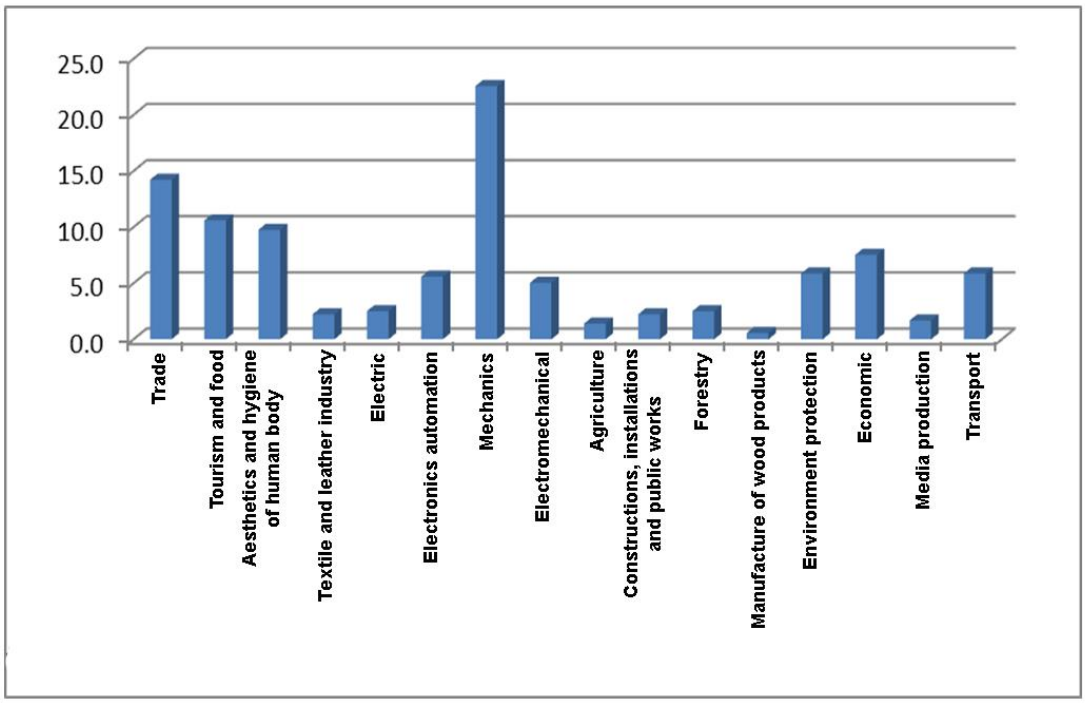

Figure no. 1. Distribution of teaching staff (%) by field variable

This distribution of teaching staff by fields is somewhat corresponding to the distribution of the number of students by fields. Students from the fields of *Mechanics* (26.9%), *Economics* (13.9%) and *Tourism and Food* (11%) predominate, while the lowest weights are for the fields of *Agriculture* (0.9%), *Manufacture of Wood Products* (0.6%) and *Construction, Installations and Public Works* (0.2%).

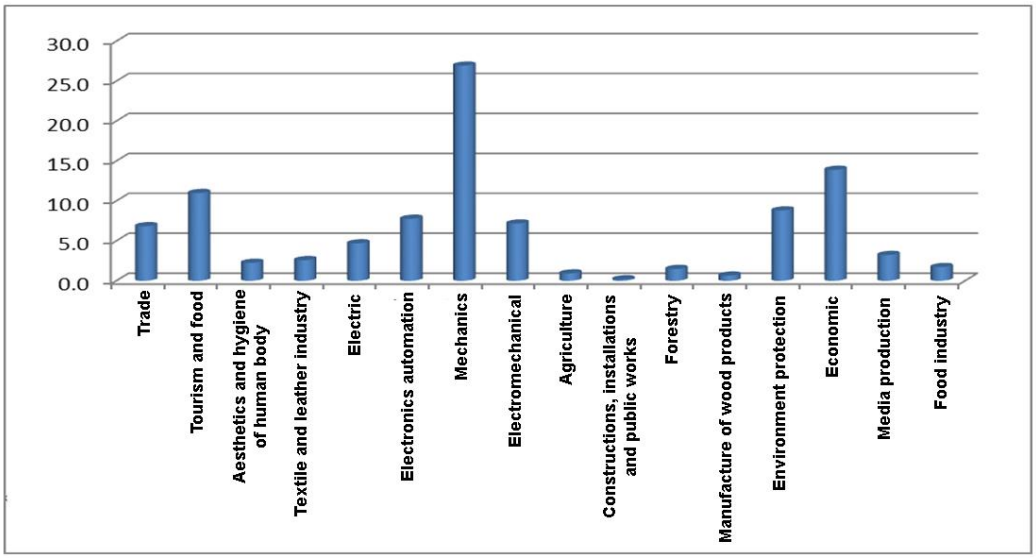

Figure no. 2. Distribution of students (%) by field variable

Considering the school-economic agent relationship, i.e. the tuition request from economic operators for professional and dual education, the following comparative analyses are noteworthy.

According to the ***field of training*** variable, it is observed that most requests are from the fields of: *Mechanics* (42.9%), with a series of professional qualifications - *car mechanic* - 25%; *metal construction welder and locksmith and technological equipment* - 16% each; *car*

paint tinsmith – 14%, etc.; *Tourism and Food* (12.7%), of which the Professional *Chef* qualification holds 50%; *Electromechanics* (9.5%), of which over 80% refer to the professional qualification of *electromechanics industrial machinery and installations*.

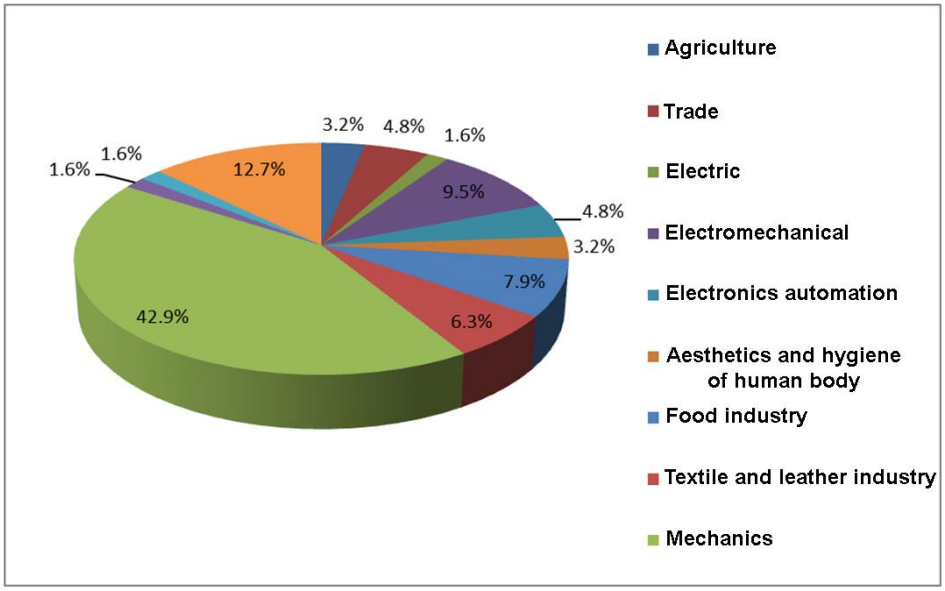

Figure no. 3. Distribution of economic operators (%) according to the field of training variable

2.2. The objectives of the study

The purpose of this research is to analyse the perceptions of the teachers who carry out the internships from the technological high-schools in Dâmboviţa County to the economic agent, regarding the impact of digitalization on the new competencies for access to the labour market – point of view for vocational and technical education in the initial training management for the professional and technical education.

The objective of the research: Analysis of the problems encountered at a workplace and the lack of digital skills at the economic agent within the internships carried out by the school units of professional and technical education.

The qualitative and quantitative research regarding a workplace and the lack of digital skills is based on the following **hypothesis**: there is a positive association between the problems encountered at a workplace and the lack of digital skills.

2.3. Documentary Analysis

Digitization is expected to increase *workplace flexibility*. In general, mobile work equipment and opportunities to work more and more online reduce the somewhat rigid dependence on the operational workplace and generate corresponding desires among employees. Workplace flexibility gives people the chance to improve their work-life balance, bringing about equal opportunities in the process. However, workplace flexibility is not possible everywhere and this is especially true for sectors that produce bulky goods using heavy materials and machinery (in this case, departments or operating units will be maintained, where staff must be present at all times).

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questions about integration, leadership and supervision, in addition to necessary adjustments in skills, working hours and workplace.

All these trends can have the following implications at the level of initial vocational training: there will be an emphasis on the development of skills in critical thinking, intuition and analysis, literacy and the integration of experiential learning through soft skills.

3. RESEARCH RESULTS

Professional software offers support in the educational act and creates a virtual climate conducive to simulating real situations in the learning process at the workplace. The analysis of the answers (to statements on a 4-point Likert scale) reveals an average score of 2.58 (fig. 4).

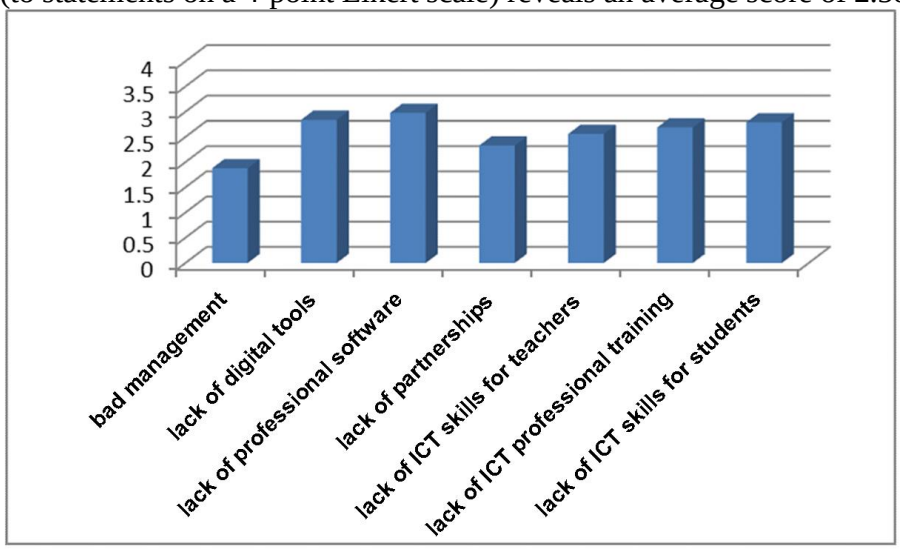

Figure no. 4. Distribution of scores obtained regarding the influence of obstacles in the use of professional software

As this can be seen, the teaching staff consider the *lack of professional software* (average score 2.98) as an innovative teaching method, with the involvement of all participants, as the main obstacle in the introduction and use of digitization in professional and technical education. Moreover, this aspect is directly related to the *lack of digital tools* (computers, internet access) - average score 2.84. Practically, in order to connect the class and the students to a society of knowledge, which increasingly calls on the digital sphere, a connection to digital means is needed (access to information technology and use of professional profile software).

A second aspect that should be mentioned is the one related to the lack of training of the participants (teachers and students) in terms of using these digital tools: *the lack of basic ICT skills of the students* (average score 2.79); *the lack of training programs on the topic of digitization in the professional sphere of teachers* (average score 2.69); *the lack of professional skills in the use of teachers' professional software* (average score 2.56).

This problem could be solved by a closer collaboration between the school unit and professional economic agents, who can provide a series of professional software. Moreover, the *lack of partnerships with prominent economic agents* (average score 2.33) expresses an obstacle (with a low influence). Conversely, *poor management* (average score 1.88) hardly influences the use of professional software in a school unit. It is appreciated that this aspect is closely related only to the activity of teaching staff with groups of students.

For the professional insertion of graduates, in the conditions of globalization and technological progress, increasingly higher skills and relevant for the labour market are needed. In order to increase productivity (from the point of view of employers) and ensure decent jobs (from the point of view of the employee), a sufficient level of basic skills is required, to which new skills can be added.

In this case, the ***school - economic agent collaboration*** is the basis of a relationship that ensures mutual information (what the economic agent wants and what the school can offer). For vocational and technical education, about 80% of the teaching staff consider it to be a strong and a very strong collaboration.

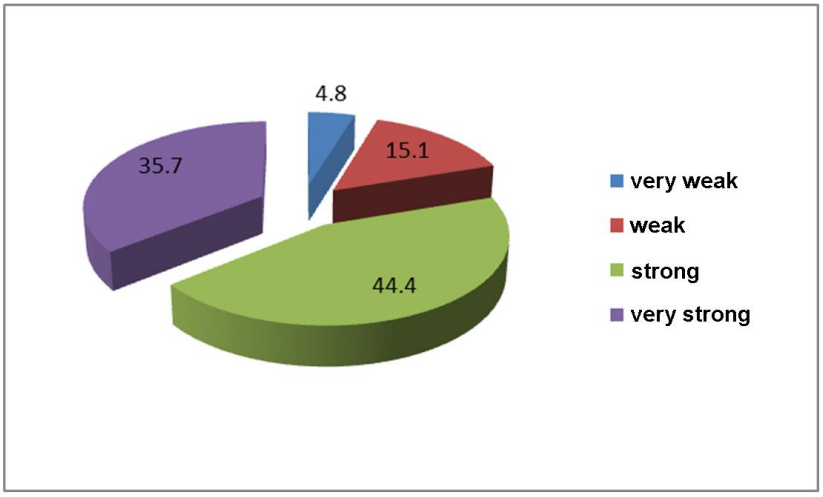

Figure no. 5. The school-business collaboration in order to identify new skills

The European reference framework for key competences allows flexible and rapid adaptation of the graduate. In this framework, a category of ***digital skills and the use of new information and communication technologies*** (***ICT***) is distinguished. This aspect involves the use of electronic media at work, in leisure time and for communication, in other words to receive, evaluate, store, produce, present and exchange information and to communicate and participate in networks, via the Internet.

Being a characteristic of education in a group of students, the competence most often targeted by teachers in the activity with students is *sociability* (average score 3.52; 95% of teachers consider it almost always). In an education system, regardless of whether it is particularized on vocational and technical education, where the activity is centred on the student, the competence that pursues *creativity* (3.29) occupies a rather important place, especially in the evaluation of students.

Trying to incorporate the knowledge accumulated until the completion of the high school cycle, the students are led, by the teachers, in the direction of using *interdisciplinary knowledge* (3.19), but also to always have a point of view, through *critical thinking* (3.17). All this can lead students to develop skills aimed at mental *flexibility and the ability to solve complex problems* (3,10).

Much less, perhaps as a consequence of the reduced number of non-specialist hours, teachers mentioned *STEM* (*science, technology, engineering and mathematics*) and *SMAC* (*Social, Mobile, Analytical and Cloud*) skills, noting - about 60% of them develop these skills weekly.

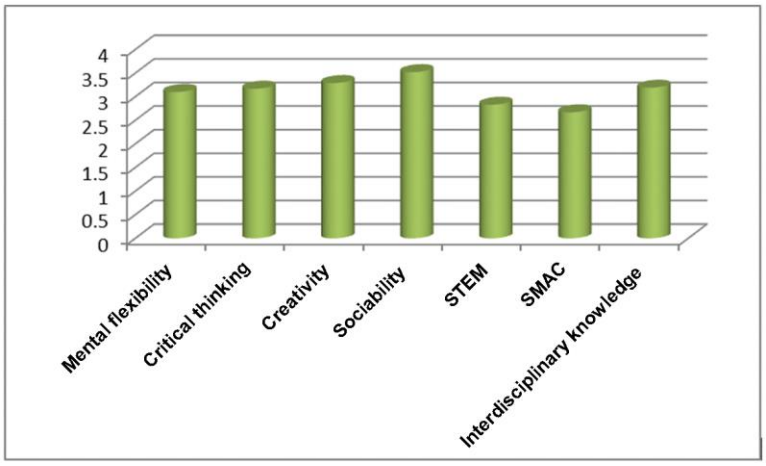

Figure no. 6. Digital skills and ICT use

Table 3. Principal component analysis (PCA) applying the Varimax rotation method with Kaiser normalization

	Component				
	1	2	3	4	5
A	-0,290	**-0,513**	0,151	-0,018	0,055
B	-0,042	0,049	0,022	-0,017	0,054
C	0,018	0,185	0,038	0,072	0,031
D	0,014	0,073	-0,066	-0,005	0,167
E	-0,134	0,004	-0,045	0,055	-0,003
F	-0,030	0,076	0,051	0,219	**0,662**
G	0,215	-0,031	0,232	**0,562**	0,237
H	0,098	0,086	-0,036	**0,829**	-0,010
I	**0,815**	0,007	-0,033	0,157	-0,003
J	**0,798**	0,241	0,226	0,114	0,001
K	0,162	-0,014	-0,020	-0,147	-0,094
L	0,132	-0,052	-0,261	0,012	-0,080
M	-0,058	-0,141	-0,287	-0,061	-0,315
N	-0,090	-0,138	**-0,746**	-0,136	0,114
O	-0,059	0,043	0,020	-0,149	-0,025
P	-0,257	0,001	0,067	-0,043	-0,098
Q	-0,221	-0,038	-0,068	-0,153	0,239
R	0,093	-0,021	**0,592**	-0,004	0,382
S	0,223	0,176	-0,041	-0,049	0,098
T	0,032	0,303	0,054	0,138	-0,255
U	0,138	-0,070	0,038	0,058	0,072
V	-0,081	0,012	0,189	0,034	0,146
W	-0,006	**0,783**	0,110	0,135	0,128
X	0,212	**0,645**	0,136	-0,083	0,014
Y	-0,052	0,331	-0,052	-0,111	-0,083
Z	0,071	0,042	-0,174	-0,058	0,400
A1	-0,024	0,121	0,074	0,008	0,328
B1	-0,041	0,247	0,051	0,195	0,072
C1	-0,089	0,119	-0,125	-0,022	-0,060
D1	0,181	0,124	0,000	-0,102	-0,011
E1	0,210	0,004	0,164	0,046	-0,189
F1	0,114	0,024	0,243	-0,070	0,136
G1	-0,045	0,075	-0,160	0,002	-0,025
H1	-0,098	0,026	0,048	0,071	0,038
I1	-0,206	0,023	0,066	0,052	0,026
J1	-0,030	0,114	0,167	0,100	0,074
K1	0,308	0,021	-0,198	-0,164	0,208

L1	0,000	-0,051	0,107	0,060	-0,042
M1	-0,075	-0,063	-0,069	0,237	-0,093
N1	-0,001	-0,033	0,227	0,122	-0,055
O1	0,086	-0,078	0,021	0,017	0,090
P1	-0,005	0,035	-0,017	-0,020	-0,024
Q1	0,065	0,060	0,107	-0,056	-0,129
R1	0,175	-0,059	-0,138	-0,182	0,099
S1	0,038	-0,073	0,190	-0,205	0,043

- Component 1 is defined by the implementation of information technologies in professional activities. Teachers who use information technologies in their daily activities (I; 0.815; N = 289), also implement them in the professional field (J; 0.798; N = 289). There is a weak negative correlation (A; -0.290; N = 289) between female teachers and IT implementation. Women are less computer literate.
- Component 2 is defined by the technological and scientific skills assessed/developed by teachers. Female teachers are less interested in technological and scientific skills (A; -0.513; N = 289). The most important technological and scientific skills of students are (in descending order):
    - STEM (Science, Technology, Engineering and Mathematics) (W; 0.783; N = 289);
    - SMAC - Social, Mobile, Analytical and Cloud (sociability in the digital environment) (X; 0.645; N = 289).
- Component 3 is characterized by collaboration with economic agents of the academic environment (R; 0.592; N = 289). In the use of professional software in school, the lack of partnerships with professional economic agents has a large negative influence (N; -0.746; N = 289).
- Component 10 is related to digital investments (H; 0.829; N = 289). Schools, which make digital investments, generally have a system for monitoring digital use (G; 0.562; N = 289).
- Component 4 is defined by the intensity of ICT use by teachers (F; 0.662; N = 289). The lack of professional software (M; -0.315; N = 289) and the assessment/development of critical thinking in students (T; -0.255; N = 289) have a weakly negative influence on the intensity of ICT use by teachers. The intensity of collaboration with economic agents (R; 0.382; N = 289), the need to reduce the time spent performing an activity (Z; 0.400; N = 289) and the need to make the work schedule more flexible (A1; 0.328; N = 289) have a weak positive influence on the intensity of ICT use by teachers.

4. Conclusions

In this context, the impact of digitalization on the new competencies for access to the labour market - point of view for vocational and technical education in professional and technical education in training fields, highlights the following aspects: the lack of implementation of information technologies in professional activities in collaboration with the economic agent, the tendency to increase the dependence of public schools on business and technology partnerships for the formation of initial skills, the impossibility of implementing digital technologies where the local economy is poorly developed, the outdated mentality of teaching staff who must adopt a spirit of innovation through the development of skills digital professionals, the lack of a legislative framework to encourage innovation through cooperation and partnerships.

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